

April 8, 1930.

H. FORD

1,753,825

ENGINE

Filed Feb. 13, 1928

2 Sheets-Sheet 1

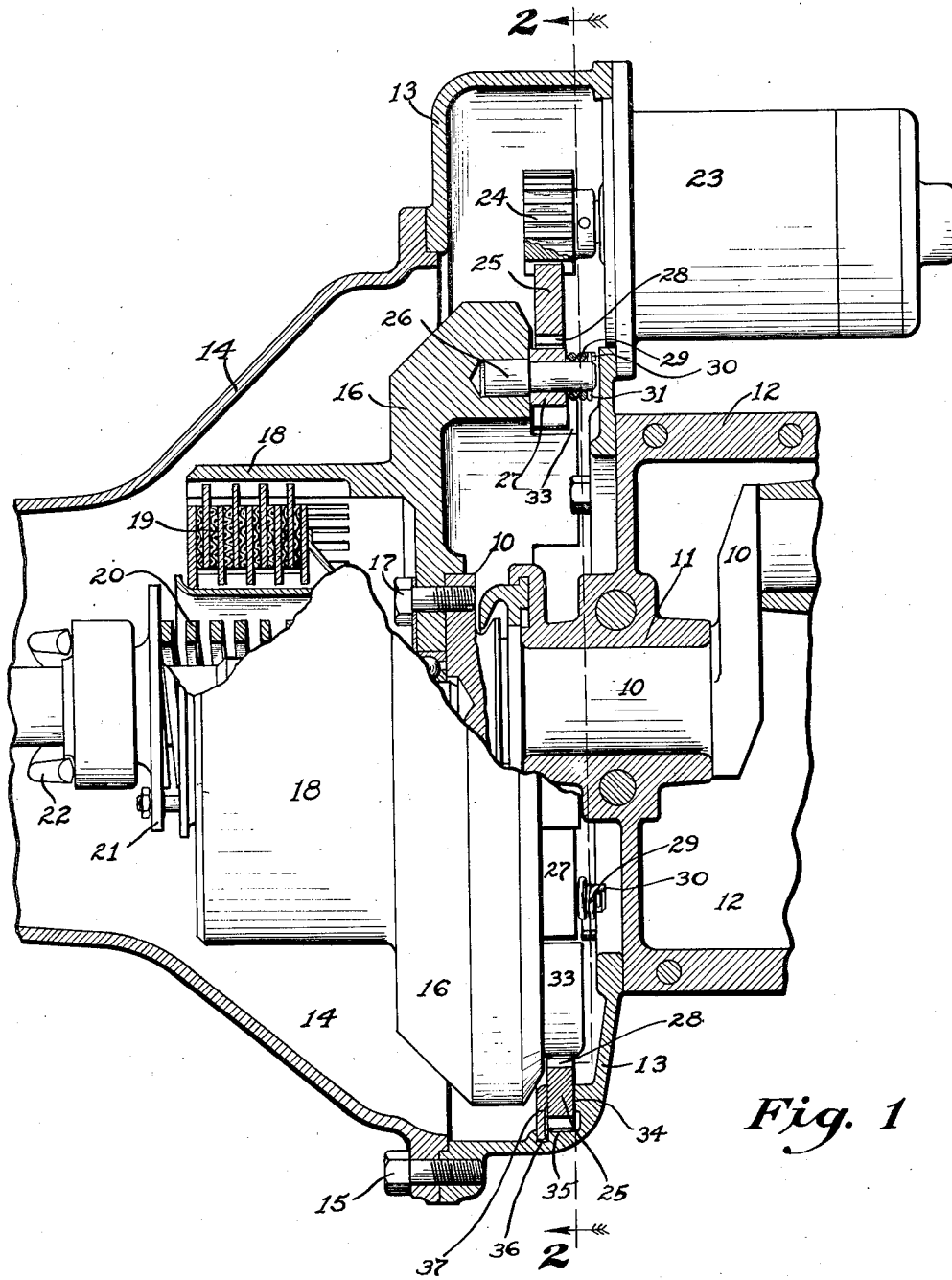


Fig. 1

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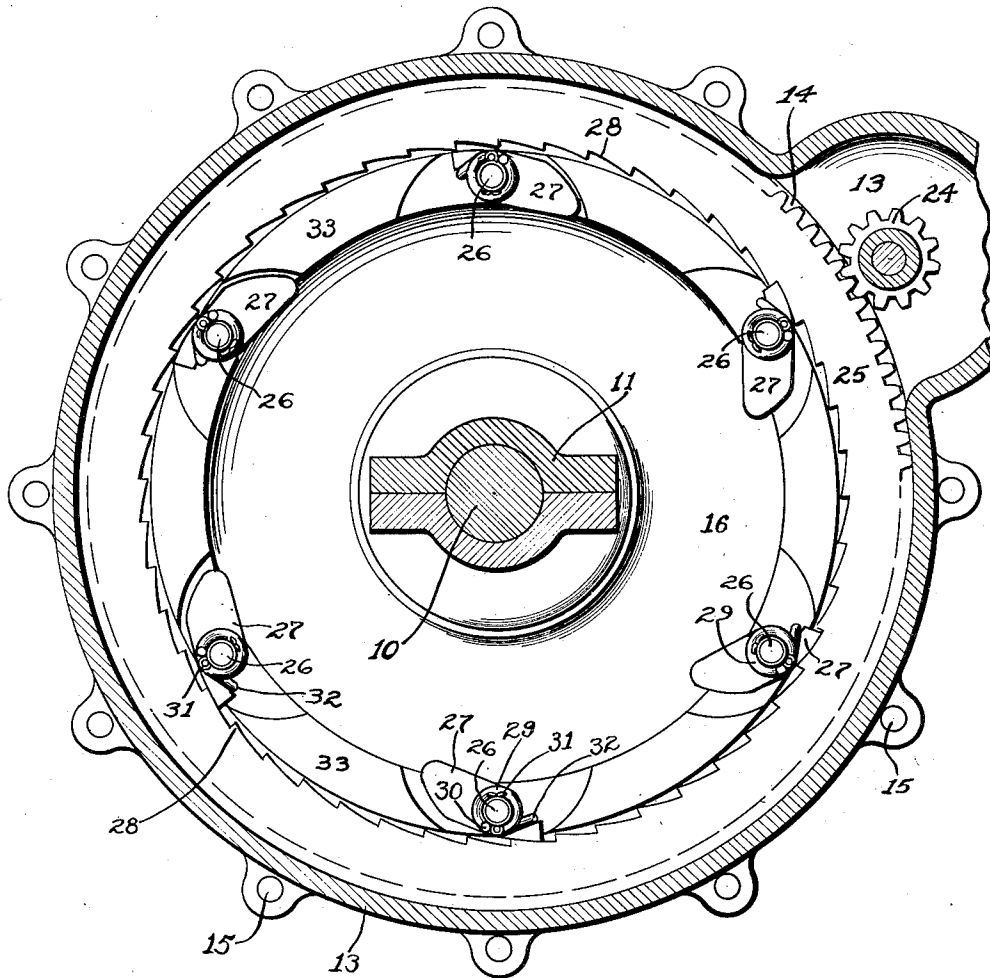


Fig. 2

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UNITED STATES PATENT OFFICE

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ENGINE

Application filed February 13, 1928. Serial No. 253,908.

The object of my invention is to make an engine of simple, durable, and inexpensive construction.

Still a further object of my invention is to provide a starter drive for an engine wherein the reduction gearing between the internal combustion engine crankshaft and the starting motor may be constantly in mesh and means may be provided for connecting this gearing with the crankshaft which will be operative only when the starting motor is being actuated and which will automatically connect and disconnect themselves.

Still a further object of my invention is to provide a starter gear for an internal combustion engine wherein the starting motor is connected to the engine fly wheel through a small pinion and ring gear, the ring gear being connected by a ratchet to the fly wheel so that when the starting motor is operated then the ratchet will cause the ring gear to rotate the fly wheel.

Still a further object of my invention is to construct the ratchet connection between the ring gear and the fly wheel that the starting up of the internal combustion engine will permit the fly wheel to rotate faster than the ring gear, and will also pull the ratchet members completely out of engagement so that there will be no noise due to the starter drive parts when the latter is not being operated.

Still a further object of my invention is to provide a ratchet device between the ring gear and the fly wheel such that the ratchets are carried by the fly wheel whereby the centrifugal force due to the operation of the internal combustion engine will throw these ratchets out of mesh with the teeth on the ring gear and permit the flywheel to revolve without any contact with the ring or starter gear when the engine is being operated.

With these and other objects in view, my invention consists in the arrangement, construction, and combination of the various parts of my improved device, as described in the specification, claimed in the claims, and illustrated in the accompanying drawings, in which:

Figure 1 shows a sectional view taken in a

plane passing through the axis of the crankshaft and the starting motor shaft of an internal combustion engine, and

Figure 2 shows a vertical transverse sectional view taken on the line 2—2 of Figure 1.

Referring to the accompanying drawings, I have used the reference numeral 10 to indicate generally the crankshaft of an internal combustion engine which rotates in bearings 11 in the crankcase 12 of the engine. A flywheel housing 13 is secured to the rear of the crankcase 12 and a clutch housing 14 is secured to the rear of the flywheel housing 13 by screws 15.

A flywheel 16 is secured to the rear end of the crankshaft 10 by screws 17. This flywheel has a rearwardly extending annular sleeve 18 which houses the clutch discs 19 which are pressed together by the spring 20 which in turn is compressed to release the pressure on the clutch discs 19 by a pressure plate 21 which is operated by a fork 22.

A starting motor 23 is removably clamped to a bell on the housing 13 and a starter small gear 24 is mounted on the starting motor shaft and is disposed within the housing 13 in position to co-act with the ring gear 25. The interior of the housing 13 is machined out to a true circular form and properly shouldered so that the ring gear 25 may rotate within the housing 13 and said housing will form a bearing for said ring gear upon which it will rotate when the gear 24 is actuated by the motor 23 to rotate said ring gear 25. It will be noted that this ring gear is in full mesh with the gear 24 at all times. A plurality of studs 26 are set in the forward face of the flywheel 16 and a ratchet dog 27 is mounted on each of these studs 26. These are mounted so that the tooth end thereof is much lighter than the other end thereof and they are disposed within the ring gear 25 so that they may co-act with teeth 28 on the inner periphery of the ring gear 25. As these dogs 27 are carried around by the flywheel 16 upon which they are mounted it will be seen that rotation of the flywheel 16 will cause these weighted free ends of the dogs 27 to swing outwardly thereby drawing the

tooth ends of said dogs inwardly and out of contact with the teeth 28. Springs 29 are disposed on each of the extending ends of the studs 26 and are wrapped around said studs twice. One end 30 of each spring is turned out to co-act with the head of a cotter pin 31 which extends through the stud 26 and the other end 32 is turned out in the opposite direction to bear against the tooth end of the dog 27 so that this spring tends to normally keep the tooth end of the dog into engagement with the teeth 28 of the ring gear. Incidentally the cotter pins 31 and the bodies of the springs 29 retain the dogs 27 on the studs 26. Shoulders 33 are cast on the flywheel 16 and are properly machined so that the weighted end of the dogs 27 will hit against the shoulders 33 when the engine is rotating due to the action of centrifugal force and thereby hold these dogs 27 in a fixed position where they will not rattle and vibrate when they are out of engagement with the teeth 28.

As has heretofore been mentioned, the flywheel housing 13 is machined as at 34 and 35 to form shoulders against which the ring gear 25 may rest and which will form a bearing for said ring gear in which it may rotate. A groove 36 is machined into the inner surface of the flywheel housing 13 adjacent to the shoulders 35 and a split resilient ring 37 is sprung into this groove 36 to prevent front to rear weaving of the ring gear 25 when the latter is rotated. In other words the forward or rearward movement of the ring gear is limited by the shoulder 34 and the ring 37 while movement to a position eccentric to the crankshaft 10 is prevented by the shoulder 35 which also acts as a bearing for the ring gear when the latter is rotating.

Among the many advantages that result from the use of my improved starter gear construction, it should first be pointed out that I provide a means whereby the small starter gear and the ring gear are always in mesh so that they may be made to fit closely enough so that their operation will be relatively quiet.

A second advantage results from the use of my improved device in that the starting mechanism and the flywheel are entirely disconnected from each other due to the action of centrifugal force on the dogs 27, whenever the engine is operating under its own power so that this starter mechanism will not interfere with the free operation of the engine after the latter has been started.

Still a further advantage results from the use of my improved device in that the parts may all be made relatively strong and yet they are so simple that they are not likely to become damaged or get out of order.

Still a further advantage results from the use of the springs which act both to keep the dogs 27 in mesh with the teeth 28 when the

engine is not running and which also cooperate with the cotter pins 31 to secure the dogs 27 onto the studs 26. Still a further advantage results from the use of my improved device in that it only requires the additional room in the flywheel housing necessary for the small starter gear and the room which is always required for the starting motor.

It will be noted that the dogs 27 are so spaced about the flywheel 16 that the ring gear will travel less than one sixth of the length of a tooth 28 before one of the dogs 27 will be fully engaged where those dogs are placed as in the attached illustration. In other words these dogs are spaced apart a distance equal to a predetermined number of teeth plus one sixth of one tooth. If desired these dogs may be spaced so that two or three or all of the dogs engage the teeth at the same time.

I claim as my invention:

1. In a device of the character described, a flywheel housing having a portion of its interior machined to circular shape and shoulders formed adjacent to said circular portions, a flywheel mounted in said housing concentric with said machined portion, a starting motor mounted on said housing, a gear on said starting motor, a ring shaped gear member journaled in said housing by the engagement of the teeth thereon with the machined and shouldered portions of the flywheel housing, said teeth being in constant mesh with the gear on the starting motor, and means connecting said ring gear member with the flywheel, said means automatically disconnecting said gear member and flywheel when the latter overruns the gear member.

2. In a device of the character described, a flywheel housing having a portion of its interior machined to circular form and having shoulders adjacent to said portion, a flywheel mounted in said housing, a starting motor mounted on said housing, a gear mounted on said starting motor, a ring gear mounted for rotation in said housing having internal and external teeth thereon, the bearing for said ring gear being secured by the engagement of the external teeth thereon with said machined and shouldered portion of the flywheel housing and said ring gear being in constant mesh with said gear on the starting motor, and dog members mounted on said flywheel in position to engage the inner teeth of said ring gear.

January 24, 1928.

HENRY FORD.