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P. VAN SITTERT ET AL

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NUT SETTER

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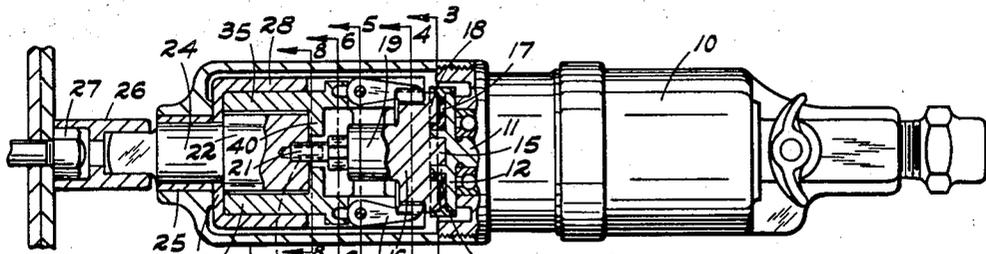


Fig. 1

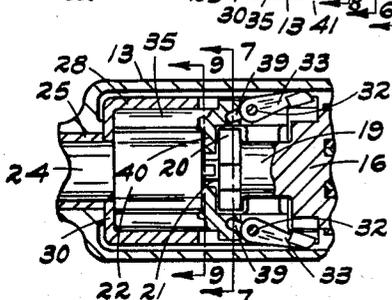


Fig. 2

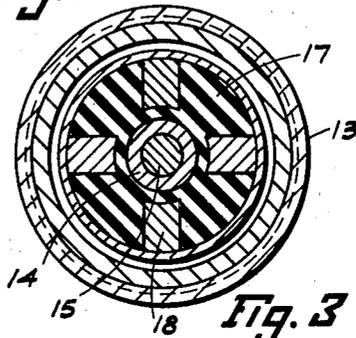


Fig. 3

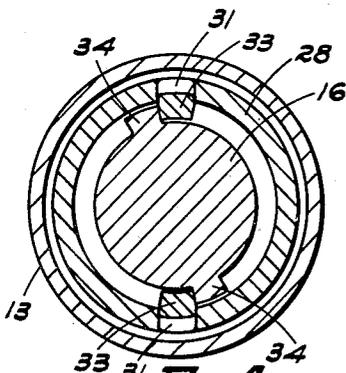


Fig. 4

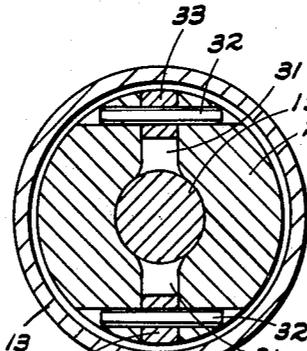


Fig. 5



Fig. 6

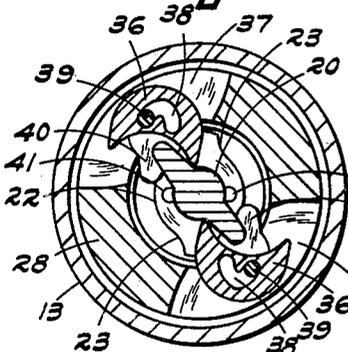


Fig. 7

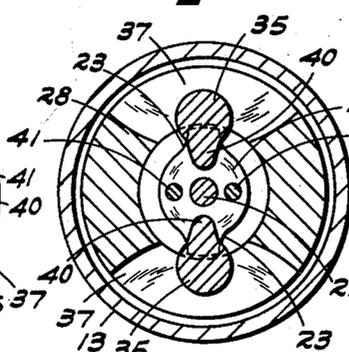


Fig. 8

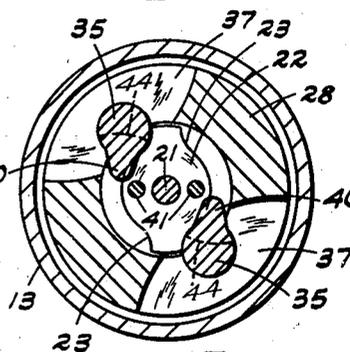


Fig. 9

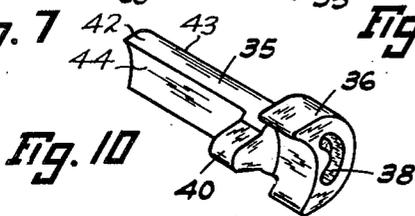


Fig. 10

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## NUT SETTER

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5 Claims. (Cl. 192—30.5)

This invention relates to improvements in nut setters of the type which deliver intermittent impacts.

One of the objects of the invention is the provision of means carried by a floating flywheel for clutching the latter to the driving and driven members alternately without the use of gearing.

Another object is the provision of means for the purpose stated which shall be simple and rugged in character and which will function with certainty.

Other objects and features of novelty will appear as we proceed with the description of that embodiment of the invention which, for the purposes of the present application, we have illustrated in the accompanying drawing, in which:

Fig. 1 is a view of a power tool embodying the invention, a portion of the view being in central longitudinal section in order to more clearly illustrate the mechanism, and the fly-wheel being shown clutched to the driving member;

Fig. 2 is a fragmental view corresponding to a portion of Fig. 1, the flywheel being declutched from the driving member and in position to deliver an impact to the driven member;

Figs. 3, 4, 5, 6, and 8 are transverse sectional views taken substantially on the lines 3—3, 4—4, 5—5, 6—6, and 8—8 of Fig. 1, these views being on a larger scale than Figs. 1 and 2;

Figs. 7 and 9 are transverse sectional views taken substantially on the lines 7—7 and 9—9 of Fig. 2, these views being on the same planes as Figs. 6 and 8; and

Fig. 10 is a perspective view of an oscillatable dog used as a connecting element between the flywheel and driven member.

In Fig. 1 of the drawing there is shown a nut setter comprising a casing portion 10 in which is housed a motor, for example a compressed air motor, having a shaft 11 provided with a coupling plate 12. A second casing part 13 is removably threaded to the part 10 and houses mechanism with which the present invention is concerned.

Coupling plate 12 has a central annular boss 14 forming a central cavity in which is received a trunnion 15 of a clutch plate 16. Surrounding boss 14 there is a body of rubber 17 which is suitably recessed to take a plurality of blades 18 on plate 16, by which means the plate 16 is driven. On the side of plate 16 opposite trunnion 15 there is a shaft 19 and beyond that a two-armed cam 20 and a reduced diameter shaft 21. The latter is rotatably received in a

central socket in a driven clutch member 22 which is of peculiar form, having a cross-section comprising circular portions on two different radii joined by reverse curves so as to provide four concave walls 23. This driven clutch member is carried by shaft 24 that is journaled in a bushing 25 mounted in the casing part 13. Beyond the casing, shaft 24 carries a squared head upon which may be mounted a socket wrench 26 of selected size for driving a nut 27.

Interposed between the driving member 16 and the driven member 22 there is a flywheel 28 of generally cylindrical form which functions to transfer rotary impulses from the driver to the driven member. At the start of a nut setting operation, however, before the load becomes heavy, the drive through the flywheel may be continuous, as will be hereinafter more fully described. The flywheel at its forward end may have an inturned flange 30 bearing on the shaft 24, and near its rearward end it may bear upon shaft 19, as shown particularly in Fig. 5. At diametrically opposite points the flywheel has slots 31 formed therein, and mounted in these slots on pivot pins 32 are two pawls 33, the free ends of which are adapted to engage clutch lugs 34 which project outwardly from clutch plate 16. When the pawls 33 are swung outwardly, however, as shown in Fig. 2, they clear the lugs 34, freeing the flywheel from the driving member 16.

In the forward end of the flywheel there are two oscillatably mounted dogs 35. Each of these dogs has a shank 42 with a partially cylindrical wall 43 received by a correspondingly shaped socket in the flywheel and an inner concave wall 44 corresponding approximately to the internal surface of the flywheel. Each of these dogs has a head 36 which is accommodated in a cut-out portion 37 of the flywheel, and in this head there is a curved slot 38 into which extends a finger 39 projecting from the butt end of pawl 33. When the dog 35 oscillates in either direction from its normal position illustrated in Figs. 1 and 6, the finger 39 located in the curved slot 38 is, by virtue of the shape of the slot, deflected radially inward and the pawl 33 is swung upon its pivot 32 into the position of Fig. 2. At this time the heads 36 will have been oscillated to the position illustrated in Fig. 7. It will accordingly be seen that this interconnection of the pawls 33 with the dogs 35 is such that when the latter have been oscillated into impact engaging position with the concave walls 23 of the driven member 22, the pawls 33 will be disengaged from the driving member 16 and when

the dogs 35 are out of impact position, the pawls 33 will be engaged with the driving member lugs 34.

The oscillatable dogs 35 below the heads 36 carry inwardly projecting lips 40 which in the intermediate position of the dogs extend over the face of the driven clutch member 22, as indicated in Fig. 8. Driven member 22 has two pins 41 fixed therein which project beyond the face of the member and are adapted to engage the lips 40 to be driven thereby. When the driven member stalls, said pins act to oscillate the dogs 35 to the position shown in Fig. 9.

*Operation.*—Assuming that the parts are in the position illustrated in Fig. 1, and that the operator has placed the socket wrench 26 over a nut 27 to be driven and has operated a control to start the motor, the driving plate 16 will then rotate and will communicate rotation to the flywheel through the pawls 33 engaged by the lugs 34. Rotation of the flywheel will revolve the oscillatable dogs 35 around the axis of the device and the lips 40 will strike the pins 41 on the driven member, whereupon rotation will be communicated to the driven member 22 and the whole mechanism will revolve as a unit, turning the nut 27 at motor speed. At this point there is very little resistance to rotation to be encountered from the nut, and sufficient resistance is met by the shanks 42 within their respective sockets to prevent oscillation thereof as contact is made with the pins 41. Consequently, contact of the lips 40 with the pins 41 will communicate rotation to the driven member 22 from the driving member 16 causing the entire mechanism to revolve as a unit. When initially starting the mechanism, it may be advisable to apply power gradually to the driving member 16 so that the lips 40 will not be brought into contact with the pins 41 too suddenly and thereby be oscillated out of the path of said pins.

As soon as the nut begins to tighten down, its resistance to rotation will slow down the driven member 22, and the flywheel will overrun sufficiently to cause the oscillatable dogs 35 to be swung past the pins 41, whereby the dogs will be oscillated substantially to the angle illustrated in Fig. 9. This oscillation will turn the heads 36 on the dogs to the position of Fig. 7, causing the slots 38 to move the fingers 39 inwardly disengaging the pawls 33 from the lugs 34, thereby freeing the flywheel from the driving member. Through this oscillation the shanks 42 of the oscillated dogs 35 are moved inwardly for engagement with two of the concave walls 23 of the member 22 and will impart a rotary impact to the latter member. Thereupon the driven member and the flywheel will stop, but the shaft 19, continuing to turn, will cause the cam 20 to engage the heads 36, as indicated in Fig. 7, swinging them back to neutral position indicated in Fig. 6. This will serve due to the fingers 39 within the slots 38 to tilt the pawls 33 on their pivots to cause their free ends to again come into the field of rotation of the lugs 34. As soon as the lugs strike the pawls, rotation will be communicated to the flywheel, through the lips 40 and pins 41, the blow being softened somewhat by the rubber cushion 17. The flywheel will then be accelerated until the fingers 40 engaging the pins 41 meet sufficient resistance to again cause oscillation of the dogs 35 and the consequential disconnection of the flywheel from the driver and connection with the driven member to impart another impact, and the alternating connection of the fly-

wheel with the driving and driven members will continue until the nut is sufficiently tightened.

If, when the operation of the tool is begun, it should happen that the parts are in the position of Figs. 2, 7, and 9 rather than in that of Figs. 1, 6, and 8, the cycle of events will be the same except that at the start the cam 20 will swing the oscillatable dogs 35 back to intermediate position, whereupon the flywheel will be connected with the driving member 16, when the continuous rotation of the various parts as a unit will be begun and maintained until the threading down of the nut progresses far enough to slow down and interrupt the continuous operation, whereupon the alternate operation of the pawls will begin and the series of impacts will be delivered to complete the job.

As will be obvious, the tool is so designed that by reversing the motor, a nut may be unthreaded. In such a case, however, the series of impacts will be delivered as the first part of the operation and continuous rotation will begin after the nut is sufficiently loosened.

Although the foregoing description is necessarily of a detailed character, in order to completely set forth the invention, it is to be understood that the specific terminology is not intended to be restrictive or confining and it is to be further understood that various rearrangements of parts and modifications of structural detail may be resorted to without departing from the scope or spirit of the invention as herein claimed.

Having thus described our invention, we claim:

1. In a nut setter, coaxial driving and driven members, a flywheel, two dogs carried by the flywheel, one of said dogs arranged to engage the driving member and the other arranged to engage the driven member, means initially providing a driving relationship between said driving and driven members, said means being also responsive to relative rotation between the flywheel and the driven member for shifting one of said dogs from normal driving to impact position, additional means responsive to relative rotation between the flywheel and the driving and driven members for shifting said one dog from impact to normal driving position, and interconnections between the dogs for imparting movement from one to the other and permitting one dog at a time only to occupy engaged position.

2. In a nut setter, coaxial driving and driven members, means initially providing a driving relationship between said driving and driven members, a flywheel intermediate said driving and driven members arranged to be connected with one or the other alternately, first and second dogs carried by the flywheel functioning one at a time for effecting said connections, said means being also responsive to relative rotation between the flywheel and driven member for shifting said first dog from normal driving to impact position, interconnecting means between said dogs for causing the movements of the first dog to shift the second dog from connected to disconnected position, and vice versa, and additional means responsive to relative rotation between the flywheel and the driving and driven members for shifting said first dog from impact to normal driving position.

3. In a nut setter, coaxial driving and driven members, means initially providing a driving relationship between said driving and driven members, a flywheel intermediate said driving and driven members arranged to be connected with one or the other alternately, an oscillatable dog and a pivoted dog carried by the flywheel func-

tioning one at a time for effecting said connections, a pin and slot connection between said dogs for causing the oscillation of one dog to swing the other dog on its pivot, said means being also responsive to relative rotation between the flywheel and driven member for moving said oscillatable dog from normal driving to impact position, and additional means responsive to relative rotation between the flywheel and the driving and driven members, respectively, for shifting said oscillatable dog from impact to normal driving position.

4. In a nut setter, driving and driven members, a flywheel, two dogs carried by said flywheel, the first dog being arranged to engage the driven member and the second dog being arranged to engage the driving member, means initially providing a driving relationship between said driving and driven members, said means being also responsive to relative rotation between the flywheel and the driven member for shifting the first dog from normal driving to impact position, additional means responsive to relative rotation between the driven member and the driving member for shifting the first dog from impact to

normal driving position, and interconnections between the dogs for causing the first dog when it moves to impact position to shift the second dog to disengaged position, and vice versa.

5. In a nut setter, driving and driven members rotating about a common axis, means initially providing a driving relationship between said driving and driven members, a cylindrical flywheel, a dog carried by the flywheel oscillatable about an axis parallel to said common axis, said means being also responsive to relative rotation between the flywheel and driven member for throwing the dog into position for imparting a rotary impact to the driven member, means on the driving member for throwing the dog out of impact position when the flywheel is stationary, and means actuated by the oscillations of said dog for connecting said flywheel to the driving member for imparting rotation to the flywheel after each impact is delivered and for disconnecting said flywheel and driving member to free the flywheel before an impact is delivered.

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