Oct. 14, 1941. J. C. CURTIS 2,258,950

INTERMITTENT GRIP DEVICE

Filed April 5, 1941 2 Sheets-Sheet 1

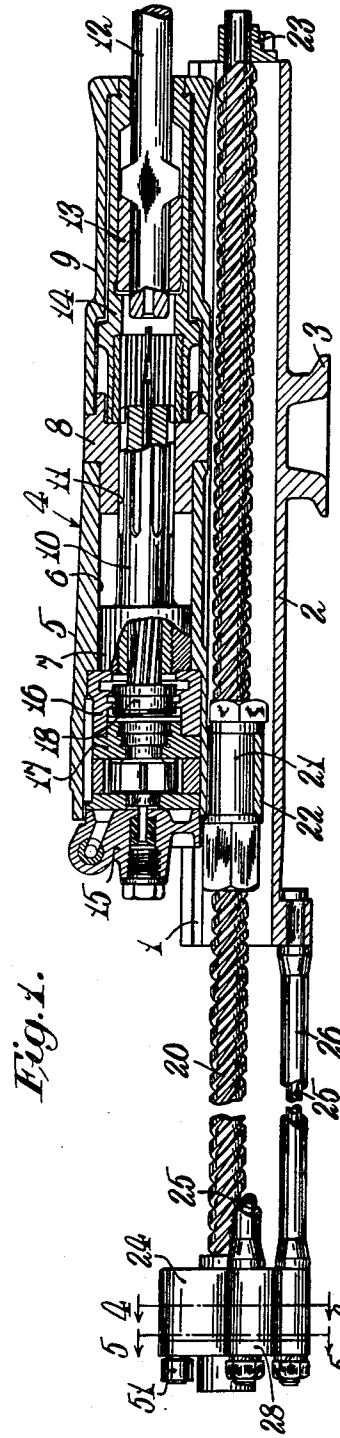


Fig. 1.

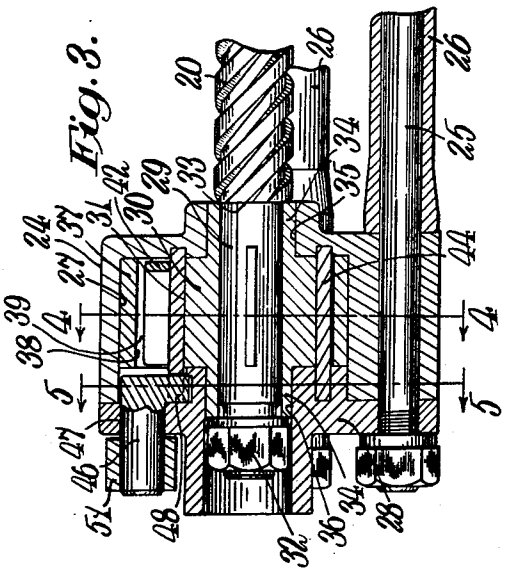


Fig. 3.

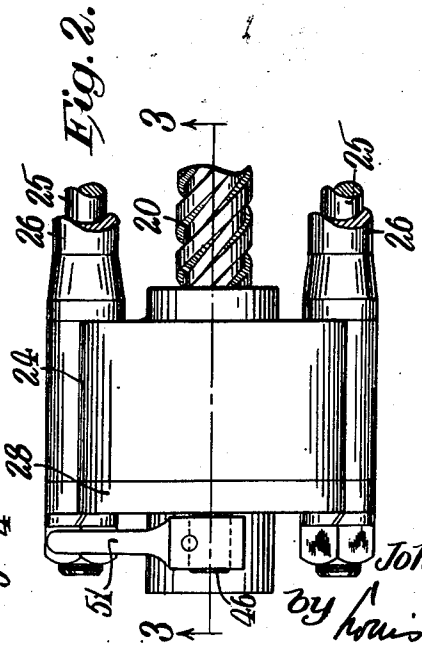


Fig. 2.

Inventor:
John C. Curtis.
by Louis A. Maxson
Atty.

Oct. 14, 1941. J. C. CURTIS 2,258,950

INTERMITTENT GRIP DEVICE

Filed April 5, 1941 2 Sheets-Sheet 2

Fig. 4.

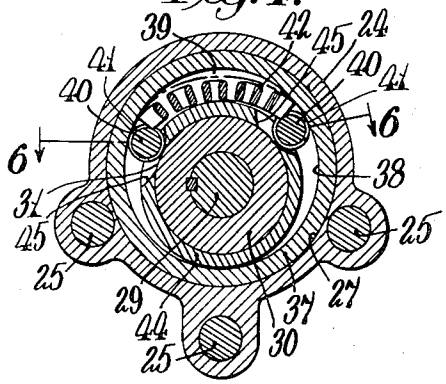


Fig. 5.

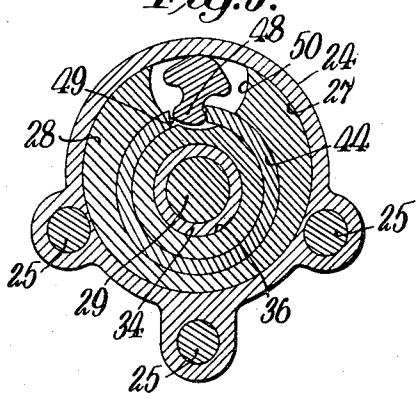


Fig. 6.

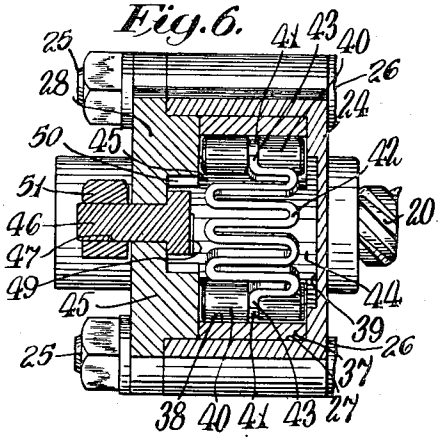


Fig. 7.

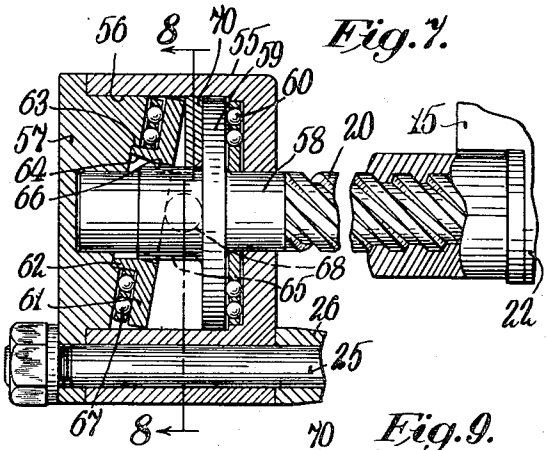


Fig. 8.

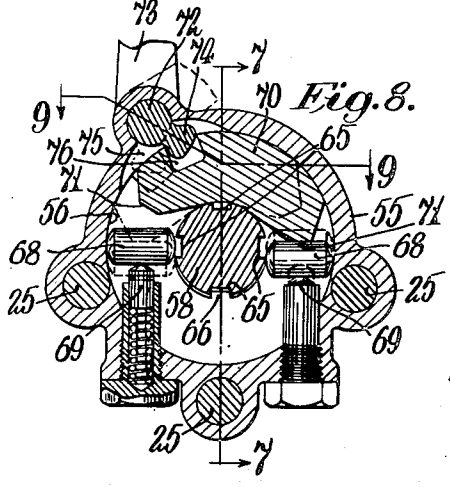
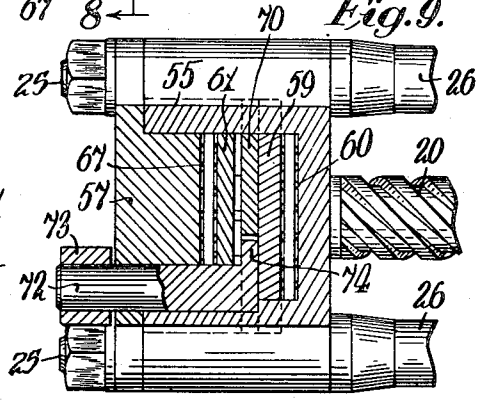


Fig. 9.



Inventor:
John C. Curtis.
By Louis A. Maxson,
Atty.

Patented Oct. 14, 1941 2,258,950

UNITED STATES PATENT OFFICE

2,258,950

INTERMITTENT GRIP DEVICE

John C. Curtis, Claremont, N. H., assignor to Sullivan Machinery Company, a corporation of Massachusetts

Application April 5, 1941, Serial No. 387,093

22 Claims. (Cl. 188—81)

This invention relates to intermittent grip devices, and more particularly to improvements in intermittent grip devices for transforming reciprocatory motion into an intermittent rotary motion and/or for transforming back and forth motion into unidirectional intermittent motion.

In intermittent grip devices of known types, and particularly in roller ratchet or ratchet and pawl devices, the structures thereof are usually of a relatively complicated nature and the component parts thereof have relatively short life due to concentrated wear. The roller ratchet type gripping device has, in certain respects, advantages over those of the ratchet and pawl type, in that the degree or rotation of a rotatable element controlled thereby is not predetermined by spaced ratchet teeth, since the rollers grip immediately whenever rotation of the controlled element occurs in the reverse direction. Due, however, to the above disadvantages, intermittent grip devices, when employed under certain conditions, have not met with complete success.

A primary object of the present invention is to provide an improved intermittent grip device whereby the disadvantages of previous known devices, as above outlined, are substantially overcome in that complication is avoided and concentrated wear is, to a large extent, eliminated. A further object is to provide an improved intermittent grip device whereby a positive controlling action is attained. A further object is to provide an improved intermittent grip device embodying reversing means whereby rotation of the rotatable element controlled thereby may be effected in either of opposite directions in an improved manner. Still another object is to provide an improved intermittent grip device whereby, due to its novel design, wear is reduced to a minimum. A still further object is to provide an improved intermittent grip device wherein the reaction member is free to rotate, thereby to reduce concentrated wear such as occurs when the reaction member is relatively stationary. Still another object is to provide an improved intermittent grip device of the roller type having an improved gripping arrangement for the rollers and improved roller release means. Other objects and advantages of the invention will, however, more fully appear in the course of the following description and as more particularly pointed out in the appended claims.

This application is a continuation-in-part of my copending application Serial No. 190,356, filed February 14, 1938.

In the accompanying drawings there are shown for purposes of illustration two forms which the invention may assume in practice.

In these drawings—

Fig. 1 is a view in longitudinal vertical section, with parts in side elevation, of a hammer rock drill with which an illustrative embodiment of the invention is associated.

Fig. 2 is an enlarged, fragmentary, plan view of the improved intermittent grip device.

Fig. 3 is a view in longitudinal vertical section taken substantially on line 3—3 of Fig. 2.

Fig. 4 is a cross sectional view taken substantially on line 4—4 of Figs. 1 and 3.

Fig. 5 is a cross sectional view taken substantially on line 5—5 of Figs. 1 and 3.

Fig. 6 is a developed transverse sectional view taken substantially on line 6—6 of Fig. 4.

Fig. 7 is a view similar to Fig. 3 showing another embodiment of the invention.

Fig. 8 is a cross sectional view taken substantially on line 8—8 of Fig. 7.

Fig. 9 is a developed transverse sectional view taken substantially on line 9—9 of Fig. 8.

In both illustrative embodiments of the invention, the improved intermittent grip device is shown as associated with the feeding mechanism of a hammer rock drill to effect control of the drill feed, although it will be evident that the improved intermittent grip device may be incorporated in mechanisms of various other types and may be utilized for various other purposes.

The rock drill with which the improved intermittent grip device is shown associated is herein of the mounted drifter type and is slidably mounted on the horizontal guideways 1 of a guide shell 2, the latter having a swivel trunnion 3 adapted to be clamped in any appropriate form of support. The rock drill is generally designated 4 and comprises a motor cylinder 5 having a bore 6 containing a reciprocatory hammer piston 7. The motor cylinder has a front head 8 and a front chuck housing 9, the head and chuck housing being secured to the forward end of the cylinder. The hammer piston has a forwardly projecting striking bar 10 guided in a bore 11 formed in the front motor head and adapted to transmit impact blows to the shank of a drill steel 12, the latter being supported within a chuck bushing 13 secured to a chuck sleeve 14 rotatably mounted within the chuck housing 9. The motor cylinder has a rear head block 15 suitably secured to the rear end of the cylinder, and arranged between this head block and the rear end of the cylinder is a combined rear cylinder head and valve box 16 and a valve box cover 17,

the parts 16 and 17 cooperating to provide a valve chamber in which is mounted an automatic fluid actuated fluid distributing valve 18 of a conventional design. The valve 18 is adapted to control the flow of pressure fluid through suitable ports and passages to the bore of the motor cylinder to effect reciprocation of the hammer piston, in the manner well known to those skilled in the art. As the particular structure of the rock drill per se does not enter into this invention, other than its particular manner of association therewith, further description thereof is herein considered unnecessary.

In both illustrative embodiments of the improved feeding mechanism, the improved intermittent grip device is associated with a rotatable element, herein a rotatable feed screw 20, the latter engaging a non-rotatable feed nut 21 secured within the bore of a depending lug 22 formed integral with the motor cylinder. This feed screw is journaled at its forward end within a bearing yoke 23 secured to the front end of the guide shell 2 and at its rear end within the casing of the intermittent grip device, in a manner to be later described.

In the illustrative embodiment of the invention shown in Figs. 1 to 6, inclusive, the improved intermittent grip device has a casing 24 secured by parallel tie bolts 25 and cooperating spacing sleeves 26 to the rear end of the guide shell 2 in the manner shown in Fig. 1. The casing 24 has a bore 27 closed at its rearward side by a detachable cover plate 28 secured to the casing by the tie bolts 25, as shown in Fig. 3. By removing the nuts of the tie bolts, the cover plate can be readily detached from the casing, to obtain access to the internal mechanism. The feed screw 20 has a rearwardly extending shaft portion 29 extending within the casing bore, and this shaft portion has keyed thereto a cylindric member 30 having a smooth external peripheral surface 31. This cylindric member receives the axial thrust of the feed screw 20 in opposite directions and is held against axial displacement with respect to the screw shaft by a holding nut 32 threaded on the rearward portion of the shaft, the nut, when tightened, clamping the cylindric member against a shoulder 33 on the screw. The cylindric member 30 has oppositely projecting bearing portions 34 journaled within alined bores 35 and 36 formed respectively in the front end casing wall and the cover plate 28. The alined bores 35, 36 are eccentric with respect to the casing bore 27 and the shaft portion 29 of the screw extends eccentrically within the casing bore in the manner shown in Figs. 4 and 5. Mounted for free rotation within the bore 27 of the casing 24 is a reaction member in the form of a sleevelike annulus 37 having a smooth internal peripheral surface 38. Arranged in the space 39 between the eccentrically disposed surfaces 31 and 38 are gripping rollers 40 of cylindric form each having midway between its ends an annular circumferentially extending groove 41. Also arranged in the space 39 is a spring 42 of loop-bent form having projecting ends 43 seated within the grooves 41 in the rollers, the ends 43 of the spring also engaging the surface 38 of the reaction annulus 37 in the manner shown in Fig. 4. This spring constantly urges the rollers 40 toward frictional gripping engagement with the surfaces 31, 38. Surrounding the cylindric member 30 and arranged within the reaction annulus 37 is a sleevelike shifter annulus 44 having its ends rotatably mounted within annular grooves formed in the front end casing wall and the cover member 28, as shown in Fig. 3. The member 44 is cut away at 45 at circumferentially spaced points, and the rollers 40 are arranged within these cut away portions (see Fig. 4). The means for rotating the annulus 44 comprises a shaft 46 journaled within a bore 47 formed in the cover plate 28 (see Fig. 3). This shaft has an integral projection 48 extending within a slot 49 formed in the annulus 44. The cover plate 28 is preferably cut away at 50 to permit movement of the projection. Secured to the shaft 46 is an operating lever 51. When the annulus 44 is rotated in a counter-clockwise direction, as viewed in Fig. 4, an end wall of the right-hand cut away portion 45 engages the right hand roller 40 and moves the latter against the pressure of the spring 42 out of concurrent engagement with the peripheral surface 31 and the surface 38 of the reaction annulus 37, while the left hand roller remains in engagement with both of these surfaces and when the annulus 44 has turned in a clockwise direction, as viewed in Fig. 4, the left hand roller is released from concurrent engagement with the surfaces 31 and 38 while the right hand roller is in engagement therewith. Thus by rotating the control annulus 44 the gripping rollers may be selectively rendered active.

In the embodiment of the invention shown in Figs. 7 to 9, inclusive, the improved automatic grip device has a casing 55 secured by the tie bolts and spacing sleeves 25, 26 to the rear end of the guide shell 2, and this casing has a bore 56 closed at its rear side by a detachable cover plate 57, the cover plate and casing being held together by the tie bolts. In this construction, the feed screw 20 has a rearwardly extending shaft portion 58 projecting axially within the casing bore and journaled within alined bores respectively in the front casing wall and cover plate as shown in Fig. 7. Surrounding and preferably integral with the shaft portion 58 of the screw is a disclike plate 59 arranged in the casing bore, and interposed between the front surface of the plate and the rear surface of the front casing wall is a ball thrust bearing 60 for receiving the endwise axial thrust of the screw in a forward direction. Also arranged within the casing bore in an inclined position with respect to the plate 59 is a reaction member in the form of an an annular plate 61 surrounding the screw shaft portion 58 in the manner shown in Fig. 7. This plate has a sleeve-like hub 62 rotatably mounted in a bore 63 in the cover plate, and the bore of the plate hub is rearwardly and outwardly tapered at 64 to permit the plate to rotate with respect to the casing as the shaft portion rotates. The shaft portion 58 at the rear of the plate 59 is formed with splineways 65, and splines 66 on the plate 61 project within these splineways so that the plate rotates with the shaft. Interposed between the rear reaction surface of the plate 61 and the front reaction surface of the cover plate is a ball thrust bearing 67 for receiving the axial thrust of the screw in a rearward direction. Arranged between and engaging the inner adjacent surfaces of the plates 59 and 61 are gripping rollers 68 of cylindric form, and these rollers are constantly urged toward gripping engagement with the plate surfaces by spring-pressed plungers 69. Arranged in the casing bore between the plates 59 and 61 is an arcuate shifter member 70 having its exterior surface fitting the

bore 56 of the casing and its inner surface curved to conform with the exterior shaft periphery. The shifter member 70 has end surfaces 71 engageable with the rollers for selectively moving the latter against the pressure of the plunger springs out of concurrent engagement with the rear surface of the plate 59 and the front surface of the plate 61. The means for moving the shifter member 70 into its different roller releasing positions comprises a shaft 72 rotatably mounted in alined bores in the casing and cover plate and having an operating handle 73. This shaft has a projection 74 arranged to move in a slot 75 cut in the inner wall of the casing and projecting within a recess 76 in the shifter member. When the shaft 72 is rotated, the projection 74 engages an end wall of the recess 76 to move the shifter member in one direction or the other to bring a surface 71 thereon into releasing engagement with a roller.

The general mode of operation of the improved automatic grip mechanism is as follows: In both embodiments of the invention, when the hammer motor of the rock drill is running to effect percussive actuation of the drill steel 12, the reciprocatory movement of the hammer piston 7 causes, due to the sudden reversal in the direction of movement of the piston within the motor cylinder, a vibratory or recoil movement in a direction longitudinally of the hammer motor, as is well known by those skilled in the art. Movement of the hammer motor in a direction opposite from the direction of feeding movement with respect to the shell guideways is checked automatically by the intermittent roller gripping device, the rollers slipping automatically to permit free movement of the hammer motor in the feeding direction. In the form of the invention shown in Figs. 1 to 6, inclusive, when the shifter annulus 44 is in the position shown in Fig. 4 the feed screw is free to rotate in a clockwise direction as viewed in Fig. 4, thereby permitting the feed nut 21 to move in a forward direction relative to the screw, the nut as it moves forwardly effecting rotation of the screw. Rearward movement of the feed nut relative to the feed screw is checked automatically when the active roller 40, tending to move further between the converging surfaces 38 and 31, operates to preclude turning of the member 30, and as a result rotation of the feed screw in a counter-clockwise direction as viewed in Fig. 4 is prevented. It will thus be seen that as the hammer piston 7 of the hammer motor reciprocates within the cylinder bore to effect percussive actuation of the drill steel, the jars imparted by the hammer piston due to the sudden reversal in the direction of movement thereof cause the hammer motor to jump step by step in a forward direction along the shell guideways, thereby feeding the drill steel toward the work. When the operator manipulates the handle 51, the shifter annulus 44 may be rotated to render the left hand roller shown in Fig. 4 inoperative to effect locking and to permit the right hand roller to move under the pressure of the spring into gripping engagement with the surfaces 31 and 38. When the parts are in this reversed position, the feed screw, as viewed in Fig. 4, is free to rotate in a counterclockwise direction so that as the hammer piston rapidly reciprocates within the motor cylinder to actuate percussively the drill steel, the feed nut is moved in a rearward direction with respect to the feed screw due to the jars set up by the hammer piston, the active roller releasing automatically to permit free rotation of the feed screw as the feed nut moves rearwardly and to hold automatically the feed screw against rotation in the opposite direction, i. e. the clockwise direction as viewed in Fig. 4. When the shifter annulus 44 is moved into its intermediate position, both friction rollers 40 are free to engage the surfaces 31 and 38, and as a result the feed screw is locked against rotation in both directions so that movement of the hammer motor along the shell guideways is prevented. The embodiment of the invention shown in Figs. 7 to 9, inclusive, operates in the same general manner as that above described, except, in this instance, the gripping rollers engage the relatively inclined surfaces of the plates 59 and 61 to lock the plates against rotation relative to the casing in one direction while permitting free rotation thereof in the opposite direction so that, with the arrangement as shown, movement of the drill along the shell guideways in a rearward direction is permitted while forward movement is automatically precluded. When the operator moves the shifter member 70 in its opposite position, the left hand roller shown in Fig. 8 is made ineffective while the right hand roller is free to move into gripping engagement with the plate surfaces, and as a result the direction in which the feed screw is free to rotate is reversed so that the rock drill may be fed in a forward direction along the shell guideways. When the shifter member 70 is in its intermediate position, both friction rollers are free to grip the plate surfaces, to lock the feed screw against rotation in both directions. In both embodiments of the invention the member on which the active roller reacts is adapted to rotate when the rollers are released so that the gripping rollers engage the surface thereof at different points, the annulus 37 shown in Fig. 3 being free-floating while the member 61 shown in Fig. 7 is positively rotated whenever the feed screw is rotated.

As a result of this invention, it will be noted that by the provision of the novel intermittent grip device for controlling rotation of a rotatable element, all relatively complicated structure is eliminated and increased life is obtained due to the avoidance of concentrated wear. It will further be noted that an improved intermittent grip device is provided wherein the reaction member for the gripping devices is mounted for free rotation so that when the gripping rollers are released the reaction member is free to rotate about its axis so that the rollers engage the gripping surface thereof at different points, thereby increasing the life of the parts by avoiding concentrated wear. It will still further be evident that an improved intermittent grip device is provided which is relatively simple and rugged in design. Other uses and advantages of the invention will be clearly apparent to those skilled in the art.

While there are in this application specifically described two forms which the invention may assume in practice, it will be understood that these forms of the same are shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a mechanism of the character described, the combination of a rotatable element to be controlled, and means normally operative to pre-

clude material rotation of said rotatable element in one direction while permitting free rotation thereof in the opposite direction including a control member rotatable with said rotatable element, a reaction member, gripping means operative to engage said members to lock the latter against rotation in one direction while permitting free relative rotation thereof in the opposite direction, and means for mounting said reaction member for free rotation so that the same may rotate into different positions when said gripping means is released, said reaction member presenting a circumferentially continuous surface surrounding its axis of rotation and engageable by said gripping means.

2. In a mechanism of the character described, the combination of a rotatable element to be controlled, and means normally operative to preclude material rotation of said rotatable element in one direction while permitting free rotation thereof in the opposite direction including a relatively stationary casing having a bore, a member arranged within said casing bore and rotatable with said rotatable element, an annular, peripherally continuous reaction member arranged in said casing bore, gripping means automatically operative to engage said members to lock the latter against rotation relative to said casing in one direction while permitting free rotation thereof in the opposite direction relative to said casing, and means for mounting said reaction member within said casing bore for free rotation relative to said casing so that the same may rotate into different positions when said gripping means is released.

3. In a mechanism of the character described, the combination of a rotatable element to be controlled, and means normally operative to preclude material rotation of said rotatable element in one direction, said rotation-precluding means including a member rotatable with said rotatable element, a reaction member, and gripping means operative to engage said members to lock the same against rotation in one direction while permitting free relative rotation thereof in the opposite direction, said reaction member mounted for free rotation so that the same may rotate into different positions when said gripping means is released, and means adjustable to render said rotation-precluding means wholly ineffective notwithstanding rotation of said rotatable element in said one direction.

4. In an intermittent grip mechanism, in combination, a rotatable element to be controlled, and means for controlling rotation of said rotatable element for automatically holding the same against rotation in one direction while permitting free rotation thereof in the opposite direction comprising a control member rotatable with said rotatable element, a rotatable reaction member and a gripping element engageable with said members automatically to lock the same against relative rotation in one direction while permitting free relative rotation thereof in the opposite direction, said rotatable reaction member presenting a circumferentially continuous reaction surface for engagement by said gripping element, and means for mounting said rotatable reaction member for free rotation so that the same may automatically rotate freely into different positions when said gripping element is released.

5. In an intermittent grip mechanism, in combination, a rotatable element to be controlled, and means for controlling rotation of said rotatable element for automatically holding the same against rotation in one direction while permitting free rotation thereof in the opposite direction comprising a relatively stationary member having a bore, a rotatable reaction member in the form of a continuous annulus and mounted in said bore, a member rotatable with said rotatable element, a gripping element engageable with said last two members for automatically locking the same relative to said stationary member against relative rotation in one direction while permitting free relative rotation thereof in the opposite direction, and means for mounting said reaction member for free rotation so that the same may automatically rotate freely into different positions when said gripping element is released.

6. In an intermittent grip mechanism, in combination, a rotatable element to be controlled, and means for controlling rotation of said rotatable element for automatically holding the same against rotation in one direction while permitting free rotation thereof in the opposite direction comprising a relatively stationary member having a bore, a circumferentially continuous reaction sleeve rotatably mounted in said bore, a cylindric member arranged eccentrically within said sleeve and rotatable with said rotatable element, a gripping member engageable with the exterior surface of said cylindric member and the interior surface of said sleeve for holding said sleeve against rotation relative to said stationary member, and means for mounting said reaction sleeve for free rotation with respect to said stationary member so that the same may rotate into different positions when said gripping member is released.

7. In an intermittent grip mechanism, in combination, a rotatable element to be controlled, and means for controlling rotation of said rotatable element for automatically holding the same against rotation in one direction while permitting free rotation thereof in the opposite direction comprising a cylindric member fixed to and rotatable with said rotatable element, a circumferentially continuous sleeve mounted eccentrically with and surrounding said cylindric member, a relatively stationary member having a bore receiving said sleeve and cylindric member, and a roller gripping element engageable with the exterior surface of said cylindric member and the interior surface of said sleeve for precluding rotation thereof relative to each other and to said bore.

8. In a roller ratchet mechanism, in combination, a rotatable element to be controlled, and means for controlling rotation of said rotatable element for automatically holding the same against rotation in one direction while permitting free rotation thereof in the opposite direction comprising a plate rotatable with said rotatable element, a relatively inclined plate rotatable with said rotatable element, a relatively stationary casing enclosing said plates and having surfaces on which said plates react, and a roller arranged between said relatively inclined plates and engageable therewith for locking the same against rotation relative to said casing.

9. In a mechanism of the character described, the combination of a rotatable element to be controlled, and means normally operative to preclude material rotation of said rotatable element in one direction while permitting free rotation thereof in the opposite direction including a member rotatable with said rotatable element, a relatively in-

clined reaction member connected to said rotatable element for rotation therewith, a casing enclosing said members and having surfaces on which said members react, and a gripping element arranged between said relatively inclined members and engageable therewith for locking the same against rotation relative to said casing in one direction.

10. In a mechanism of the character described, in combination, a rotatable element to be controlled, and means for controlling rotation of said rotatable element for automatically holding the same against rotation in one direction while permitting free rotation thereof in the opposite direction comprising a relatively stationary member having an annular surface, a member mounted for free rotation with respect to said stationary member and of fixed circumferential dimension, a member rotatable with said rotatable element, and means cooperating with said freely rotatable member and said last mentioned member for effecting holding of said rotatable element against rotation in one direction and releasable automatically to free said rotatable element to permit free rotation of said rotatable element in the opposite direction.

11. In a mechanism of the character described, in combination, a rotatable element to be controlled, and means for controlling rotation of said rotatable element for automatically holding the same against rotation in one direction while permitting free rotation thereof in the opposite direction comprising a relatively stationary member having a bore, an annulus continuous throughout its periphery mounted for free rotation in said bore, a member arranged within said annulus and having an eccentrically located portion and rotatable with said rotatable element, means cooperating with said annulus and said eccentrically arranged portion for effecting holding of said rotatable element against rotation in one direction and releasable automatically to free said rotatable element to permit free rotation of said rotatable element in the opposite direction, and means for mounting said annulus for free rotation with respect to said stationary member so that the same may rotate into different positions when said rotatable element is released.

12. In a mechanism of the character described, in combination, a rotatable element to be controlled, and means for controlling rotation of said rotatable element for automatically holding the same against rotation in one direction while permitting free rotation thereof in the opposite direction comprising a member rotatable with said rotatable element and having a plane surface, a member rotatable with said rotatable element and having a cooperating plane surface inclined with respect to the axis of rotation of said rotatable element, a relatively stationary member relative to which said members are mounted for rotation and having surfaces on which said members react, and means arranged between said relatively inclined plane surfaces and engageable therewith for locking said rotatable members against rotation relative to said stationary member.

13. In a mechanism of the character described, the combination of a rotatable element to be controlled, and means normally operative to preclude material rotation of said rotatable element in one direction while permitting free rotation thereof in the opposite direction including a control member rotatable with said rotatable element, a substantially rigid reaction member mounted for free rotation, and means operative to engage said members to lock the same against relative rotation in one direction while permitting free relative rotation thereof in the opposite direction, said reaction member being automatically freely rotatable into different positions when said locking means is released whereby concentrated wear of said reaction member is reduced to a minimum.

14. In an intermittent grip mechanism, the combination of a rotatable element to be controlled, and means normally operative to preclude material rotation of said rotatable element in opposite directions, said rotation-precluding means including a member rotatable with said rotatable element, a reaction member and gripping devices, one operative to lock said members against rotation in one direction and another operative to lock said members against rotation in the opposite direction, said reaction member mounted for free rotation so that the same may rotate into different positions when one of said gripping devices is released, and adjustable means for releasing either one of said gripping devices.

15. In an intermittent grip mechanism, the combination of a rotatable element to be controlled, and means for controlling rotation of said rotatable element for automatically holding the same against rotation in one direction while permitting free rotation thereof in the opposite direction comprising a reactive member having a bore whose surrounding surface is circumferentially continuous and which surface constitutes a reactive surface, a cylinder member arranged eccentrically within said bore and rotatable with said rotatable element, gripping means engageable with said cylinder member and said reactive member for holding said members against rotation in one direction, means for mounting said reactive member for rotation so that the same may rotate into different positions when said gripping means is disengaged from concurrent engagement with said cylinder member and said reactive member, and adjustable means for releasing said gripping means from concurrent engagement with said members.

16. In a rotation control mechanism, in combination, a stationary casing having a bore, a reaction sleeve arranged in said casing bore for free rotation relative to said casing, a member arranged eccentrically within said sleeve and rotatable relative to said casing, adjustable means for selectively locking said sleeve and said last mentioned member against rotation relative to said casing in either direction or for locking them in any one direction while permitting free rotation in the opposite direction, said adjustable means comprising gripping members movable to engage or disengage surfaces on said sleeve and said eccentrically arranged member.

17. In an intermittent grip mechanism, a rotatable control member, a rotatable reaction member of a form and construction rendering the same substantially rigid under the stresses encountered in use, releasable gripping means operative to engage said members to hold said members against rotation in one direction while permitting free relative rotation thereof in the opposite direction, and means for mounting said reaction member for free rotation so that the same may rotate into different positions when said gripping means is released.

18. In an intermittent grip mechanism, releasable gripping means including a member rotatable in either direction, a rotatable reaction

member, and selectively operable, oppositely acting, gripping elements selectively engageable with said members for automatically holding said members against relative rotation in one direction while permitting free relative rotation thereof in the opposite direction, means for mounting said reaction member for free rotation so that when said gripping elements are released said member may rotate automatically into different positions, and means for selectively rendering said gripping elements wholly ineffective.

19. In an intermittent grip mechanism, rotation-precluding means including a rotatable member, a rotatable reaction member, and releasable gripping devices, one operative to hold said members against relative rotation in one direction and another operative to hold said members against rotation in the opposite direction, said reaction member mounted for free rotation so that the same may rotate into different positions when one of said gripping devices is released, and adjustable means for releasing either of said gripping devices.

20. In an intermittent grip mechanism, the combination of a rotatable element to be controlled, and means for selectively controlling rotation of said rotatable element in either of opposite directions including a member rotatable with said rotatable element, a reaction member, alternatively operable, oppositely acting gripping elements selectively engageable with said members for automatically locking said members against relative rotation in either direction while permitting free relative rotation thereof in the opposite direction, said reaction member mounted for free rotation so that when said gripping elements are either of them released said reaction member may automatically rotate freely into different positions, and means for rendering one of said gripping elements wholly ineffective.

21. In an intermittent grip mechanism, the combination of a rotatable element to be controlled, and means normally operative to preclude material rotation of said rotatable element in one direction while permitting free rotation thereof in the opposite direction including a control member rotatable with said rotatable element, a reaction member having a gripping surface, gripping means operative to engage said members to lock the latter against rotation in one direction while permitting rotation thereof in the opposite direction, and means for mounting said reaction member for rotation so that the same may rotate, when said gripping means is released, into different positions for coaction with said gripping means at different points upon the gripping surface of said reaction member, said reaction member having its gripping surface continuous throughout a full 360° surrounding its axis of rotation.

22. In an intermittent grip mechanism, the combination of a rotatable element to be controlled, and means for precluding material rotation of said rotatable element in one direction and permitting free rotation thereof in the opposite direction including a control member rotatable with said rotatable element, a circumferentially continuous reaction member, and gripping means each operative to engage said members to lock the latter against rotation in one direction while permitting rotation thereof in the opposite direction, said reaction member having a mounting supporting the same for rotation when said rotatable element is freely rotatable in either direction and against which said reaction member is pressed by the action of said gripping means when said members are locked against rotation.

JOHN C. CURTIS.