

March 8, 1938.

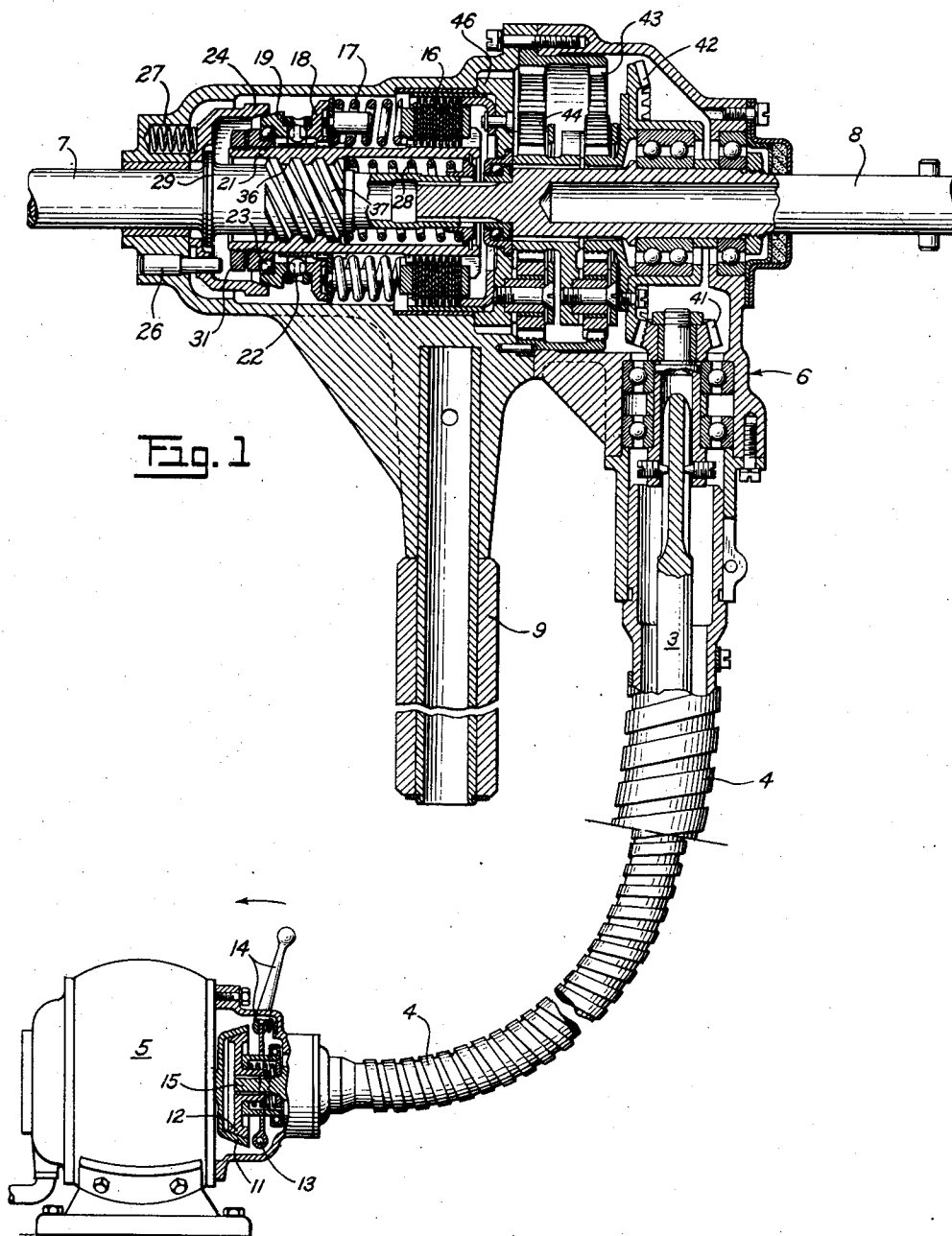
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2,110,469

DRIVING MECHANISM

Filed Aug. 24, 1935

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Fig. 2

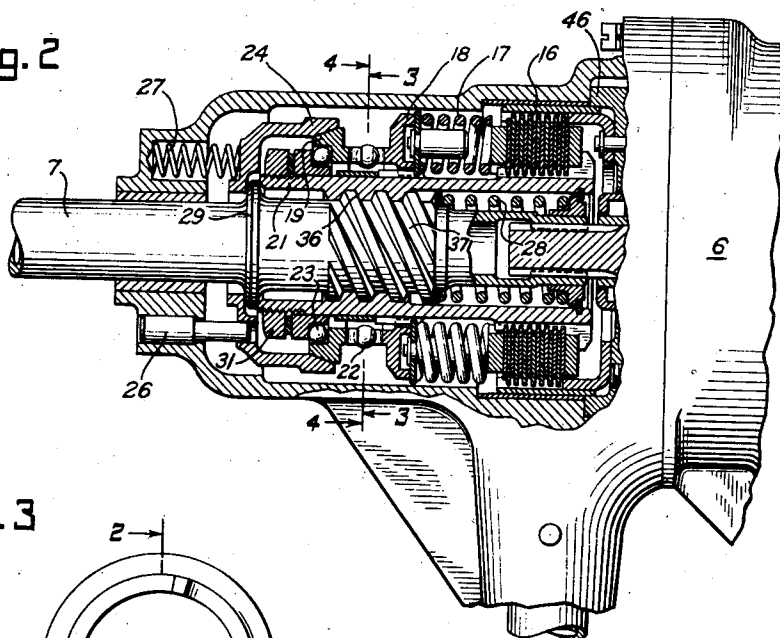


Fig. 3

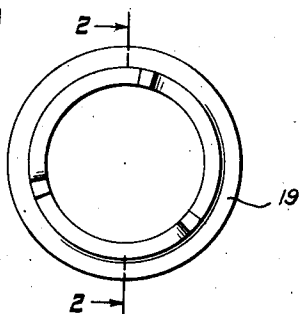


Fig. 4

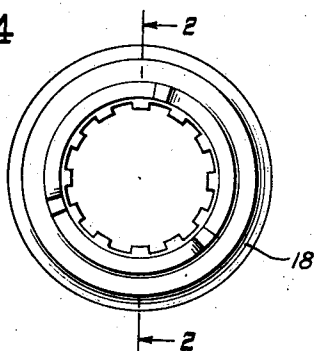


Fig. 5

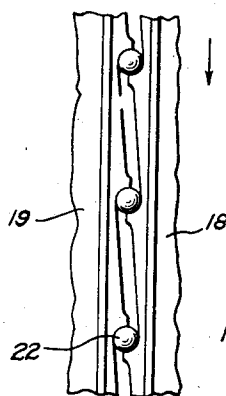
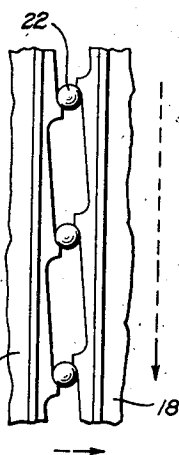


Fig. 6



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UNITED STATES PATENT OFFICE

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DRIVING MECHANISM

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4 Claims. (Cl. 123—179)

This invention relates to engine starting mechanism, (although not exclusive thereto) and particularly to engine starting mechanism of the portable character, such as has gone into extensive use at airports and landing fields for aircraft, where it has been found to be of great convenience in the starting of a large number of internal combustion engines in rapid succession, due to the possibility of manually transporting the device from one airplane to the next in succession, whereby a fleet of aircraft may be quickly prepared for take-off at closely spaced intervals of time.

An object of the invention is to improve engine starting mechanism of the foregoing character, the improvements including structural changes in the portable device itself, and also including a new method of energizing the portable parts, said new method being carried out by the use of flexible torque transmitting connections between a source of energy and the portable parts, whereby the latter may be moved in any direction with respect to said source of energy, also toward or away from said source of energy, without breaking the driving connection between said source and the portable device.

Another object is to provide for additional adaptability of such a portable device by equipping it with a plurality of work engaging shafts, whereby cranking may occur in divergent directions.

A further object is to provide novel means for controlling the transmission of torque between related parts of the portable device, including a novel clutch structure and method of operation thereof.

These and other objects of the invention will become apparent from inspection of the following specification when read with reference to the accompanying drawings wherein is illustrated the preferred embodiment of the invention. It is to be expressly understood, however, that the drawings are for the purpose of illustration only, and are not designed as a definition of the limits of the invention, the scope of the invention being defined in the appended claims.

In the drawings:

Fig. 1 is a view, in section of a portable device of the character described, shown in working relation to the source of energy, the showing being an illustration of one embodiment of the invention, and the torque regulating parts of the portable device being shown in the non-transmitting position;

Fig. 2 is a view of the torque regulating parts in transmitting position;

Fig. 3 is a view along line 3—3 of Fig. 2;

Fig. 4 is a view along line 4—4 of Fig. 2; and

Figs. 5 and 6 show the torque regulating cams in two positions.

Referring now to Fig. 1, reference character 3 designates a flexible cable enclosed in a suitable casing 4, which transmits motion from a fixedly located prime mover 5 to the portable assembly 6. The latter includes a pair of shafts 7 and 8 extending through the unit and projecting therefrom in divergent directions for purposes to be more fully explained hereinafter. Handle 9 facilitates guiding the unit 6 into place and holding it against torque reactions.

Rotatable with prime mover 5 is one element of a normally engaged cone clutch 11, having a movable member 12, so that the clutch is disengageable by movement of a yoke 13, and a shaft and lever 14, the member 12 being splined to the reduced end 15 of the flexible shaft 3.

In the portable unit 6 there is a clutch 16 consisting of a set of friction discs engaged by a small initial pressure supplied by springs 17, such as to give a minimum torque capacity on the order of a few foot pounds. Springs 17 are backed up by a face-cam plate 18 movable along splines on a sleeve 21 in such manner that its movement to the right compresses springs 17 to load clutch 16 to a maximum capacity at least several times greater than its minimum. A series of balls 22 are interposed between this cam plate and a second cam plate 19 supported on a ball bearing 23. The outer diameter of the plate 19 is formed into a cone to act as one member of a cone clutch or brake. The second member 24 is prevented from rotating by guide pins 26 in housing 25, but is movable along these guides and is urged by springs 27 toward contact with cone 19. Notwithstanding this engaging tendency, cone 24 is normally held in the disengaged position (Fig. 1) by action of spring 28 on shaft section 7, the latter having a shoulder 29 engaging the hub of cone 24. Adjustment of friction clutch spring pressure is effected by turning nut 31 on sleeve 21. The latter has rather steeply pitched internal threads 36 engaging corresponding threads 37 on shaft 7.

In operation, shaft section 7 or 8 is engaged to the part to be actuated (engine starter, for example) and the power unit motor 5 (which may be an electric or compressed air motor, a fluid turbine, or an internal combustion engine) energized. This causes transmission of rotary effort

to the shaft 3, through engaged clutch 11, and from shaft 3 through gears 41 and 42 to the planetary gears 43 and 44 in series, the latter being secured to clutch housing 46. The resulting rotation of clutch disc 16 (at reduced speed) and sleeve 21 acts to pull shaft 7 to the right (due to the pitch of threads 36) until such motion is arrested by engagement of collar 29 with the end of sleeve 21. This movement of collar 29 away from brake shoe 24 enables springs 27 to become effective to engage brake shoe 24 with the rotating part 19. Such engagement retards rotation of cam plate 19, and the resulting relative motion of the cams 18 and 19 causes cam 18 to move to the right and compress springs 17. Shaft 7 must rotate approximately one-half of a revolution before the cam has moved its full distance. When balls 22 are on the top of the rises, as shown in Fig. 6, no further motion of 18 occurs. Slipping of the part 19 on brake 24 then begins, and the part engaged by shaft 7 (or 8) is thereupon driven with maximum torque passing through clutch 16.

After the portable unit is withdrawn from engagement with the work piece, spring 28 pushes shaft 7 to the left, to the position in Fig. 1, and it carries brake cone 24 also to the left out of engagement with cone 19. The pressure of springs 17, acting on cam plate 18 and balls 22, now rolls the balls down the inclines, to the position in Fig. 5, and reduces the pressure on clutch 16 to the minimum.

What is claimed is:

1. Engine starting mechanism including, in combination a cranking shaft, a portable housing for said shaft, a prime mover spaced from said housing, means extending downwardly from said housing to facilitate holding the latter against torque reactions, a socket in said housing to receive said downwardly extending means, a flexible torque transmitter drivably connecting said prime mover and cranking shaft and bearing means in said housing for said torque transmitter, said

bearing means including a second socket parallel with the first.

2. Engine starting mechanism including, in combination, a portable housing, a pair of cranking shafts projecting from said housing in divergent directions for selective engagement with a part to be driven, a prime mover spaced from said housing, a flexible torque transmitter drivably connecting said prime mover and cranking shafts, and means responsive to operation of said torque transmitter to cause one of said shafts to recede toward said housing while retaining driving engagement with the other shaft.

3. Engine starting mechanism including, in combination, a cranking shaft, a portable housing for said shaft, a prime mover spaced from said housing, a flexible torque transmitter drivably connecting said prime mover and cranking shaft, and means responsive to operation of said torque transmitter to cause axial movement of said cranking shaft, said last named means including a slippable clutch, a sleeve threaded on said cranking shaft and driven by said clutch, and torque responsive means coacting with said housing and said sleeve to vary the engaging pressure on said slippable clutch.

4. Engine starting mechanism including, in combination, a cranking shaft, a portable housing for said shaft, a prime mover spaced from said housing, a flexible torque transmitter drivably connecting said prime mover and cranking shaft, and means responsive to operation of said torque transmitter to cause axial movement of said cranking shaft, said last named means including a slippable clutch, a sleeve threaded on said cranking shaft and driven by said clutch, and torque responsive means rotatable with said sleeve to vary the engaging pressure on said slippable clutch, said torque responsive means including a friction brake having one part secured to said housing and a cooperating part rotatable with said threaded sleeve.

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