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STARTER DRIVE

Filed April 6, 1961

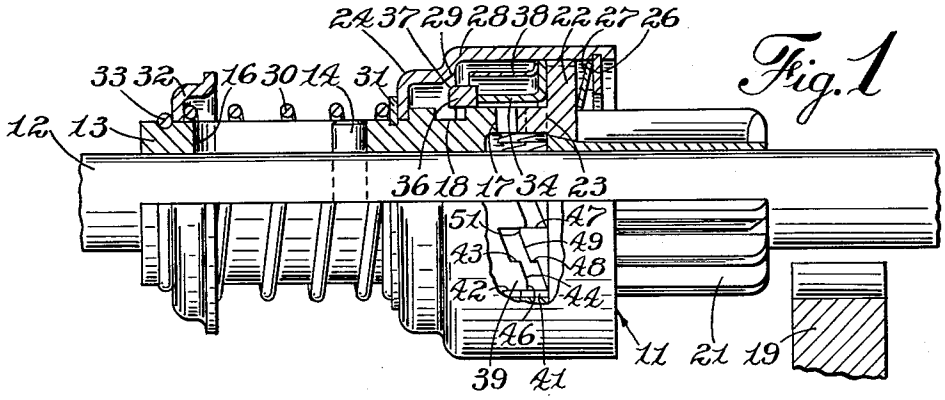


Fig. 1

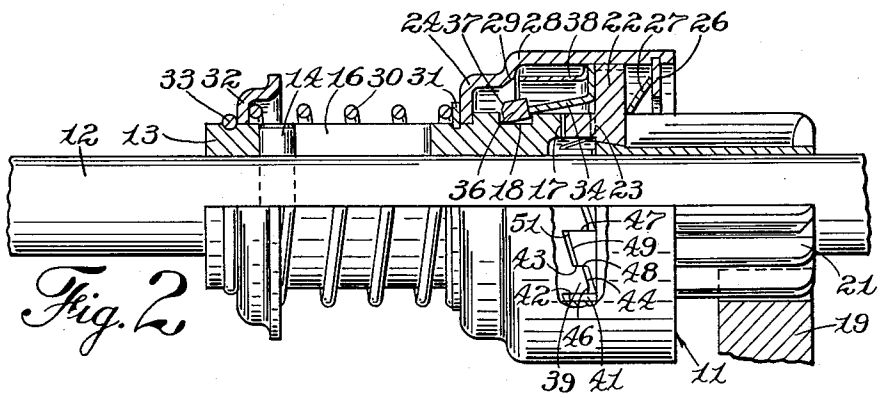


Fig. 2

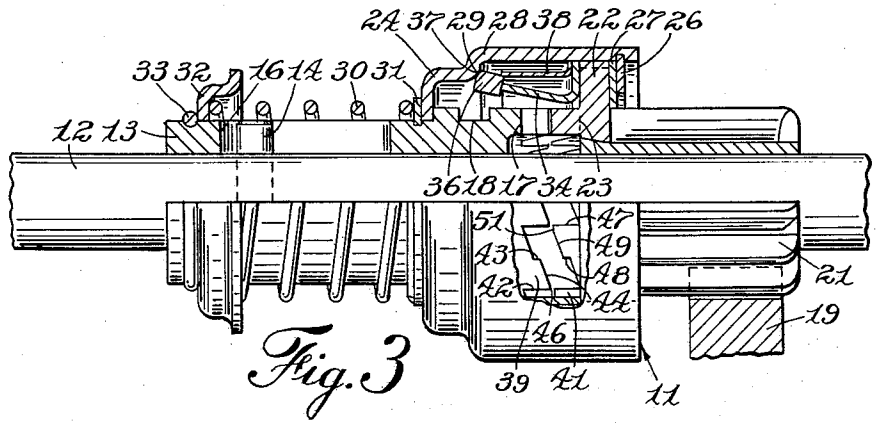


Fig. 3

WITNESS:

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STARTER DRIVE

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The present invention relates to a starter drive for internal combustion engines and more particularly to the positive shift type of drive having a dentil type overrunning clutch connection provided therein. Specifically, the invention relates to means for maintaining locked engagement of the clutch members and preventing overrunning clutch operation below a predetermined range of pinion speeds which means are responsive to centrifugal force for urging the clutch members out of engagement at and above the predetermined range of pinion speeds.

The problem of pumping has become quite serious in the development of drives of this type. When the engine to be started is cranked to just beyond a peak compression point, or when an engine misfire occurs, there is an inherent tendency for the engine to momentarily drive a portion of the starter drive or starter gearing at a faster rotational rate of speed than that of the starting motor armature. This temporary assumption of the propelling duties by the engine momentarily causes a separation to occur between the teeth of the clutch members of the drive and releases the starting motor from any load thereby allowing its armature to freely and rapidly accelerate.

It has been found that, if the reduction of backlash and lost motion associated with the described clutch separations can be eliminated and the armature is not allowed to freely accelerate, there will be a considerable reduction of the peak torque requirements subsequently placed on the starting motor once it resumes its driving duties.

Reduction of the described clutch separations has also been found to have the added effect of all but eliminating the noise of impact associated with the engagement of the clutch members. This undesirable noise has been described as a thumping or knocking and is created in taking up the backlash or lost motion. Pulsating operations of the clutch members also create this undesirable noise.

Elimination of the separation of the clutch members below a predetermined range of pinion speeds causes the engine, when temporarily assuming the propelling duties due to a misfire or false start, to drive the starting motor armature as well as the entire starter drive assembly. This temporary driving of the starting motor by the engine generally does not cause the armature to be rotated above its free running speed, and, consequently, it is not detrimental to the starting motor, or if the armature should be driven at speeds in excess of its free running speed, it will be of such short duration so as not to be harmful or detrimental to the starting motor.

The use of means which lock the engaged clutch members below a predetermined range of pinion speeds, and which means are actuated at and above that range of speeds to release the engagement of the clutch members and to cause their axial separation, have been found to attain the desired results. Briefly, the means comprise a detent supported on the free extremity of an arm substantially pivotally secured to the pinion assembly. Below the range of pinion speeds, the detent engages a circumferential groove in the sleeve and limits or eliminates the axial separation occurring between the clutch members which separation is necessary to allow for overrunning clutch operation. At and above the range of speeds, the detent will disengage from the groove due to centrifugal forces and will move out radially into engagement with an inclined or tapered surface on a surrounding casing or housing. A sleeve of limited flexibility also secured to the pinion assembly will be engaged by the detent. The radial centrifugal forces are then translated by the detent, sleeve and inclined casing surface into axial force of sufficient magnitude to cause the driven clutch member, which is associated with the pinion assembly, to be urged axially out of engagement from the driving clutch member. This allows the overrunning clutch to function in a normal manner permitting the pinion and associated parts to be driven by the engine without adversely affecting the starting motor by driving its armature. When a true engine start has been accomplished, the entire drive assembly is shifted out of engagement and is returned to the idle position available for subsequent starts.

It is an object of the present invention to provide a novel engine starter drive of the positive shift type which is efficient and reliable in operation, is of a simple and sturdy construction and economical to manufacture and fabricate.

It is a primary object of the invention to provide a positive shift type of drive having dentil overrunning clutch members which can be locked in engagement below a predetermined range of pinion speeds to maintain the overrunning clutch inoperative.

It is another object of the invention to provide a positive shift type of starter drive having dentil overrunning clutch members which can be axially separated by centrifugally actuated means at and above a predetermined range of pinion speeds so as to provide normal overrunning clutch operation.

It is still another object of the invention to provide means which will limit or eliminate axial separation of the starter drive clutch elements below a specific range of pinion speeds and which will, due to centrifugal force, allow and cause axial separation between the starter drive clutch elements at and above the specific range of pinion speeds.

It is a further object of the invention to provide overrunning clutch teeth which, when engaged, will possess the inherent tendency to lock the clutch members together and oppose axial separations therebetween.

It is a still further object of the invention to provide means which will prevent undue wear from occurring between a centrifugally actuated clutch locking and actuating member and the casing and which will assist in translating radial centrifugal forces into axial forces.

It is a still further object of the invention to provide means which will substantially eliminate all but the initial impact noises associated with starter drive engagements.

It is a still further object of the invention to provide means whereby the overrunning clutch is made inoperative and the engine is caused to drive the starting motor armature during false or abortive starts thereby eliminating peak torque requirements from being subsequently placed on the starter motor armature when its kinetic energy is subsequently transferred to the engine flywheel gearing after the false start.

Further objects and advantages will be apparent from the following description taken in connection with the accompanying drawing which illustrates a single 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 longitudinal view, partly in section and broken away, of the preferred embodiment of the invention illustrating the parts in the normal idle position;

FIGURE 2 is a view similar to FIGURE 1 illustrating the parts in a cranking position or in an engine driving

condition below a predetermined range of pinion speeds where clutch overrun is prevented; and

FIGURE 3 is a view similar to FIGURE 1 illustrating the parts in an overrunning position at and above a predetermined range of pinion speeds.

In FIGURE 1, there is illustrated a positive shift type of starter drive for internal combustion engines generally designated as 11. The drive is supported on the armature or power shaft 12 of a starter motor (not shown). A shifting sleeve 13 is supported on the shaft. Pin member 14 is secured in the shaft with its extremity engaging the slot 16 of the sleeve. The slot may be a straight axial void and thus would limit any relative movement between the shaft and sleeve to axial sliding movements or the slot may be a helical void thereby providing relative axial and rotational movements between the shaft and sleeve. The latter arrangement of a pin and slot combination is preferred since it materially assists in overcoming tooth abutment between the starter drive gearing and the engine ring gearing hereinafter described.

The right-hand extremity of the sleeve, as illustrated in the accompanying drawing, is dentiled to provide a driving clutch member 17 integrally formed thereon or fixedly secured thereto. Adjacent the driving clutch the sleeve is provided with a circumferential groove 18.

A pinion assembly is slidably journalled on the power shaft for movement into and out of mesh with a gear 19 of the engine to be started. The pinion assembly comprises a pinion gear 21 adapted to drivingly engage the engine gear 19 in a fashion illustrated in FIGURE 2. A radial flange 22 integrally formed on or fixedly secured to the pinion and a dentiled driven clutch member 23 are formed on the left-hand extremity of the pinion assembly. The driven clutch can be an integral part of the pinion assembly or it can be a separate element secured thereto.

A casing or bell-shaped housing 24 is fixedly secured to the sleeve 13 with its open end extending in the direction of the pinion assembly. The casing is concentrically disposed about the clutch members 17 and 23 and the flange 22. A snap ring 26 engages the casing adjacent its opening and limits the relative axial displacement possible between the casing and the pinion assembly by providing a stop abutment for the flange. A spring washer 27 is interposed between the flange 22 and the snap ring 26 and serves to normally bias the driven clutch member 23 into engagement with the driving clutch member 17. The casing diameter is varied at 28 to provide an angular inclined cam surface 29 which in turn is positioned substantially above and concentrically with respect to the circumferential groove 18. The cam surface is inclined axially away from the shaft axis in the direction of the open end of the casing. A mesh enforcing spring 30 is disposed about the sleeve 13 and at one end engages the snap ring 31 retaining the casing 24 in place. A shift flange 32 slidably supported on the sleeve and limited by a retainer ring 33 engages the other end of the spring 30. The shift flange is in turn engaged by a shift fork or yoke (not illustrated) which moves the sleeve relative to the shaft and causes pinion movement into and out of engagement with the gear 19.

Within the cavity defined by the casing there are provided centrifugally actuated means for limiting clutch operation. These means comiprise an elongated member 34 secured in any convenient manner to the flange 22. In the illustrated embodiment, the arm is illustrated as being formed of a resilient or spring material. It will be readily appreciated by those versed in this art that the arm can be, as a matter of choice, rigid and be pivotally supported by the flange 22. Affixed to the free extremity of the arm 34 is a detent 36 of nylon or metal. During the normal demeshed or idle condition, the arm assumes a substantially horizontal position best illustrated in FIGURE 1. When the clutch members are engaged and the dentils 39 and 41 thereof are fully meshed, the detent 36 drops into or engages in the circumferential groove 18 and remains in that position until the pinion assembly is rotated at and above a predetermined speed. At this predetermined speed centrifugal force will cause the detent 36 to move radially outwardly and be pivoted by the arm 34 into contact with the inclined cam surface 29 of the casing 24. The corner of the detent 36 is chamfered as at 37 to provide a detent cam surface.

A cylindrical sleeve 38 is secured to the pinion flange 22 and extends into the cavity defined by the casing. The free extremity of the sleeve terminates adjacent the casing cam surface 29. The sleeve 38 is preferably formed of material providing limited flexibility. Nylon has been found to be satisfactory. During radial outward movement the detent strikes the sleeve which is provided for a two-fold purpose. Since the sleeve is also connected to the flange 22, there will be no relative movement between the detent and sleeve, thus the wearing surfaces of the detent are minimized and are effectively limited to the detent cam surface 37 and additionally it limits the number of undesirable frictional contact areas. The sleeve also assists in translating the radial centrifugal forces into axial forces by ensuring that the forces coact solely on the cam surfaces 29 and 37. As the centrifugal force increases with increased pinion rotation, so will the force exerted by the detent 36 on the casing cam surface 29. This force will increase to such an extent that it will be of sufficient magnitude to overcome the bias exerted by the spring washer 27 on the pinion assembly and to urge the driven clutch member 23 out of driving engagement with the driving clutch member 17.

In prior art dentil clutches used on overrunning clutches in starter drives, the dentils have been of the saw-tooth variety. In the present invention, the dentils 39 and 41 of the driving and driven clutch members 17 and 23, respectively, are formed as extensions having substantially trapezoidally shaped cross-sections. The side walls of the dentils are circumferentially spaced parallel faces axially and radially straight relative to the axis of the shaft 12. The side walls 42 of the dentils 39 which face in the direction of normal clutch rotation have a longer or major axial length relative to the other side wall 43 which is defined as having a minor axial length. An inclined cam surface 44 connects the side walls 42 and 43. The dentil cam surface 44, as illustrated, may be flatted adjacent the side wall 42 as at 46 to assist in obtaining smooth overrunning clutch operation. The dentils 41 are substantially identical to those described except that the side wall 47 which faces in an opposite direction to the normal clutch rotation has a major axial dimension and the side wall 48 has the minor axial dimension. The dentil surface 49 and flat 51 are identical to those described as elements 44 and 46, respectively. It will be appreciated that the camming effect obtained between the dentil surfaces 44 and 49 cannot be attained until the clutch members are axially separated a distance equal to the minor axial length of the dentils 39 and 41. Prior to the attainment of the desired axial separation, the side walls 43 and 48 will abut and effectively prevent any overrunning clutch operation from taking place. The use of the described dentils, coupled with the previously described clutch locking means, effectively controls clutch operation to attain the stated objects.

In operation, starting from a normal idle position illustrated in FIGURE 1, the yoke (not shown) is pivotally actuated and urges the shift flange 32 to the right causing the mesh enforcing spring 30 to compressively engage the casing 24 and thereby urges the starter drive in a meshing direction. Initial meshing movement causes the sleeve 13 to move relative to the shaft 12. If the slot 16 is helical, this sleeve movement will be rotarial as well as axial. The sleeve movement will cause dentils 39 and 41 of the clutch members 17 and 23, respectively, to interengage and thereafter the pinion assembly will also be urged in the meshing direction. If the pinion gearing 21 and the engine gearing 19 are in alignment,

the drive will assume the driving position illustrated in FIGURE 2. In the event the pinion and engine gearing abut, further movement of the yoke will cause the mesh enforcing spring **30** to be compressed until such time as the yoke has been pivoted a predetermined amount. Thereafter, the starting motor will be actuated causing the drive to be rotated. As soon as the gear teeth become aligned, the spring **30** will be released from its abnormal compression and will urge the pinion into mesh with the engine gearing. The helical slot and pin arrangement will materially assist in assuring complete and proper gear mesh.

When the clutch members **17** and **23** are meshed, the detent **36** supported on the pinion flange by the elongated lever arm **34** will drop into the circumferential groove **18** to effectively lock the clutch members in engagement and prevent their being axially separated. The spring washer **27** coacting with the casing **24** and the pinion flange **22** will also materially assist clutch engagement.

Below a predetermined range of pinion speeds, the detent **36** will maintain engagement with the groove **18** and will eliminate clutch overrunning operations as is best illustrated in FIGURE 2. Should the engine misfire or pass over a compression peak causing it to temporarily drive the pinion at a speed below this range, the clutch will transmit this engine propulsion to the starter drive and motor. Generally, this driving by the engine under these conditions will not be harmful to the starting motor since the speeds are well under the armature free running speeds or they are of very short duration and are not detrimental. When the starting motor again assumes its driving function, the armature will not be subjected to a high peak torque load which would accompany the taking up of blacklash and lost motion associated with a normally overrunning clutch operation.

At and above the predetermined range of pinion speeds the detent **36** will be subjected to centrifugal forces of sufficient magnitude to cause the detent to be radially and pivotally displaced as best illustrated in FIGURE 3. This displacement will cause the detent to strike the casing cam surface **29** and the cylindrical sleeve **38**. The sleeve **38** will deflect the force of the detent towards the cam surface and limit the cam wearing surfaces to the chamfered portion **37**. The translated centrifugal force is sufficient to overcome the force exerted by the spring **27** and to urge the driven clutch **23** axially away from the driving clutch **17** a sufficient distance to enable the clutch to overrun satisfactorily. It will be apparent that axial displacement caused by the detent must be at least equal to the minor length of the clutch dentils. Further overrunning of the pinion will cause a greater separation between the clutch members. Upon release of the yoke actuating force the starter drive will be caused to return to its idle position.

While there has been hereinbefore described what is at the present time considered a preferred embodiment of the invention, it will be apparent that many and various changes and modifications may be made with respect to the embodiment without departing from the spirit of the invention. It will also be understood, therefore, that all and any such changes and modifications as fall freely within the scope of the present invention as defined in the appended claims are to be considered as part of the present invention.

I claim:

1. In an engine starter drive: a power shaft; a sleeve supported on the shaft and having limited movement relative thereto; means for moving the sleeve relative to the shaft; a driving clutch member fixedly secured to the sleeve; a pinion slidably journalled on the shaft for movement into and out of engagement with a gear of the engine to be started; a driven clutch member fixedly secured to the pinion adapted for engagement with the driving clutch member to provide an overrunning connection between the sleeve and pinion; a casing secured to the sleeve concentricaly disposed about the clutch members; and, means including a centrifugally actuated weight member secured to the pinion for maintaining locked engagement between the clutch members below a predetermined range of pinion speeds and for urging the clutch members out of driving engagement at and above the predetermined range of pinion speeds.

2. An engine starter drive as set forth in claim 1 in which the last named means includes further: a circumferential groove formed in the sleeve adjacent the driving clutch member, said weight member being adapted to engage the groove below the predetermined range of pinion speeds whereby the clutch members are prevented from separating and overrunning; and, an inclined surface formed in the casing concentric with the groove, said weight member being adapted to engage the inclined surface at and above the predetermined range of pinion speeds whereby the clutch members are caused to be axially separated.

3. An engine starter drive as set forth in claim 2 including further: flange means fixedly secured to the pinion; a cylindrical sleeve member of limited flexibility secured to the flange concentrically disposed within the casing spatially overlying the weight member and having its free extremity adjacent the inclined surface of the casing whereby engagement between the weight member and the casing is limited to the inclined surface thereof.

4. An engine starter drive as set forth in claim 3 in which the centrifugally actuated weight member comprises: an elongated offset lever arm having one of its extremities pivotally supported for radial movement on the flange; and, detent means secured to the free extremity of the arm adapted to cooperate with the circumferential groove below the predetermined range of pinion speeds for locking the clutch members into driving engagement and adapted responsive to centrifugal force generated at and above the predetermined range of pinion speeds to be pivoted by the lever arm into engagement with the inclined surface for axially separating the clutch members.

5. An engine starter drive as set forth in claim 3 in which the centrifugally actuated weight member comprises: an elongated offset spring arm having one of its extremities supported for radial movement on the flange; and, detent means secured to the free extremity of the spring arm adapted to cooperate with the circumferential groove below the predetermined range of pinion speeds for locking the clutch members into driving engagement and adapted responsive to centrifugal force generated at and above the predetermined range of pinion speeds to be radially displaced into engagement with the inclined surface for axially separating the clutch members.

6. An engine starter drive as set forth in claim 1 wherein the clutch members include clutch teeth adapted when engaged to maintain a clutch locked condition and to overrun only when the clutch members are axially separated a predetermined distance, said clutch teeth comprising extensions formed on the clutch members having circumferentially spaced axially and radially straight side walls of major and minor axial lengths, the side wall of the driven clutch member facing in the direction of normal rotation and the side wall of the driving clutch member facing in the direction opposite to normal rotation being of the minor axial length and determining the amount of axial separation required to cause clutch overrun, and having an inclined camming surface connecting said side walls, said side walls and camming surface forming dentils having substantially trapezoidally shaped cross-sections.

7. An engine starter drive as set forth in claim 1 including further: flange means intermediate the pinion and the driven clutch member; and, means cooperating with the casing and the flange means for normally biasing

the driven clutch member into engagement with the driving clutch member, said biasing means exerting an axial force of less magnitude than the force exerted by the means urging the clutch members apart at and above the predetermined range of pinion speeds.

8. In an engine starter drive: a power shaft; a sleeve supported on the shaft having limited movement relative thereto, said sleeve including a dentilated extremity providing a driving clutch member and having a circumferential groove adjacent said extremity; means for moving the sleeve relative to said shaft; a casing fixedly secured to the sleeve with portions thereof concentrically disposed about the groove and the driving clutch member, said casing including an angularly inclined surface axially adjacent the groove; a pinion including a flange disposed within the casing slidably journalled on the shaft for movement into and out of mesh with a gear of the engine to be started, said pinion including a dentilated extremity providing a driven clutch member adapted to engage the driving clutch member and providing an overrunning clutch connection therewith; means cooperating with the casing and the flange for normally biasing the clutch members into engagement; and centrifugally actuated weight means secured to the pinion adapted to engage the groove during engagement of the clutch members for preventing disengagement of the clutch members below a predetermined range of pinion speeds and adapted during pinion overrun at and above said predetermined range of pinion speeds to engage the casing inclined surface for urging the clutch members out of engagement.

9. In an engine starter drive: a power shaft; a sleeve supported on the shaft having a limited amount of movement relative thereto; a driving clutch member secured to an extremity of the sleeve; circumferential groove means formed in the sleeve adjacent the driving clutch; means for moving the sleeve relative to the shaft; a casing fixedly secured to the sleeve with a portion thereof concentrically and spatially disposed about the groove and said clutch member, said casing including an angularly inclined surface axially adjacent the groove; a pinion including a flange positioned within the casing slidably journalled on the shaft for movement into and out of mesh with a gear of the engine to be started; a driven clutch member secured to the pinion adapted to engage the driving clutch member to provide an overrunning connection between the sleeve and the pinion; means cooperating with the casing and flange for normally biasing the clutch members into driving engagement; a cylindrical sleeve member of limited flexibility secured to the flange concentrically and spatially disposed within the casing having its free extremity adjacent the inclined surface; elongated arm means having one extremity supported on the flange and disposed within the casing overlying the clutch members adapted for radial movement; detent means secured to the free extremity of the arm means adapted to cooperate with the circumferential groove below a predetermined range of pinion speeds for locking the clutch members into driving engagement and adapted to be responsive to centrifugal force generated at and above the predetermined range of pinion speeds to be pivoted by the radial movement of said arm means into engagement with the cylindrical sleeve and the inclined surface whereby the centrifugal forces are translated into axial forces exerted on the flange for causing the clutch members to be separated and to overrun.

10. In an overrunning clutch for coupling a power shaft to an output member: a sleeve drivingly supported on the shaft and adapted to have limited movement relative thereto; a driving clutch member secured to the sleeve; a driven clutch member secured to the output member adapted for engagement with the driving clutch member to provide an overrunning connection between the shaft and the output member; means of urging the clutch members into driving engagement; a casing secured to the sleeve concentrically disposed about the clutch members; and, means including a centrifugally actuated weight member secured to the output member for maintaining locked engagement between the clutch members and preventing overrunning clutch operation below a predetermined range of output member speeds and for urging the clutch members out of driving engagement at and above the predetermined range of output member speeds.

11. An overrunning clutch as set forth in claim 10 in which the last mentioned means includes further: a circumferential groove formed in the sleeve adjacent the driving clutch member, said weight member being adapted to engage the groove below the predetermined range of output member speeds whereby the clutch members are prevented from separating and overrunning; and, an inclined surface formed in the casing concentric with the groove, said weight member being adapted to engage the inclined surface at and above the predetermined range of output member speeds whereby the clutch members are caused to be axially separated.

12. An overrunning clutch as set forth in claim 11 including further: flange means fixedly secured to the output member; a cylindrical sleeve member of limited flexibility secured to the flange concentrically disposed within the casing spatially overlying the weight member and having its free extremity adjacent the inclined surface of the casing whereby engagement between the weight member and the casing is limited to the inclined surface thereof.

13. An overrunning clutch as set forth in claim 12 in which the centrifugally actuated weight member comprises: an elongated offset lever arm having one of its extremities pivotally supported for radial movement on the flange; and, detent means secured to the free extremity of the arm adapted to cooperate with the circumferential groove below the predetermined range of output member speeds for locking the clutch member into driving engagement and adapted responsive to centrifugal force generated at and above the predetermined range of output member speeds to be pivoted by the lever arm into engagement with the inclined surface for axially separating the clutch members.

14. An overrunning clutch as set forth in claim 12 in which the centrifugally actuated weight member comprises: an elongated offset spring arm having one of its extremities supported for radial movement on the flange; and, detent means secured to the free extremity of the spring arm adapted to cooperate with the circumferential groove below the predetermined range of output member speeds for locking the clutch member into driving engagement and adapted responsive to centrifugal force generated at and above the predetermined range of output member speeds to be radially displaced into engagement with the inclined surface of the casing for axially separating the clutch members.

15. An overrunning clutch as set forth in claim 10 wherein the clutch members include clutch teeth adapted when engaged to maintain a clutch locked condition and to overrun only when the clutch members are axially separated a predetermined distance, said clutch teeth comprising extensions formed on the clutch members having circumferentially spaced axially and radially straight side walls of major and minor axial lengths, the side wall of the driven clutch member facing in the direction of normal rotation and the side wall of the driving clutch member facing in the direction opposite to normal rotation being of the minor axial length and determining the amount of axial separation required to cause clutch overrun, and having an inclined camming surface connecting said side walls, said side walls and camming surface forming dentils having substantially trapezoidally shaped cross-sections.

16. An overrunning clutch as set forth in claim 10 including further: flange means intermediate the output

member and the driven clutch member; said means for urging the clutch members into engagement including means cooperating with the casing and the flange means for normally biasing the driven clutch member into engagement with the driving clutch member, said biasing means exerting an axial force of less magnitude than the force exerted by the means urging the clutch members apart at and above the predetermined range of output member speeds.

17. In an overrunning clutch member for coupling a power shaft to an output member; a sleeve drivingly supported on the shaft and having limited movement relative thereto, said sleeve including a dentilated extremity providing a driving clutch member and having a circumferential groove adjacent said extremity; means for moving the sleeve relative to the shaft; a casing fixedly secured to the sleeve with portions thereof concentrically disposed about the groove and the driving clutch member, said casing including an angularly inclined surface axially adjacent the groove; a flange affixed to the output member and disposed within the casing, said output member including a dentilated extremity providing a driven clutch member adapted to engage the driving clutch member and providing an overrunning clutch connection therewith; means cooperating with the casing and the flange for normally biasing the clutch members into driving engagement; and, centrifugally actuated weight means secured to the output member adapted to engage the groove during engagement of the clutch members for preventing disengagement of the clutch members below a predetermined range of output member speeds and adapted during output member overrun at and above said predetermined range to engage the casing inclined surface for urging the clutch members out of engagement.

18. In an overrunning clutch member for coupling a power shaft to an output member: a sleeve drivingly supported on the shaft and having a limited amount of movement relative thereto; a driving clutch member secured to an extremity of the sleeve; circumferential groove means formed in the sleeve adjacent the driving clutch member; means for moving the sleeve relative to the shaft; a casing fixedly secured to the sleeve with a portion thereof concentrically and spatially disposed about the groove and said clutch member, said casing including an angularly inclined surface axially adjacent the groove; an output member including a flange positioned within the casing; a driven clutch member secured to the output member adapted to engage the driving clutch member to provide an overrunning connection between the shaft and the output member; means cooperating with the casing and flange for normally biasing the clutch members into driving engagement; a cylindrical sleeve member of limited flexibility secured to the flange concentrically and spatially disposed within the casing having its free extremity adjacent the inclined surface; elongated arm means having one extremity supported on the flange and disposed within the casing overlying the clutch members adapted for radial movement; detent means secured to the free extremity of the arm means adapted to cooperate with the circumferential groove below a predetermined range of output member speeds for locking the clutch members into driving engagement and adapted to be responsive to centrifugal force at and above the predetermined range of output member speeds to be pivoted by the radial movement of said arm means into engagement with the cylindrical sleeve and the inclined surface whereby the centrifugal forces are translated into axial forces exerted on the flange for causing the clutch members to be separated and to overrun.

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