Dec. 13, 1938. R. P. LANSING 2,140,083

ENGINE STARTING APPARATUS

Original Filed Feb. 25, 1935 2 Sheets-Sheet 1

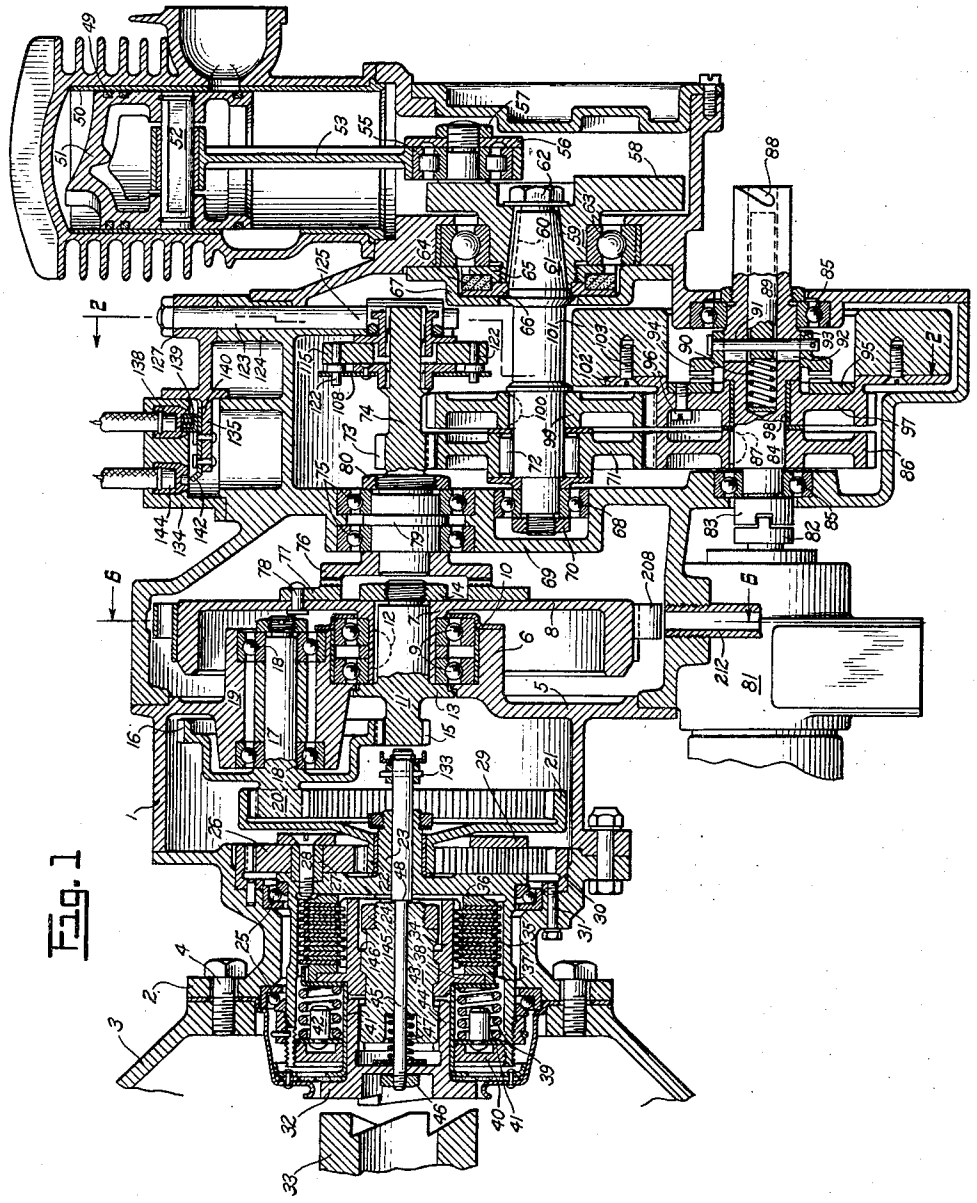


Fig. 1

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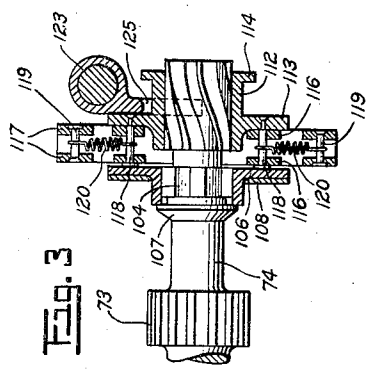


Fig. 3

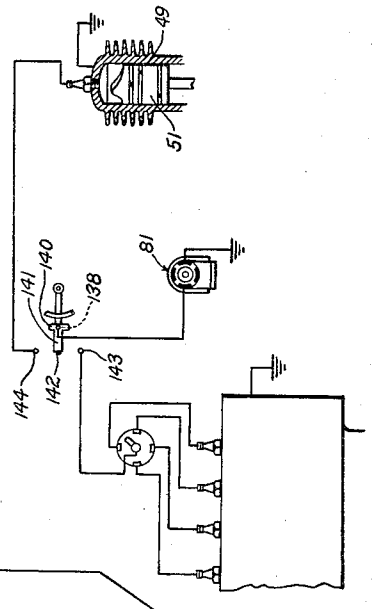


Fig. 4

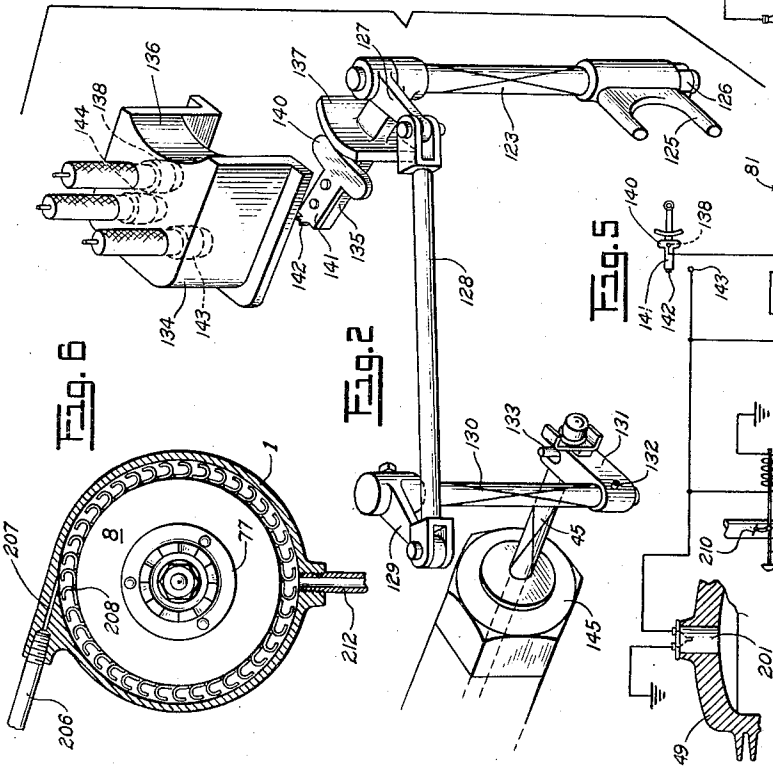


Fig. 2

Fig. 5

Fig. 6

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UNITED STATES PATENT OFFICE

2,140,083

ENGINE STARTING APPARATUS

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Application February 25, 1935, Serial No. 8,187
Renewed May 22, 1937

9 Claims. (Cl. 123—179)

My invention relates to engine starting apparatus for the starting of engines, such as internal combustion engines, more particularly but not necessarily airplane engines, and an object thereof is to provide a simple, efficient and reliable apparatus capable of either manual or power operation, or both, characterized by the provision of simple and efficient inertia means such as a flywheel which is actuated by such power or manual means for the accumulation and storing of energy, which is thereupon utilized by the application thereof to the engine for cranking such engine, and characterized also by the provision of fluid pressure mechanism as the power means, the same in the present instance acting directly upon the inertia means or flywheel. The fluid under pressure which is utilized may be either air, gas, water or any other fluid under pressure, and while a source of supply of such fluid under pressure may be used in case of airplanes, a tank of fluid under pressure may be carried on board the airplane itself, if desired, and such tank may be removable for refilling, or may be charged or refilled from a pump driven by the airplane engine if desired. Usually at an airplane landing field, a supply of compressed air is available and a line thereof may be carried to the airplane and the nozzle of the supply hose applied to my new apparatus for the purpose of cranking and starting the engine.

Another object is to provide novel starting mechanism embodying an inertia member, an internal combustion engine for accelerating said inertia member, and means for manually cranking said engine to start the same.

Another object is to provide starting mechanism of the type embodying an inertia member and an internal combustion engine for accelerating the same, wherein said engine is automatically stopped when the energy stored in said inertia member is applied to the main engine to be started.

Another object is to provide starting mechanism for an internal combustion engine embodying an inertia member, an internal combustion engine for accelerating said inertia member, and a magneto which provides ignition current for the accelerating engine and also serves as a booster magneto for the main or large engine to be started.

A still further object is to provide starting mechanism for an internal combustion engine embodying an inertia member, a magneto, and means operable at a predetermined speed of rotation of said inertia member to engage the starting mechanism automatically with the main engine to be started and to connect the magneto automatically with said main engine to serve as a booster magneto therefor.

Another object is to provide starting mechanism for internal combustion engines of the type embodying an inertia member, an internal combustion engine for accelerating the same and a magneto providing ignition current for the accelerating engine, wherein the accelerating engine is automatically stopped when the energy stored in the inertia member is applied to the main engine to be started, but the magneto is driven from the inertia member and is adapted to serve as a booster magneto for the engine to be started.

Another object is to provide automatically fired cartridge means to actuate the accelerating engine coincidently with the automatic cut-off of the pressure fluid acting directly upon the inertia member, the added impetus thus imparted to the accelerating engine being transmitted to the inertia member to offset the loss of energy during the first, or "break-away" stage of the engine cranking process. Preferably this cartridge firing occurs at the moment of coupling starter and engine parts, and hence at the moment of "break-away".

These and other objects will appear more fully hereinafter.

One embodiment of the invention is illustrated in the accompanying drawings, but it is to be expressly understood that said drawings are for purposes of illustration only, and are not to be construed as a definition of the limits of the invention, reference being had to the appended claims for this purpose.

In said drawings—

Fig. 1 is a longitudinal section through a starting mechanism embodying the invention, one of the planet pinions being omitted in order to avoid obscuring the showing of the adjacent parts;

Fig. 2 is a perspective view of certain details of Fig. 1;

Fig. 3 is a sub-assembly view of certain details of Fig. 1;

Figs. 4 and 5 are diagrams of the electrical connections; and

Fig. 6 is a sectional view along line 6—6 of Fig. 1.

Referring now to the drawings, wherein like reference characters refer to like parts throughout the several views, and particularly to Fig. 1, the starting mechanism is housed in a sectional

casing 1 of any suitable form, the casing sections being secured together in any suitable manner and the inner casing section being provided with a flange 2 that is secured to the housing 3 of an internal combustion engine to be started in any suitable manner, as by means of screws 4. Extending across the casing and preferably formed integrally with one of the casing sections is a plate or diaphragm 5 that is provided with a suitable bearing boss 6 wherein the hub 7 of a flywheel 8 is rotatably mounted in any suitable manner, as by means of ball bearings 9 held in place by a suitable retaining ring 10. A short shaft 11 extends through the hub 7 of the flywheel and is suitably keyed thereto at 12, a collar 13 on said shaft and a lock nut 14 on the outer end thereof preventing relative longitudinal displacement of shaft 11 and hub 7.

Flywheel 8 is preferably of small size and light weight and is adapted for rotation at very high speed, the energy stored in the rapidly rotating flywheel being transmitted preferably through a train of reduction gearing and a yieldable driving connection to a driving member adapted to engage a member of an engine to be started. In the form shown, gear teeth formed integrally with the inner end of shaft 11 constitute a gear 15 that meshes with a pinion 16 which is rotatably mounted by means of a stub shaft 17, preferably formed integrally therewith, in ball bearings 18 carried by a boss 19 formed in the plate or diaphragm 5. The inner end of shaft 17 is provided with gear teeth constituting a pinion 20 that meshes with an internal ring gear 21, the hub 22 of which is rotatably mounted on an extension 23 of a barrel member 24 that is in turn rotatably mounted in the housing by suitable means such as ball bearings 25. The hub 22 of ring gear 21 is provided with great teeth and constitutes a pinion or sun gear that meshes with a plurality of planetary gears, one of which is shown at 26 in Fig. 1, said planetary gears preferably being three in number and being rotatably mounted on the barrel 24 in any suitable manner, as by means of bushings 27 surrounding screws 28 threaded into said barrel member. A retaining ring 29 secured to the screws 28 retains the planetary gears on the bushings 27, and an internal ring gear 30 that is secured to the casing by means of screws 31 surrounds and meshes with said planetary gears.

The rotation of flywheel 8 is thus transmitted through a reduction gear train constituted by pinion 15, gear 16, gears 20, 21, sun gear 22, planetary gears 26 and ring gear 30 to the barrel 24. The rotation of barrel 24 is in turn suitably transmitted, preferably through a yeildable driving connection, to a driving member or clutch jaw 32 that is adapted to be shifted axially into driving engagement with a corresponding clutch jaw 33 formed on a member of the main engine to be started. In the form shown, an interiorly threaded nut 34 is positioned in the barrel 24 and is drivably connected therewith by means of a friction clutch formed by a plurality of friction disks 35, alternate disks being splined to the inner surface of barrel 24 and to the outer surface of nut 34. The disks 35 are held between a spacing ring 36 that is interposed between the outermost disk and the barrel 24 and a spacing ring 37 that is interposed between the innermost disk and a collar 38 formed on the nut 34, and are resiliently pressed together by means of a plurality of coil springs 39 that are interposed between collar 38 and spacer 37 and a nut 40 that is threaded in the outer end of barrel 24. If desired, a ring 41 provided with a plurality of studs 42 may be employed to maintain springs 39 in spaced relation around the axis of the nut and barrel.

A short shaft 43 positioned within the nut 34 is exteriorly threaded to engage the threads formed on the interior of the nut, the outer end of said shaft being splined to engage the interiorly splined hub 44 of clutch jaw 32. A rod 45 extends centrally through the extension 23 of barrel 24, shaft 43 and clutch jaw 32 and is provided on its inner end with a nut 46, a coil spring 47 surrounding said rod and being interposed between the outer face of clutch jaw 32 and shaft 43. Rod 45 is further provided with a shoulder 48 engaging the outer end of shaft 43, so that when said rod is pushed toward the left, as seen in Fig. 1, by means described hereinafter, the threaded engagement between shaft 43 and nut 34 causes said shaft to move toward the left, compressing spring 47 and resiliently urging clutch jaw 32 inwardly into engagement with clutch jaw 33. When the engine to be started starts under its own power, clutch jaw 33 overruns clutch jaw 32 and the inclined faces of the teeth of said jaws are adapted to force clutch jaw 32 outwardly or to the left, as seen in Fig. 1, and to restore the parts to the position shown in the drawings.

It is desirable to employ an internal combustion engine to accelerate the flywheel 8 to the proper speed before the clutch jaws 32 and 33 are engaged, and preferably this accelerating engine is drivably connected with the flywheel 8 through suitable gearing and also through a one-way driving connection so that the flywheel is driven by the engine but energy will not be transmitted from the flywheel back to the engine. In the form shown, a two-cycle internal combustion engine of any suitable type is employed which, as shown, comprises the usual cylinder 49 and liner 50 in which reciprocates a piston 51 having a wrist pin 52 to which is pivoted a connecting rod 53. A crank pin 54, on which the end of the connecting rod 53 is rotatably mounted by means of a suitable roller bearing 55 and secured by means of a disk 56 and nut 57, is secured to or preferably formed integrally with a crank or disk 58, the hub 59 of which is keyed at 60 to one end of a shaft 61 and is secured on said shaft by a nut 62. Hub 59 is rotatably mounted by means of ball bearing 63 in the casing and constitutes a supporting bearing for one end of shaft 61, and the crankcase of the accelerating engine is sealed in any suitable manner as by means of a cork washer 64 or the like compressed between a ring or nut 65 threaded on the end of hub 59 and a ring 66 drivably connected to shaft 61 in any suitable manner. A retaining ring 67 secured to the casing in any suitable manner maintains these parts in proper assembled relation. The other end of shaft 61 is mounted in a ball bearing 68 supported in a recess formed in a plate or diaphragm 69 preferably integral with one of the casing sections, and a retaining nut 70 is threaded on the inner end of the shaft.

The shaft 61, which constitutes the crank shaft of the accelerating engine, is adapted to drive the flywheel 8 preferably through a suitable train of step-up gearing and through a suitable one-way driving connection. In the form shown, a gear 71 is mounted on the shaft 61 and is drivably connected therewith by means of an overrunning

roller clutch 72 of any suitable type that is adapted to transmit torque in one direction only, that is, the clutch transmits torque from shaft 61 to gear 71 but the latter overruns shaft 61 so that driving torque is not transmitted in the reverse direction. Gear teeth 73, preferably formed integrally with a shaft 74, constitute a pinion that meshes with gear 71, the shaft 74 being rotatably mounted by means of ball bearings 75 supported in the plate or diaphragm 69.

Rotation of the shaft 74 is transmitted to flywheel 8 by any suitable means, which as shown, comprise a clutch jaw 76 drivingly secured in any suitable manner to the end of shaft 74 and engaging a corresponding clutch jaw 77 that is suitably attached as by means of rivets 78 to the flywheel 8. Endwise movement of shaft 74 is prevented by clutch jaw 76, a collar 79 engaged between the ball races of ball bearings 75, and a nut 80 threaded on the shaft 74 and having engagement with the outermost ball race.

For the purpose of providing ignition current for the accelerating engine, a magneto 81 of any suitable type is secured in any suitable manner to the casing section and is drivingly connected to a rotating part of the mechanism so as to be rotated with the crank shaft 61. Preferably said magneto is adapted by means hereinafter described to provide ignition current not only for the accelerating engine, but also for the main engine to be started by clutch jaws 32, 33, and accordingly the driving connections for said magneto are such that the magneto armature is rotated not only by the accelerating engine, but also by the flywheel 8, although the accelerating engine is stopped.

In the form shown, the shaft of the magneto 81 is drivably connected by means of cooperating clutch members 82, 83 with a shaft 84, which is rotatably mounted by means of ball bearings 85 in the casing 1, and with a gear 86 which is keyed to shaft 84 at 87 and meshes with gear 71 on shaft 61. As above described, gear 71 may be driven by shaft 61 to rotate the flywheel 8, or may be rotated by flywheel 8 and overrun the stationary shaft 61, and the magneto armature is rotated in either case.

Any suitable means may be employed for starting the accelerating engine, said means preferably being manually operable and embodying an engine flywheel. Preferably, however, the driving torque of a manually operable member is transmitted to the accelerating engine through the shaft 84, which as above described, is connected directly with the magneto armature shaft, so that the rotation of the magneto armature may be synchronized with the position of the piston 51 and the accelerating engine will be properly timed. In the form shown, the outermost end of shaft 84 is hollow and is provided with a suitable slot 88 so that the usual hand crank (not shown) may be engaged therewith. Positioned in the hollow shaft 84 is a short rod 89 that is resiliently urged outwardly by means of a suitable coil spring 90, and a pin 91 extends diametrically through the rod 89, through elongated slots 92 formed in the walls of shaft 84, and through the hub 93 of a clutch jaw 94 that is slidable on said shaft. When a hand crank is fitted to the end of shaft 84, rod 89 is pushed inwardly, and clutch jaw 94 is displaced longitudinally on the shaft 84 into engagement with a corresponding clutch jaw 95 that is suitably secured as by means of screws 96 to a gear 97, the latter being mounted for rotation on shaft 84 by means of a suitable bushing 98 and meshing with a gear 99 that is keyed at 100 to shaft 61. A flywheel 101 is suitably secured to a flange 102 formed on said gear 97 by means of screws 103. Thus when a hand crank is fitted to the end of shaft 84 and the shaft together with the magneto armature is rotated, clutch jaws 94, 95 are engaged and the rotation of shaft 84 is transmitted through gears 97 and 99 to crankshaft 61 to start the accelerating engine, flywheel 101 rotating simultaneously.

It will be seen that the relation between the angular position of the magneto armature and the position of piston 51 is controlled by the engagement of clutch jaws 94, 95, and said jaws are preferably of a type engageable in only one relative position. This can be done by providing clutch jaw 94 with two notches to be engaged by teeth formed on clutch jaw 95, and the driving faces of said notches and teeth, instead of being diametrically opposite one another, may be slightly offset so that they are engageable in only one relative position. With such an arrangement, no matter what may be the relative positions of the magneto armature and the piston 51 when the shaft 84 is first turned by the hand crank, the driving connection from the hand crank to the crank shaft 61 will be established in only one predetermined relative position of the shafts 84 and 61 so that the accelerating engine will always be properly timed.

When the flywheel 8 is rotating and the clutch jaws 32 and 33 mesh, slippage results between the friction disks 35 and the flywheel 8 slows down as the energy stored therein is absorbed in turning over the engine to be started, and simultaneously with the engagement of said clutch jaws it is desirable that the accelerating engine be stopped. At this time the magneto 81, which is still rotated by the flywheel 8, is available for use as a booster magneto for the engine to be started. Accordingly, novel means may be provided that are operated in common with the means for displacing the rod 45 to mesh the clutch jaws 32, 33 and which disconnect magneto 81 from the accelerating engine and connect it with the main engine to be started, thereby both stopping the accelerating engine and employing the magneto as a booster. While any suitable means may be employed for this purpose, either manually or automatically operable, it is preferred to employ automatic means operable when the flywheel 8 has reached a predetermined speed for shifting rod 45 and for simultaneously operating suitable switching mechanism controlling the circuit of the magneto 81. In the form shown in the drawings, said automatic means is constituted by a governor mechanism operated by centrifugal force and carried by shaft 74 that is drivingly connected with flywheel 8 to accelerate the latter.

Referring more particularly to Figs. 1, 2, 3, and 4, the shaft 74 is provided with a straight splined portion 104 on which is mounted the correspondingly splined hub 105 of a plate 106, said hub 105 seating against a collar 107 formed on shaft 74. A plate 108, that is mounted on the hub 105 and is suitably secured to plate 106, as by means of a rivet or rivets 109, is provided with diametrically opposite extensions in which are formed elongated slots 110. The end of shaft 74 is provided with curved splines or threads 111 on which is positioned a correspondingly splined or threaded hub 112 having a circular flange or

plate 113 intermediate its end and a flange or collar 114 formed on its outer end.

A pair of similar irregularly shaped flyweights 115, provided with forked or bifurcated ends 116 and 117, are each pivoted at diametrically opposite points to the flange 113 by suitable means such as pins 118 extending through the bifurcations 116 and preferably riveted in the flange 113. Pins 119 extend through and are preferably riveted in the bifurcations 117 of each of members 115, and said members 115 are resiliently held inwardly close to the shaft 74 by means of coil springs 120, each extending from a pin 119 of one member 115 to a pivot pin 118 of the other member 115. Flyweights 115 are positioned intermediate the flange 113 and plate 106, and each flyweight is provided adjacent the center of its outer periphery with a hole or opening 121 in each of which is positioned one end of a pin 122, the other ends of said pins 122 extending through the slots 110 in the plate 108. Pins 122 normally rest in the inner ends of slots 110, and the plate 108, flyweights 115, and the member 112 and its flange 113 normally rotate together in unison with the shaft 74. When the speed of rotation of shaft 74 becomes sufficiently great that the tension of springs 120 is overcome and the weights 115 move radially outward, pins 122 moving outwardly in slots 110, relative rotation is produced between member 112 and plates 106 and 108, that is, between member 112 and shaft 74, and the splines or threads 111 cause member 112 to move longitudinally toward the end of shaft 74.

This longitudinal displacement of the member 112 may be employed to operate the rod 45 and the switching mechanism above referred to by any suitable means. As shown in the drawings, a shaft 123 is rotatably mounted in a bearing 124 formed in the casing and carries at its inner end a fork 125, the bifurcations of which engage in the groove formed on member 112 by the flanges or collars 113, 114. Fork 125 is retained on shaft 123 by means of a nut 126 threaded on the lower end of the shaft. When the member 112 moves longitudinally on the shaft 74, as above described, fork 125 causes shaft 123 to rotate and this rotation is transmitted by an arm 127 (Fig. 2) rigidly secured to the outer end of shaft 123 and a link 128 to an arm 129 rigidly secured to the outer end of a rotatable shaft 130. As shown in Fig. 2 the link 128 is disposed outside the casing 1, and accordingly the arm 129 and the outer end of shaft 130 which connects therewith are also disposed outside the casing. A fork or bifurcated member 131, rigidly secured to the inner end of shaft 130 in any suitable manner as by means of a pin or set screws 132, embraces the rod 45 and engages a pin 133 extending through said rod. When the flywheel 8 and shaft 74 reach a predetermined speed of rotation, and the flyweights 115 move radially outward, the forks 125 and 131 operate through the connections above described to move the rod 45 longitudinally toward the left as seen in Fig. 1, thereby displacing clutch jaw 32 into engagement with clutch jaw 33, as above described.

The displacement of member 112 and the resulting rotation of shaft 123 is further adapted to operate a suitable switching mechanism controlling the circuit of the magneto 81. In the form shown, a terminal block 134 of suitable insulating material is secured to the casing and carries a plurality of terminals that are interconnected by means of a switching arm 135 of suitable insulating material that is rigidly secured to and rotates with the shaft 123. Preferably the terminal block 134 is provided with a curved guide plate 136 with which cooperates a correspondingly shaped guide plate 137 carried by the arm 135. Terminal 138 is connected with the terminal of the magneto 81 and is provided with a spring pressed contact 139 (Fig. 1) engaging an arcuate plate 140 of conducting material that is carried by arm 135. An extension 141 of said plate 140 is provided with an upwardly turned contact 142 adapted to engage either a terminal 143 leading through the usual distributor to the ignition circuit of the main engine to be started, or a terminal 144 that is connected to the ignition circuit of the accelerating engine according to the position of the switch arm 135.

Instead of operating the piston 51 by explosions of hydrocarbonaceous material, such as atomized gasoline, it can be operated by gases generated from the firing of one or more cartridges 201 (Fig. 5) mounted in the cylinder heads 49, and fired electrically by closure of switch 141, 143, as shown.

Closure of switch 141, 143, as shown, can also operate to energize the valve closing solenoid 205 (Fig. 5) and thereby cut off the flow of pressure fluid through conduit 206 (Figs. 5 and 6) leading to nozzle 207 (Fig. 6) which discharges the fluid against vanes 208 mounted on flywheel 8 (Figs. 1 and 6). The valve 210 is initially opened by pulling handle 211 (Fig. 5) to the left, whereupon the fluid from the source (not shown) enters nozzle 207 and impinges against vanes 208 to rotate the flywheel, the exhaust occurring through one or more outlets 212 (Figs. 1 and 6).

As soon as flywheel 8 has reached a predetermined speed of rotation, the flyweights 115 move radially outward and cause relative rotation between the member 112 and shaft 74, whereupon the member 112 moves outwardly or to the right as seen in Fig. 1 to actuate the shifting mechanism above described. Rotation of switch arm 135 disconnects the terminals 138 and 144 so that the accelerating engine stops, and connects the terminals 138 and 143 so that the magneto 81, which is now driven by the flywheel 8 through gears 73, 71 and 86, is connected to the ignition circuit of the engine to be started. At the same time shifting fork 131 pushes rod 45 inwardly or to the left as seen in Fig. 1, and shoulder 48 on said rod engages the shaft 43 and causes relative rotation between the shaft and nut 34 which in turn causes said shaft to move inwardly or to the left in said nut until a stop nut 145 on said shaft engages a suitable shoulder 146 formed interiorly of said nut. Spring 47 which tends to be compressed by movement of the shaft 43 now urges clutch jaw 32 resiliently into engagement with clutch jaw 33.

As soon as the engine starts under its own power, clutch jaw 33 overruns clutch jaw 32 and the inclined faces of the teeth of said jaws are effective to cause clutch jaw 32 to move outwardly, coacting with spring 47 to restore the parts to the position shown in the drawings. As the speed of the flywheel decreases and the flyweights tend to return to their initial position, the automatic shifting mechanism tends to be returned to its initial position ready for another starting operation and any suitable resilient means may be employed if desired to assist the return movement of the shifting mechanism.

When the piston 51 is to be cartridge actuated

as indicated in Figure 5, the electric igniting means for the cartridge **201** may be placed in circuit with the switch **141**, **143** as indicated in said figure so as to be operated simultaneously with the energization of solenoid **205**. With this arrangement movement of the switch arm **141** in response to acceleration of the flywheel to the predetermined speed will simultaneously stop the flow of fluid in conduit **206** and fire the cartridge **201**.

Changes in the form, details of construction and arrangement of parts, will now be apparent to those skilled in the art, and may be made without departing from the spirit of the invention. Reference is therefore to be had to the appended claims for a definition of the limits of the invention.

This application is a continuation in part, of my application, Serial No. 707,827, filed January 22, 1934, and in part, of my application, Serial No. 424,692, filed January 30, 1930, the former having been filed as a continuation of my subsequently abandoned application No. 137,372 of September 23, 1926.

What is claimed is:

1. In an engine starter, in combination, an engine engaging member, a flywheel connected through gearing to said member, a series of vanes on said flywheel, a conduit for directing fluid toward said vanes to accelerate said flywheel to high speed, and means independent of time factors and responsive solely to the attainment of such high speed to discontinue the supply of fluid to said vanes.

2. In an engine starter, in combination, an engine engaging member, a flywheel connected through gearing to said member, a series of vanes on said flywheel, a conduit for directing fluid toward said vanes to accelerate said flywheel to high speed, means independent of time factors and responsive solely to the attainment of such high speed to move said engine engaging member into engine engaging position and means operatively connected with said last named means to stop the flow of fluid through said conduit to said vanes.

3. In an engine starter, in combination, an engine engaging member, a flywheel connected through gearing to said member, a series of vanes on said flywheel, a conduit for directing fluid toward said vanes to accelerate said flywheel to high speed, means for driving said flywheel, said means including a reciprocable piston and motion translating connections from said piston to said flywheel, a cartridge adjacent said piston and means responsive to acceleration of said flywheel to stop the flow of fluid in said conduit and fire said cartridge.

4. In an engine starter, in combination, an engine engaging member, a flywheel connected through gearing to said member, means for accelerating said flywheel, said means including a reciprocable piston and motion translating connections from said piston to said flywheel, a cartridge adjacent said piston, a switch controlling operation of said cartridge and means responsive to acceleration of said flywheel to actuate said switch.

5. In an engine starter, in combination, an engine engaging member, a flywheel connected through gearing to said member, means for accelerating said flywheel, said means including a reciprocable piston and motion translating connections from said piston to said flywheel, an explosive containing device adjacent said piston, a switch controlling operation of said explosive containing device, and means responsive to acceleration of said flywheel to actuate said switch.

6. In an engine starter, in combination, an engine engaging member, a flywheel connected through gearing to said member, means for accelerating said flywheel, said means including a reciprocable piston and motion translating connections from said piston to said flywheel, an explosive containing device adjacent said piston, electrical means controlling operation of said explosive containing device, and means responsive to acceleration of said flywheel to actuate said electrical means.

7. In an engine starter, in combination, an engine engaging member, a flywheel connected through gearing to said member, means for accelerating said flywheel, said means including a reciprocable piston and motion translating connections from said piston to said flywheel, an explosive containing mechanism adjacent said piston, means controlling operation of said explosive containing mechanism, and means responsive to acceleration of said flywheel to actuate said controlling means.

8. In an engine starter, in combination, an engine engaging member, a flywheel connected through gearing to said member, a series of vanes on said flywheel, a conduit for directing fluid toward said vanes to accelerate said flywheel to high speed, and means responsive to the attainment of such high speed to discontinue the supply of fluid to said vanes.

9. In an engine starter, in combination, an automatically disengaging engine engaging member, a flywheel connected through gearing to said member, means for supplying energy to accelerate said flywheel to high speed, and means responsive to the attainment of such high speed to discontinue such supply of energy.

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