Dec. 17, 1957 A. M. SELLS 2,816,535

COUPLING DEVICE

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Fig. 1.

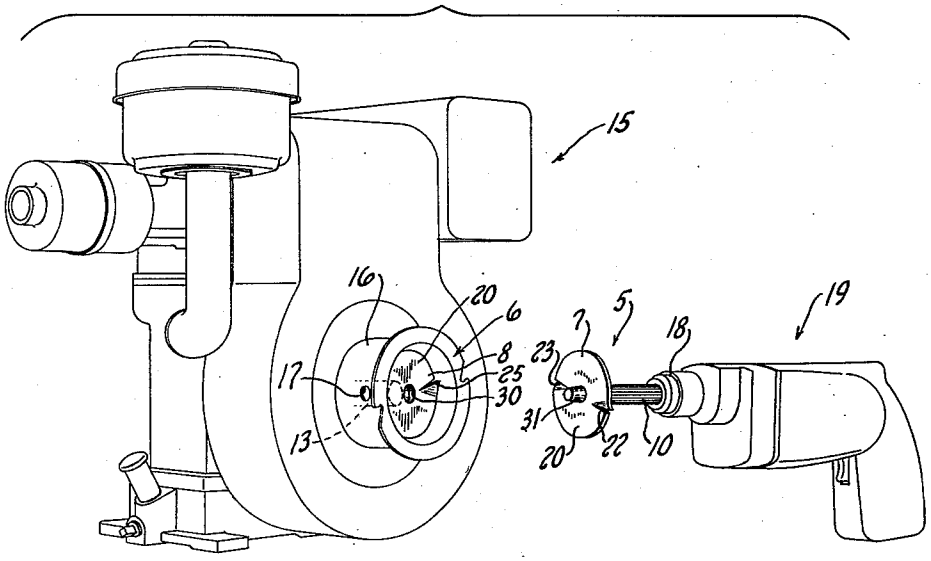


Fig. 2.

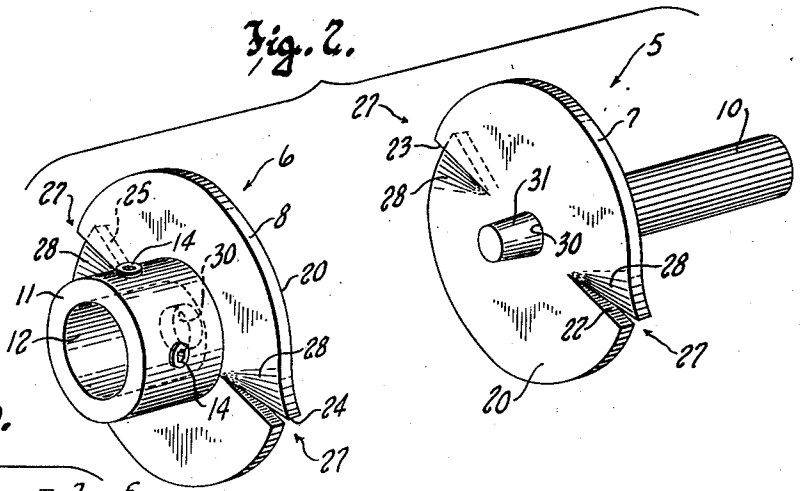
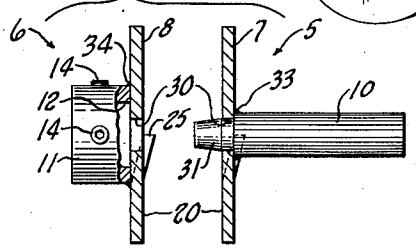


Fig. 3.



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COUPLING DEVICE

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6 Claims. (Cl. 123—179)

This invention relates to couplings generally and has more particular reference to the provision of a coupling device featuring simplicity of construction and low cost of manufacture.

One of the primary purposes of this invention resides in the provision of coupling means for transmitting torque in one direction only from a rotatable driver to a shaft to be driven. More specifically, it is an object of this invention to provide a coupling device of the character described comprising separate cooperable coupling members, one of which is adapted for securement to a shaft to be driven and the other of which has a spindle fixed thereto and adapted for securement in the chuck of a portable electric motor driven hand tool so that driving torque may be transmitted from the hand tool to the shaft to be driven in one direction through the coupling when the coupling members are brought into axial juxtaposition.

It is a further object of this invention to provide a coupling device of the character described which is specially suited to serve as a starting device for small internal combustion engines, and wherein the source of torque is furnished by the electric motor of a portable hand tool having one of the coupling members drivingly connected therewith.

With a view toward simplicity and low cost of manufacture, it is another object of this invention to provide a coupling device of the character described which comprises a pair of separate substantially flat driving and driven discs having cooperating unidirectional driving abutments formed integrally thereon and cooperatively engageable with one another upon coaxial juxtapositioning of the discs.

Still another object of the invention resides in the provision of a coupling device of the character described comprising separate driving and driven discs having unidirectional driving abutments thereon cooperatively engageable with one another upon coaxial juxtapositioning of the discs, and wherein cooperating male and female pilot means on the discs facilitate such coaxial juxtapositioning thereof and assures against relative motion therebetween in directions crosswise of their axes of rotation.

With these and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawing illustrates one complete example of the physical embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof and in which:

Figure 1 is a group perspective view illustrating the use of the coupling of this invention for the starting of a small internal combustion engine and in which the electric motor of a portable electric motor driven hand tool serves as a source of torque;

Figure 2 is a group perspective view of the cooperating elements comprising the coupling of this invention and;

Figure 3 is a group view of the coupling members of this invention showing the same partly in side elevation and partly in section.

Referring now more particularly to the accompanying drawing in which like numerals identify like parts throughout the several views, the numerals **5** and **6** generally designate separate cooperable driving and driven coupling members respectively, which together constitute the coupling device of this invention. The coupling members comprise identical substantially flat driving and driven discs **7** and **8**, respectively, and while the driving disc **7** is coaxially mounted on the outer end portion of a spindle **10**, the driven disc **8** is fixed to the outer end of a hub **11**, coaxial therewith.

The hub on the driven disc has a bore **12** to receive an end portion of a shaft **13** to be driven, to which the driven coupling member may be non-rotatably secured as by one or more set screws **14** threaded in its hub **11**. As seen in Figure 1, the shaft **13** may be the crankshaft of a small internal combustion engine **15** of a type which is usually provided with a cup-like rope starter pulley **16** encircling the exposed flywheel end of the crankshaft, with the side wall of the pulley spaced radially from the end of the crankshaft therein. The diameter of the driven disc, of course, is slightly less than the internal diameter of the rope starter pulley to enable the latter to accommodate the driven coupling member in its interior; and the side wall of the pulley may be provided with one or more access holes **17** to enable the set screws **14** to be tightened upon the projecting end of the crankshaft.

The spindle **10** on the driving disc **7** is of a size to be releasably secured in the chuck **18** of a portable electric motor driven hand tool **19**, as seen in Figure 1, so that the driving disc may be power driven by the tool. The coupling device is operable to transmit rotation from the driving disc **7** to the driven disc **8** when the outer faces **20** of the discs are brought flatwise into coaxial juxtaposition so that starting torque may be applied to the crankshaft of the engine **15**.

Rotation is transmitted to the driven disc **8** by the driving disc **7** when these discs are coaxially juxtaposed in the manner described, through a unique unidirectional driving connection which renders the coupling device particularly well suited for the starting of small internal combustion engines from a source of torque such as the electric motor of the portable hand tool **19** shown in Figure 1. This unidirectional driving connection comprises a pair of diametrically opposite radially extending driving abutments **22** and **23** on the disc **7**, the surfaces of which are bounded by the planes of the inner and outer faces of the driving disc and face in a common circumferential direction (anti-clockwise in Figure 2); and cooperating diametrically opposite radially extending driven abutments **24** and **25** on the disc **8**. The surfaces of the driven abutments **24** and **25**, however, project beyond the outer face **20** of the driven disc and face in the opposite circumferential direction (clockwise in Figure 2) from the abutments on the driving disc **7**.

Assuming the driving and driven discs **7** and **8** to be in flatwise coaxial juxtaposition with their outer faces contiguous to one another, in one position of relative rotation the upwardly facing driving abutment **22** on the disc **7** will engage the downwardly facing driven abutment **24**

on the disc **8**, while the downwardly facing driving abutment **23** on the disc **7** will engage the upwardly facing driven abutment **25** on the disc **8**; and the two discs will be coupled together for rotation of the driven disc with the driving disc in the counter-clockwise direction only (Figure 2).

It is a feature of the coupling device of this invention that the discs **7** and **8** are provided with cooperating driving and driven abutments which are integral with the discs and which may be formed thereon in an exceptionally simple manner without rendering the discs different from one another in any respect whatever. For this purpose, each disc is formed with diametrically opposite radial slits, indicated generally by the numeral **27**, which extend inwardly from the periphery of the disc approximately one-half the distance to its center; and peripheral portions of the discs which adjoin edges of the slits which face in a common circumferential direction (clockwise in Figure 2), are offset or bent axially in the same direction, as at **28**, out of the planes of the discs. In the case of the driving disc **7**, therefore, the axially offset peripheral portions **28** are bent inwardly away from the plane of the outer face **20** of the disc to provide clearance for the engagement of the driven abutments **24** and **25** on the disc **8** with the driving abutments **22** and **23**. On the driven disc **8**, of course, the axially offset peripheral portions **28** are bent outwardly beyond the plane of the outer face **20** of the driven disc.

Hence, it will be seen that the axially offset peripheral portions **28** of the two discs nest with one another when the discs are flatwise coaxially juxtaposed in the manner described hereinbefore, and that the outwardly offset peripheral portions **28** of the driven disc have their radially disposed end portions crossing the plane of the outer face **20** of the driving disc for engagement of their abutments with those on the driving disc.

From the description thus far, it will be apparent that the driving and driven discs can be stamped and formed from the same die, since they are identical in every respect, even to the provision of a substantially small central hole **30** in each. The hole in one of the discs provides a socket to receive a pilot **31** projecting coaxially from the outer face of the other disc. The pilot **31** is preferably formed as a reduced extension on the outer end of the spindle **10** of a size to fit the hole **30** in the driving disc, and to be guidingly received in the hole **30** of the driven disc as the two discs are brought into flatwise juxtaposition to render the coupling device operative. The pilot means described also assures against accidental lateral displacement of the discs relative to one another when they are cooperatively engaged.

As will be apparent from Figure 3, the driving disc **7** may have a force fit on the base of the pilot **31**, or it may be welded to the spindle **10** as indicated at **33**. The hub **11** on the driven coupling member **6** is also preferably permanently secured to the inner face of the driven disc **8** as by welding indicated at **34**.

Attention is also directed to the fact that the cylindrical wall of the rope starter pulley **16** may itself serve as a guide for proper engagement of the driving disc **7** with the driven disc **8** and to prevent lateral displacement of the driving disc during use. This follows by reason of the fact that the outer end portion of the pulley extends a distance beyond the plane of the outer face **20** of the driven disc when the driven coupling member is in place on the projecting end of the engine crankshaft.

From the foregoing description, taken together with the accompanying drawing, it will be readily apparent to those skilled in the art that this invention provides a coupling device capable of a wide variety of uses, but which is particularly useful for effecting starting of a small internal combustion engine by a source of torque comprising the electric motor of a portable electric motor driven hand tool.

What I claim as my invention is:

1. Coupling means for drivingly connecting a shaft member to be driven with a rotatable driving member characterized by: separate but identical discs each adapted to be secured to one of said members, said discs, when coaxially juxtaposed and in one position of relative rotation, having registering slits leading substantially radially inwardly from their peripheries, and having peripheral portions adjoining edges of said slits which face in a common circumferential direction offset in the same axial direction and nesting one within the other so as to dispose one of said designated edges on one of the discs in the plane of the other disc and in contiguous opposing relation to an edge of the slit in said other disc which faces in the opposite circumferential direction to thus provide for the transmission of rotation from one disc to the other in one direction of rotation.

2. Coupling means for drivingly connecting a shaft member to be driven with a rotatable driving member characterized by: a pair of identical substantially flat discs each adapted to be secured to one of said members, said discs, when coaxially juxtaposed and in one position of relative rotation, having nesting peripheral portions offset in the same axial direction and providing opposing substantially radially engaging abutments on the discs lying in the plane of one of the discs and through which rotation may be transmitted from one disc to the other in one direction only.

3. In a starting device for internal combustion engines having a crankshaft one end of which is exposed: a driving disc having inner and outer faces; a spindle coaxially fixed to said driving disc and projecting from the inner face thereof, said spindle being securable in the chuck of a portable electric motor driven hand tool so that the driving disc may be rotated in one direction thereby with the outer face of the disc substantially normal to its axis of rotation; a driven disc having inner and outer faces; means on the driven disc at the inner face thereof for securing the same to the exposed end of the crankshaft of an internal combustion engine with the outer face of the disc normal to the axis of crankshaft rotation; and means on said discs providing driving abutments interengageable with one another when the outer faces of the discs are brought into coaxial juxtaposition to afford a unidirectional driving connection in said direction between the driving and driven discs.

4. The starting device set forth in claim 3 wherein each of the discs is provided with a pair of driving abutments located diametrically opposite one another and spaced radially from the axis of rotation of the disc so as to be adjacent to the periphery of the disc.

5. A coupling device for transmitting torque from a rotatable driving member to a shaft to be driven comprising: a driving disc; a spindle fixed to said driving disc and projecting coaxially from one face thereof, said spindle being securable in the chuck of a portable electric motor driven hand tool so that the driving disc may be power rotated in one direction thereby with the outer face of the disc substantially normal to its axis of rotation; a driven disc; means on the driven disc at one face thereof for securing the same to the exposed end of a shaft to be driven with the outer face of the disc normal to the shaft axis; and a driving abutment on each of said discs formed as an integral part thereof and each provided by a substantially radially disposed edge surface on the disc exposed at the outer face thereof, said driving abutments facing in opposite circumferential directions and opposing one another when the discs are coaxially juxtaposed with their outer faces contiguous to one another so as to provide a unidirectional rotation transmitting connection between the driving and driven discs.

6. The coupling device set forth in claim 5 further characterized by the provision of an axial hole in one of said discs, and by the provision of a pilot fixed to the

other of said discs and projecting coaxially from said outer face thereof for reception in the hole of the first designated disc upon axial juxtaposition of the discs to guide the same into coaxial relationship and to preclude relative lateral shifting between the discs in directions crosswise of their axes of rotation.

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