May 7, 1957 K. W. COUSE 2,791,309

POWER TAKE-OFF APPARATUS WITH MEANS FOR LOCKING IT IN DRIVING POSITIONS

Filed April 8, 1955 4 Sheets-Sheet 1

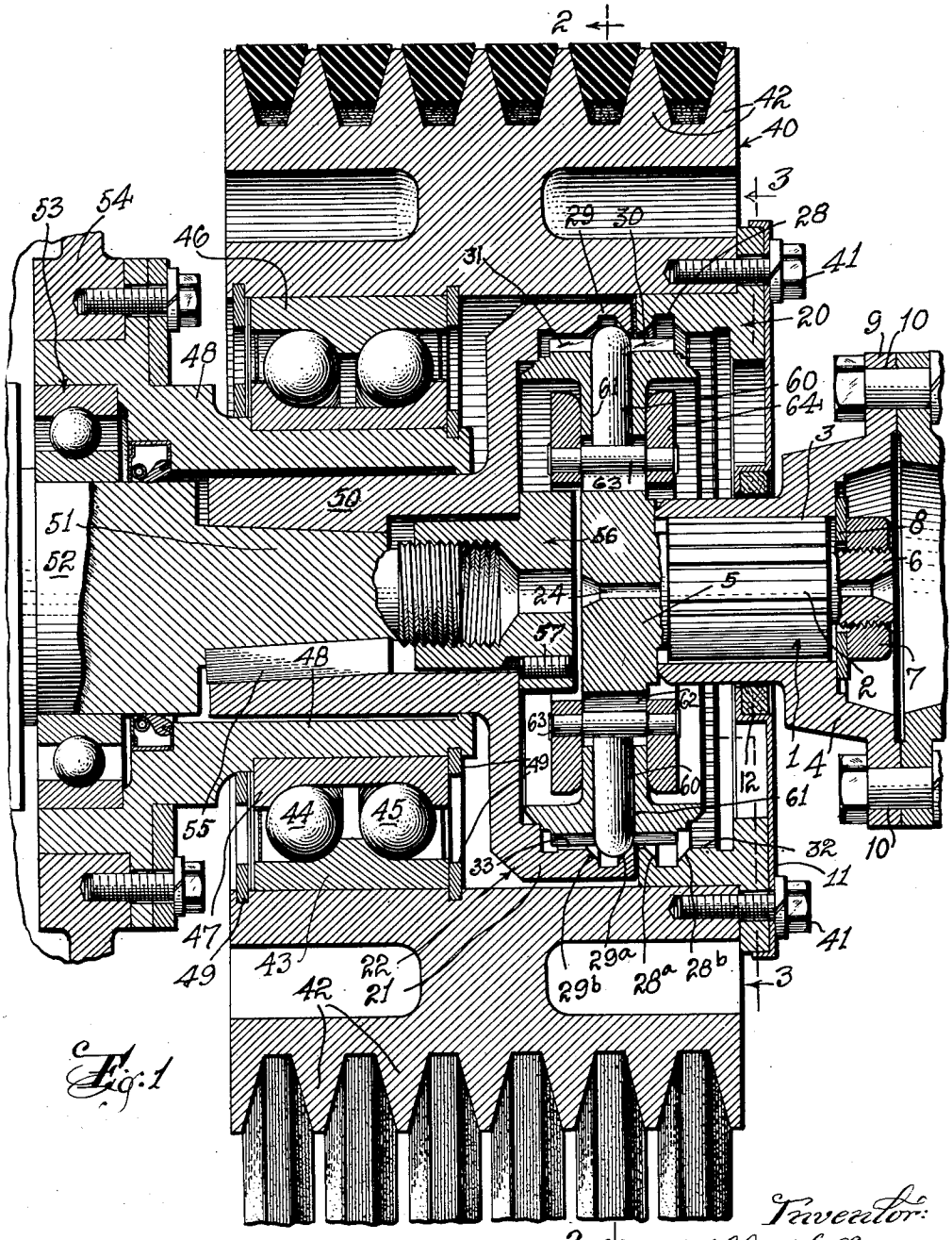


Fig. 1

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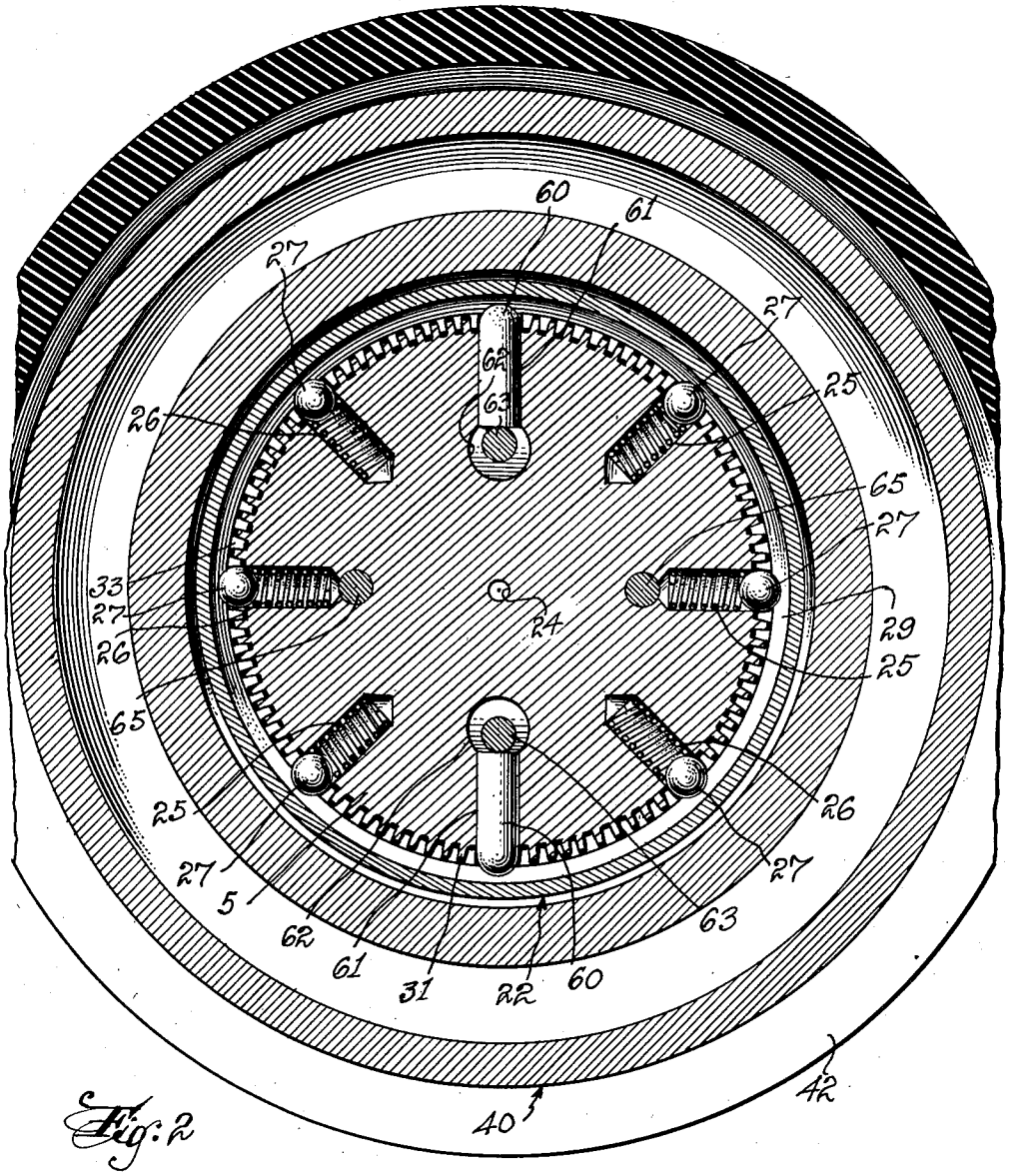


Fig. 2

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Fig. 3

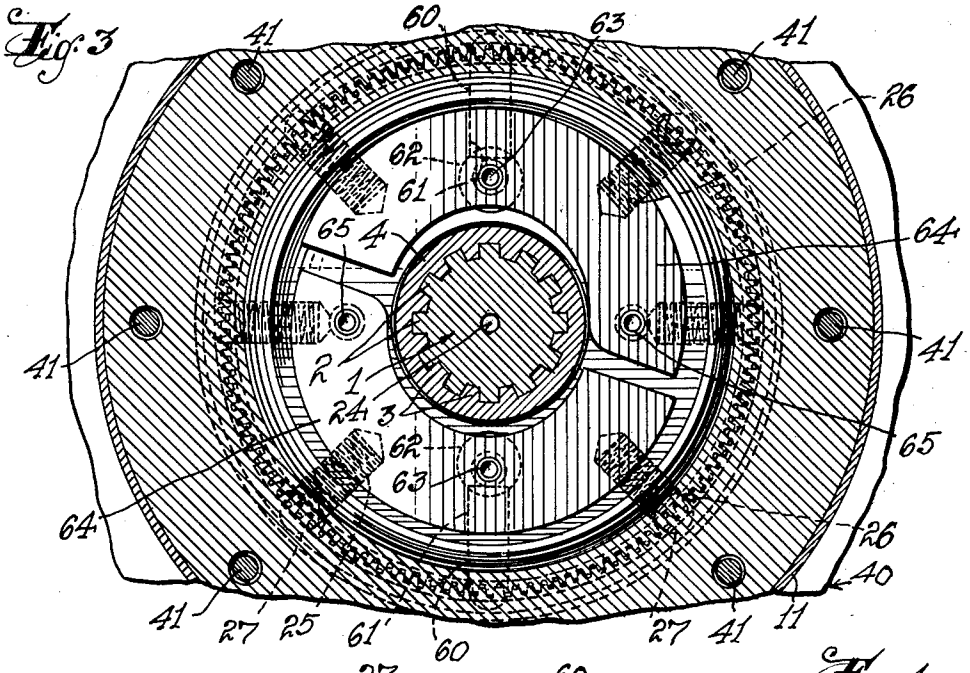
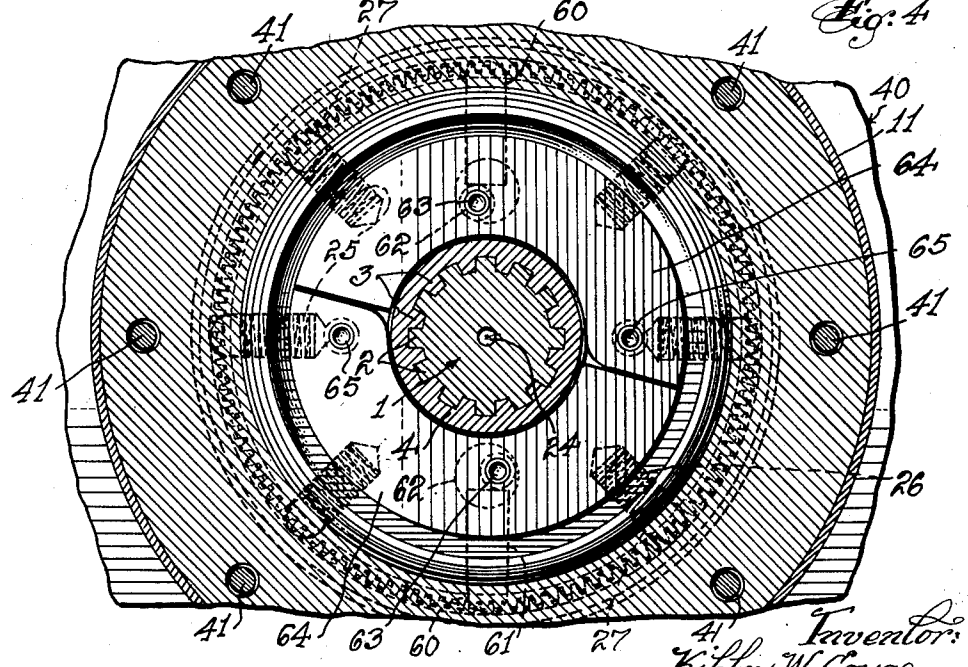


Fig. 4



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Filed April 8, 1955 4 Sheets-Sheet 4

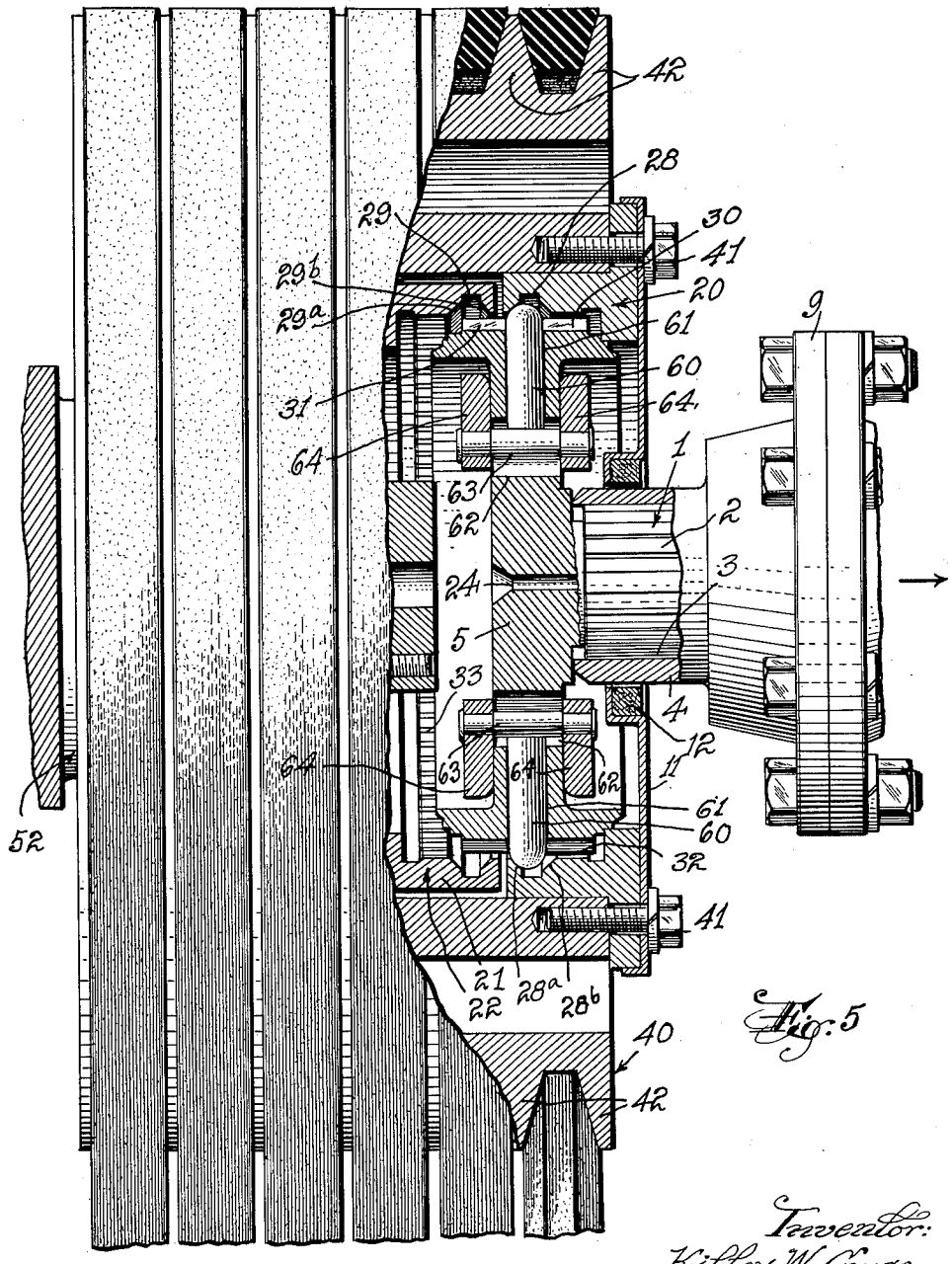


Fig. 5

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United States Patent Office 2,791,309 Patented May 7, 1957

2,791,309

POWER TAKE-OFF APPARATUS WITH MEANS FOR LOCKING IT IN DRIVING POSITIONS

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Application April 8, 1955, Serial No. 500,217

2 Claims. (Cl. 192—114)

My invention relates to power take-off apparatus which although useful in various environments is particularly adapted for use in traveling machine shops of the type illustrated in my Design Patent No. D. 109,942 issued May 31, 1938, and including a motor vehicle adapted to carry power driven machines such as drill presses, grinders, milling machines and the like which are driven from the vehicle engine. More particularly, the invention contemplates a power take-off apparatus for selectively connecting the drive shaft of the motor of the vehicle to the vehicle driving shaft or to a power take-off member such as a drum or pulley so that the vehicle can be driven directly by the motor, or when desired drill presses, or grinders or the like can be driven by the motor through the power take off member.

In general the apparatus is similar to that described and claimed in my copending application, Serial No. 283,471, filed April 21, 1952, now Patent No. 2,733,793, and includes a driving member, a driven member, a power transmitting member connected to the power take-off member, said driving member having means cooperating with said driven member and said power transmitting member for selectively effecting a driving connection between said driving member and either of said driven member and said power take-off member, and spring actuated means for locating and releasably holding the driving member in driving relation to either of said driven member or said power take-off member.

A prime object of the present invention is to provide in apparatus of this general character novel and improved mechanism for firmly locking said driving member against disengagement from either of said driven member and said power take-off member while the driving member is revolving and driving either of said driven member and said power take-off member.

Another object is to provide such locking mechanism which shall include at least one locking member mounted in the driving member to move radially thereof, and a centrifugally actuated weight member on said driving member and associated with said locking member to force the locking member into locking engagement with either said driven member or said power take-off member.

Other objects, advantages and results of the invention will be brought out by the following description in conjunction with the accompanying drawings in which

Figure 1 is a longitudinal vertical sectional view through the apparatus showing the driving member in position for operating the driven member and showing the locking mechanism in operative position;

Figure 2 is a transverse vertical sectional view approximately on the plane of the line 2—2 of Figure 1;

Figure 3 is a fragmentary transverse vertical sectional view approximately on the plane of the line 3—3 of Figure 1;

Figure 4 is a similar view but showing the locking means in normal inoperative position; and

Figure 5 is a view similar to Figure 1 but showing

the power transmitting element in position for driving the power take-off pulley and also illustrating portions of the pulley and other parts of the apparatus in side elevation.

Referring to the drawings, reference character 1 designates a driving member having a plurality of splines 2 formed on its surface for engagement by a plurality of other splines 3 on coupling member 4 so that driving member 1 may be rotated by coupling member 4. Driving member 1 has a hub section 5 at one end and a threaded portion 6 at its other end. Coupling member 4 is held by nut 7 in a fixed longitudinal position on driving member 1 between hub section 5 and washer 8. Coupling member 4 has a flange 9 which includes a plurality of openings 10 through which bolts may be inserted to operatively connect driving member 1 to a drive shaft (not shown) that is journaled in bearings in known manner, and to suitable means (not shown) for shifting the driving member longitudinally to one or another of its operative positions. Coupling member 4 is moved longitudinally during a shifting operation through an opening in cover plate 11 provided with suitable packing means 12, and of course driving member 1 is moved with coupling member 4. Hub section 5 of driving member 1 is slidable within a hollow cylindrical end section of a power transmitting member 20 and a hollow cylindrical end section 21 of a coaxial juxtaposed driven member 22. In this connection it is to be noted that hub section 5 has a plurality of openings 23 formed therein, one function of which is to permit air to escape from one side of hub section 5 to the other side thereof during shifting operations so that no undue compression results to hamper the movement of driving member 1 incident to a shifting operation. Driving member 1 is also provided with a central opening 24 extending throughout its length to permit any air compressed by hub section 5 during shifting operations to escape to the outer atmosphere.

Hub section 5 has a plurality of radial openings 25 formed therein and fitted into each such opening is a coil spring 26. The outer end of each spring engages a ball 27 which is positioned by its associated spring in an interior annular or circumferential groove or recess 28 formed in power transmitting member 20 or in another interior annular or circumferential groove or recess 29 in cylindrical section 21 of driven member 22 according to the position occupied by driving member 1. Annular recess or groove 28 is provided with beveled sides 28*a* and 28*b*, one of which is near the end of the corresponding hollow end section that is juxtaposed to the hollow end section of the power transmitting member; and annular recess or groove 29 is provided with beveled sides 29*a* and 29*b*, one of which is near the end of the hollow section that is juxtaposed to the end of the hollow end section of the power transmitting member. When driving member 1 is moved forwardly of the hollow end section of the power transmitting member 20, it occupies a first position in which position hub 5 engages power transmitting member 20 at 20*a*, each ball 27 is positioned in recess 28 where it contacts but one side of the recess, namely side 28*a*. The engagement of hub 5 with power transmitting member 20 at shoulder 20*a* that is spaced from the side 28*a* inwardly of the hollow end section of the power transmitting member 20, and the engagement of each ball 27 with side 28*a* of recess 28 locates and releasably holds driving member 1 in its first operative position until intentionally displaced therefrom. When driving member 1 is moved inwardly of the hollow end section of driven member 22, it occupies another operative position in which position hub 5 engages driven member 22 at shoulder 21*a* that is spaced from the side 29*a* inwardly of the hollow end section of the driven member 22 and each ball 27 is positioned in recess 29 being in contact with only side 29*a*. Driving member 1 is lo-

cated and releasably held in the latter operative position by the engagement of hub 5 with driven member 22 at 21*a* and the engagement of each ball 27 with side 29*a* until driving member 1 is forced back to its first operative position. Formed on hub section 5 of driving member 1 on one side of openings 25 are clutch teeth 30, hub section 5 having other clutch teeth 31 formed thereon on the other side of openings 24. Cylindrical power transmitting member 20 and cylindrical section 21 of driven member 22 are provided on their inner surfaces with clutch teeth 32 and 33 respectively, clutch teeth 32 being adapted for engagement by clutch teeth 30 when driving member 1 occupies its first operative position and clutch teeth 33 being adapted for engagement by clutch teeth 31 when driving member 1 occupies its other operative position. It will be noted that while driving member 1 is positioned to actuate power transmitting member 20 in its first operative position, driving member 1 is completely disconnected in such first operative position from driven member 22. In its other operative position driving member 1 is positioned for the actuation of driven member 22 but it is completely disconnected from power transmitting member 20.

Power transmitting member 20 is connected to power take-off drum 40 by screw studs 41 so that the drum 40 is caused to be rotated when power transmitting member 20 is rotated. It is to be noted that screw studs 41 serve to secure cover plate 11 to power transmitting member 20. Drum 40 is adapted to receive a suitable type of power transmitting means and may as illustrated in the drawing have its outer surface divided into V-shaped sections 42 spaced to receive a V-type belt not shown. Drum 40 is supported by ball bearing 43 having a double row of balls 44 and 45. Ball bearing 43 has its outer race 46 in contact with the inner surface of drum 40 and its inner race 47 in contact with the outer surface of cylindrical bearing carrying member 48, the bearing 43 being held in a fixed position longitudinally by retaining rings 49 and hub 50 on member 48.

The driven member has a central tubular extension 50 into which extends the reduced end 51 of a shaft 52 that is journaled in a roller bearing 53 in a portion 54 of the frame of the truck to which the bearing carrying member 48 is connected, the contacting surfaces of the reduced portion 51 of the shaft and the tubular portion 50 being tapered and there being a key 55 drivingly connecting the driven member 22 to the shaft 52. A nut 56 is screwed on the end of the reduced portion 51 of the shaft 52 and abuts the power transmitting member 22 to lock the latter against longitudinal movement of the shaft. Preferably a locking set screw 57 is provided in the nut to engage the driven member 22 for preventing backward rotation of the nut. The driven shaft 52 may be connected to any element or machine to be driven, more particularly in the present case to the driving shaft for the rear wheels of the motor vehicle.

A shifting operation is accomplished by moving driving member 1 longitudinally by suitable shifting means operatively connected thereto through connecting member 4. When driving member 1 occupies its first operative position (Fig. 5) as determined by the shifting means balls 27 are positioned in recess 28 of power transmitting member 20 as already noted and clutch teeth 30 on driving member 1 are positioned to engage clutch teeth 32 on power transmitting member 20 so that power transmitting member 20 and drum 40 secured thereto may be rotated by driving member 1. When driving member 1 is moved from its first operative position to its other operative position, driving member 1 is moved to the left as viewed in Fig. 5, balls 27 being pushed inwardly in the process by side 28*a* of recess 28 compressing coil springs 26 but when driving member 1 reaches its other operative position (Fig. 1), coil springs 26 snap balls 27 into position in recess 29 of cylindrical section 21 and in contact with side 29*a* of recess 29. In such other operative position of driving member 1, clutch teeth 31 of driving member 1 are positioned for engagement with clutch teeth 33 of cylindrical section 21, thus permitting driven member 22 to be rotated by driving member 1. Balls 27 are of course also pushed inwardly by side 29*a* of recess 29 compressing spring 26 when the driving member is moved from the aforesaid other operative position back to its first operative position, the balls 27 being snapped into position in recess 28 in power transmitting member 20 and in contact with side 28*a* of recess 28 when the first operative position is attained.

The apparatus so far described is generally similar to that described and claimed in my aforesaid copending application, Serial No. 283,471 and an important feature of the present invention is mechanism for firmly locking the driving member in driving engagement with either the driven member or the power transmitting member that is connected to the power take-off member or drum while the drive shaft is rotating and driving either said driven member or said power take-off member, whereby inadvertent or accidental longitudinal or axial movement of the power transmitting element from engagement with one of the driven member and the power take-off member into engagement with the other shall be prevented. This mechanism is shown as comprising at least one locking member 60 that is mounted in the driving member for movement radially thereof and is forced by a centrifugally actuated weight into locking engagement with the driven member or the power transmitting member as the case may be.

Preferably there are at least two locking members and they are shown in the form of pins slidably mounted in radially disposed openings 61 in the power transmitting element and projecting from the periphery thereof in the same manner and in the same general plane with the balls 27 that is perpendicular to the axis of rotation of the driving member. Extending transversely of each of the openings 16 at the inner ends of the locking pins 60 and disposed longitudinally of the power transmitting element are openings 62 through each of which extends a pin 63 whose ends are rigidly connected at opposite sides of the power transmitting element to arcuate weights 64 that are pivotally mounted adjacent one end at 65 on the power transmitting element. As shown, these weights are approximately semi-circular and normally approximately concentric with the power transmitting element as best shown in Figure 4 and the pins 63 are normally disposed to permit the locking pins 60 to withdraw out of engagement with the driven member or the power transmitting member, as the case may be, and as shown in Figure 4.

In operation, after the driving member has been initially located and releasably held by the spring press balls 27 in driving engagement either with the driven member on the power take-off member, as shown in Figures 1 and 5, respectively, when the drive shaft is started in operation to positively drive the driving member 1, the weights 64 are centrifugally actuated and force the locking pins 60 into the annular recess 28 or 29, as the case may be, and the centrifugal force applied to the locking pins is sufficient to firmly hold the driving member against longitudinal or axial movement while the driving member is driving either the driven member or the power take-off member. The outer ends of the locking pins are so formed, preferably rounded as to cooperate with the edges of the recesses 28 and 29 to provide for easy sliding of the locking pins into and out of engagement with both said power transmitting element and said driven member upon axial movement of the driving member relative to the power transmitting member and said driven member while the driving member is not revolving.

The now preferred embodiment of the invention has been shown and described, but it should be understood that this is primarily for explaining the principles of the

invention and that many modifications and changes in the construction may be made within the spirit and scope of the invention.

What I claim is:

1. Power take-off apparatus comprising the combination of a driving member, a power transmitting member and a driven member, said power transmitting and said driven member having hollow end sections coaxial with each other and with said driving member, each hollow end section having one end coaxially and closely juxtaposed to one end of the other hollow end section, said driving member being axially movable in said hollow end sections relatively to said power transmitting member and said driven member and having an opening, means for selectively effecting a driving engagement between said driving member and either of said power transmitting element and said driven element, a spring fitted into said opening, said power transmitting member and said driven member each having an interior annular recess formed in its said hollow end section near said end of the hollow end section with a side whose outer edge is in close proximity to the corresponding edge of the other recess, a detent member in said opening of the driving member urged by said spring so that said detent member is compelled to snap into one or the other of said recesses upon slight axial movement of said driving member and is pressed into one or the other of said interior recesses depending upon the position of said driving member to locate and releasably hold the driving member in a position of driving engagement with one or the other of said power transmitting member and said driven member, a locking member mounted in said driving member to move radially thereof in a common plane with said detent member that is perpendicular to the axis of rotation of the driving member, and a centrifugally actuated weight mounted on said driving member and associated with said locking member to force said locking member into the one of said annular recesses into which projects said detent member and thereby lock said driving member in driving engagement with one or the other of said power transmitting member and said driven member during revolution of said driving member, said sides of said annular recesses and said locking member and said detent member being formed to provide for easy sliding of said locking member into and out of engagement with both said power transmitting member, and said driven member upon axial movement of said driving member relative to said power transmitting member and said driven member while said driving member is not revolving, said locking member comprising a pin mounted in a radial opening in said driving member, said centrifugal weight being pivotally mounted at one end and carrying a cross-pin abuttingly engaging said locking pin so that when the driving member is revolving the end portion of the weight carrying said cross-pin will be swung outwardly and actuate the locking pin into one or the other of said annular recesses.

2. Power take-off apparatus comprising the combination of a driving member, a power transmitting member and a driven member, said power transmitting and said driven member having hollow end sections coaxial with each other and with said driving member, each hollow end section having one end coaxially and closely juxtaposed to one end of the other hollow end section, said driving member being axially movable in said hollow end sections relatively to said power transmitting member and said driven member and having an opening, means for selectively effecting a driving engagement between said driving member and either of said power transmitting element and said driven element, a spring fitted into said opening, said power transmitting member and said driven member each having an interior annular recess formed in its said hollow end section near said end of the hollow end section with a side whose outer edge is in close proximity to the corresponding edge of the other recess, a detent member in said opening of the driving member urged by said spring so that said detent member is compelled to snap into one or the other of said recesses upon slight axial movement of said driving member and is pressed into one or the other of said interior recesses depending upon the position of said driving member to locate and releasably hold the driving member in a position of driving engagement with one or the other of said power transmitting member and said driven member, a locking member mounted in said driving member to move radially thereof in a common plane with said detent member that is perpendicular to the axis of rotation of the driving member, and a centrifugally actuated weight mounted on said driving member and associated with said locking member to force said locking member into the one of said annular recesses into which projects said detent member and thereby lock said driving member in driving engagement with one or the other of said power transmitting member and said driven member during revolution of said driving member, said sides of said annular recesses and said locking member and said detent member being formed to provide for easy sliding of said locking member into and out of engagement with both said power transmitting member and said driven member upon axial movement of said driving member relative to said power transmitting member and said driven member while said driving member is not revolving, said locking member comprising a pin mounted in a radial opening in said driving member, said driving member having a longitudinal opening therethrough intersecting said radial opening, there being two centrifugal weights each pivotally mounted on the driving member at one end thereof and a cross pin connecting said centrifugal weights and loosely disposed in said longitudinal opening of the driving member in abutting engagement with the end of said locking pin so that when the driving member is revolving the end portions of the weights carrying said cross pin will be swung outwardly and actuate the locking pin into one or the other of said annular recesses.

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