May 7, 1940. F. S. HAAS 2,199,457

CENTERLESS GRINDER

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Fig. 3

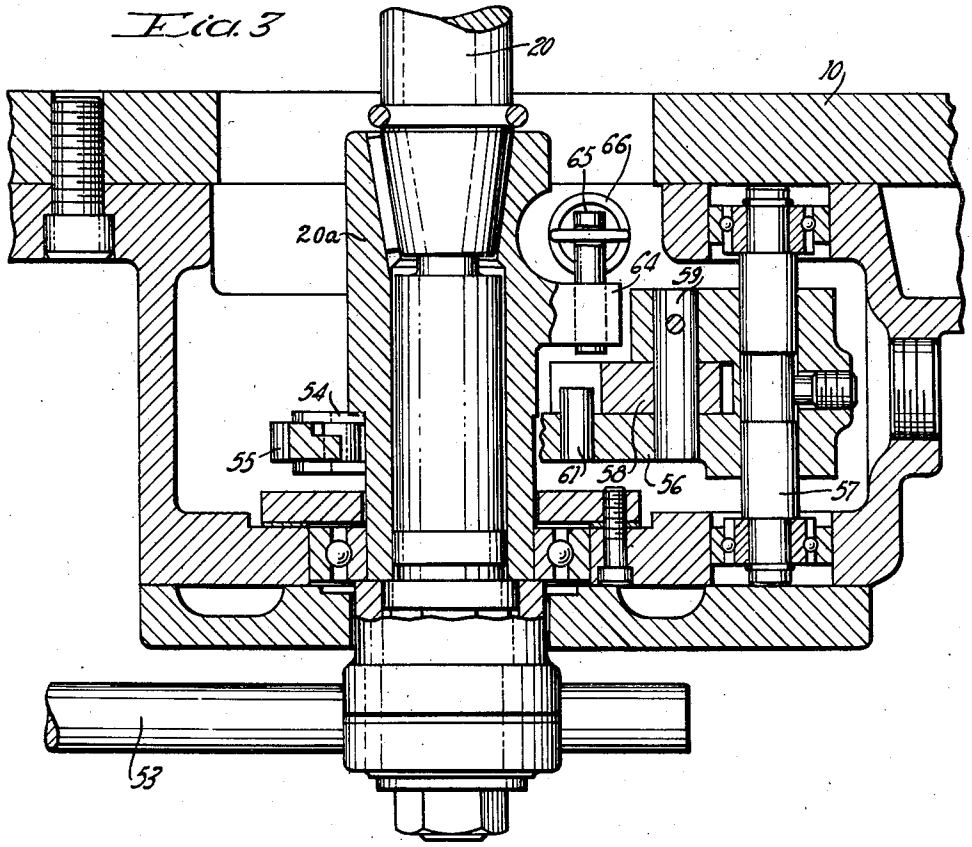
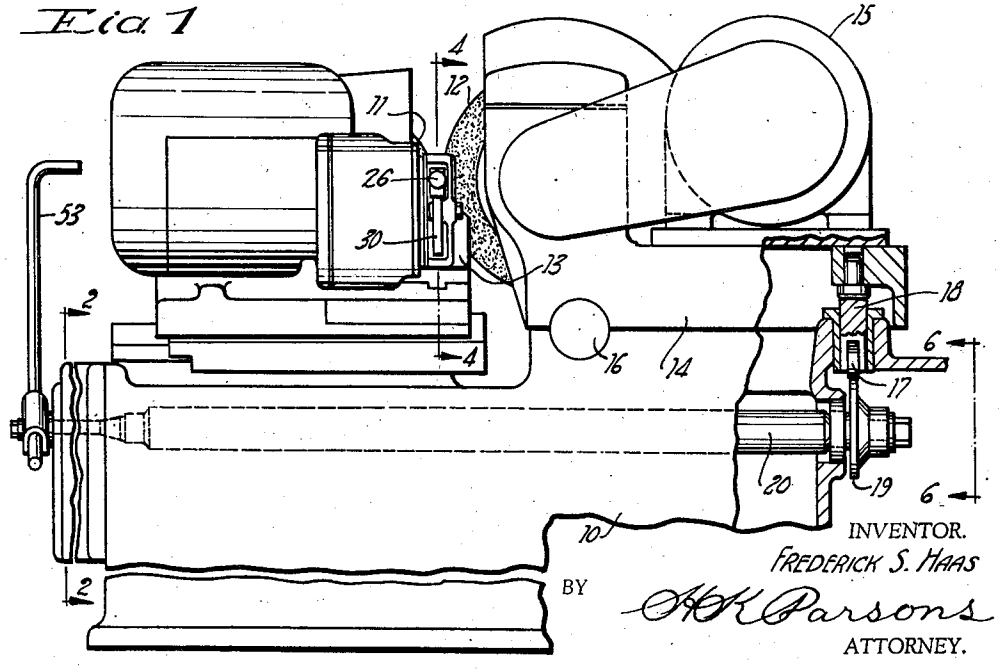


Fig. 1



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CENTERLESS GRINDER

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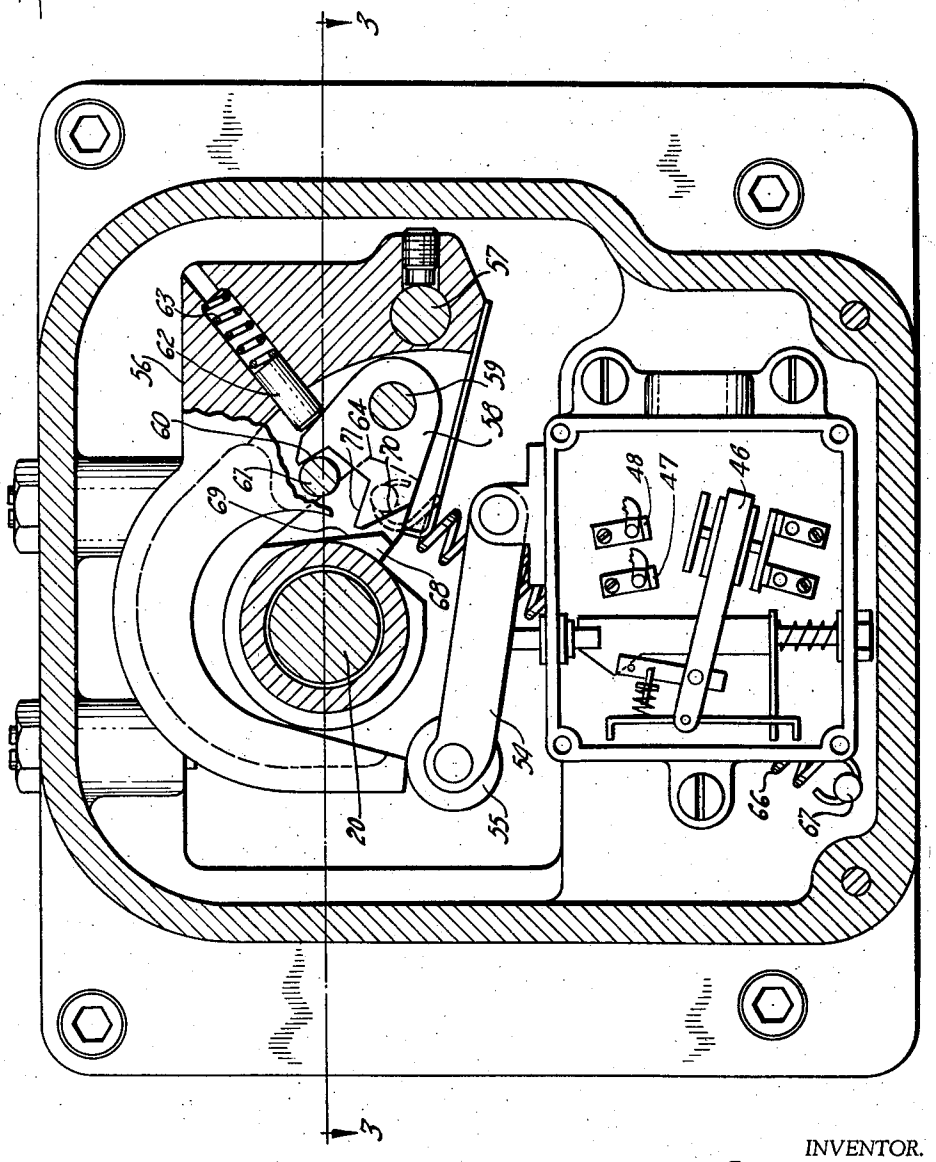
Fig. 2



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CENTERLESS GRINDER

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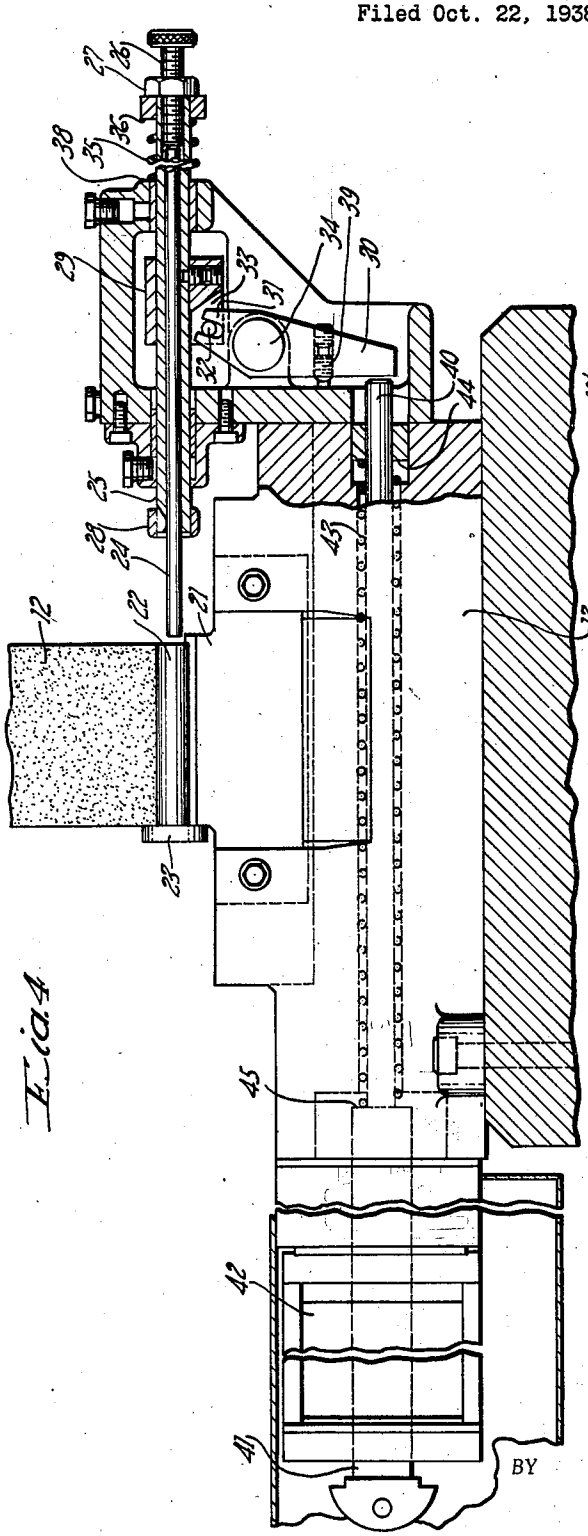

Fig. 4

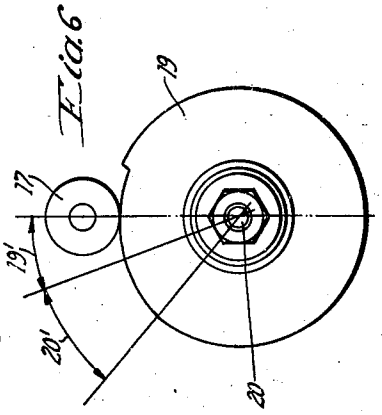

Fig. 6

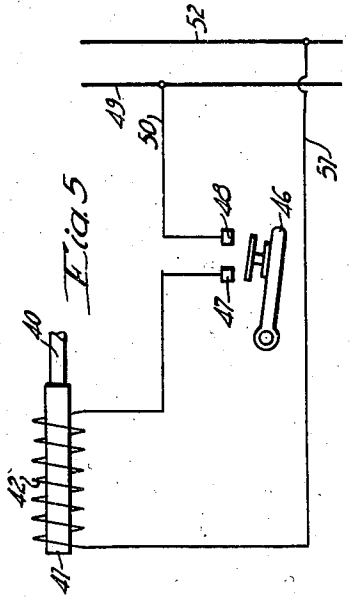

Fig. 5

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2,199,457

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2,199,457

CENTERLESS GRINDER

Frederick S. Haas, Cincinnati, Ohio, assignor to Cincinnati Grinders Incorporated, Cincinnati, Ohio, a corporation of Ohio

Application October 22, 1938, Serial No. 236,531

6 Claims. (Cl. 51—103)

This invention relates to machine tools and more particularly to improvements in centerless grinders.

One of the objects of this invention is to provide improved control means for centerless grinders.

Another object of this invention is to facilitate grinding operations in a centerless grinder on work which is not subject to the through-feed method.

A further object of this invention is to correlate the controls of a centerless grinder whereby a single lever can be utilized to govern both the wheel feed and the ejection of the work.

Other objects and advantages of the present invention should be readily apparent by reference to the following specification, considered in conjunction with the accompanying drawings forming a part thereof and it is to be understood that any modifications may be made in the exact structural details there shown and described, within the scope of the appended claims, without departing from or exceeding the spirit of the invention.

Referring to the drawings in which like reference numerals indicate like or similar parts:

Figure 1 is an elevational view partly in section of a centerless grinding machine.

Figure 2 is an enlarged section on the line 2—2 of Figure 1.

Figure 3 is a cross section on the line 3—3 of Figure 2.

Figure 4 is an enlarged section taken on the line 4—4 of Figure 1.

Figure 5 is a diagrammatic view of the electrical control circuit.

Figure 6 is a detailed view of the infeed control cam.

Referring to Figure 1 of the drawings, the reference numeral 10 indicates the bed of a centerless grinding machine upon which is supported a regulating wheel 11 and a grinding wheel 12. These wheels are supported for rotation on opposite sides of an intermediate work support, indicated generally by the reference numeral 13.

As is the usual practice in centerless grinding machines, the regulating wheel 11 is rotated at a relatively low speed to effect rotation of the work, while the grinding wheel 12 is rotated at a relatively high rate of speed to effect the actual grinding or stock removal.

In the present machine the support 14 for the grinding wheel 12, and for the motor 15 which drives the same, is pivotally mounted at 16 on the bed 10 for oscillatory movement toward and from the work support. A cam follower roller 17 is rotatably mounted in the end of a stud 18 depending from the free end of the support 14. The roller 17 engages the periphery of an infeed control cam 19 secured to the end of a rotatable shaft 20. The shaft 20 extends the full length of the bed and is anti-frictionally supported at both ends for rotation relative thereto.

The contour of the cam is shown in Figure 6, and consists of a rapid traverse portion 19' and a feed portion 20'. Rotation of the cam in a clockwise direction will move the grinding wheel toward the work support, and rotation in a counter-clockwise direction will cause the grinding wheel to move away from the work support.

Referring to Figure 4, a work rest blade 21 is mounted on the work support 13 for holding a work piece, such as 22, in parallel relation to the opposing faces of the grinding wheels. It will be noted that the work piece has an enlarged head 23 which prevents the work piece from being fed through between the grinding wheels, and it is, therefore, necessary in grinding work of this nature to insert the work in the grinding throat between the wheels and withdraw the same after grinding, from the same side of the wheels. Although the work may be easily placed in position as by pushing it into the grinding throat it is much more difficult to withdraw the work manually due to the small area available for grasping it, and furthermore, considerable time is lost if the work has to be unloaded manually. There has, therefore, been provided an automatic ejector comprising an ejection pin 24 which is mounted in an axially slidable bushing 25.

In order that the bushing may have a fixed range of movement, and still provide for the variations in the length of work being ground, means are provided for adjusting the pin relative to the bushing. This means includes an adjustable stop screw 26 which is threaded in the end of the bushing for engaging the end of the pin and determining the amount that it shall project beyond the end of the bushing. A lock nut 27 serves to clamp the screw in any determined position. The other end of the bushing is split to form a sort of chuck, and a clamping nut 28 is threaded on the split end for tightening the grip of the bushing on the pin.

The bushing has a block 29 secured midway of its length to form a connecting means with a shifter lever 30. The lever has a forked end 31 which embraces a pin 32 extending crosswise of a recess 33 formed in the block. The lever is pivotally mounted on the support 13 at 34. The

bushing and lever are normally held in a retracted position by a spring 35 interposed between a shoulder 36 on the bushing and a shoulder 38 formed on the support. An adjustable set screw 39 carried by the lever 30 determines the return position of the ejector pin. The lever 30 is actuated by a plunger 40 connected to the armature 41 of an electric solenoid 42. The plunger 40 is normally held out of contact with the lever 30 by a long spring 43 which surrounds the plunger between a fixed shoulder 44 and a shoulder 45 on the armature 41. It should now be apparent that when the solenoid is energized that the plunger 40 will move toward the right in Figure 4, rotating the lever 30 in a counterclockwise direction, thereby advancing the ejector pin 24 toward the work piece 22. It is not intended that the ejector pin should follow the work through the throat, but more to give it a sharp blow whereby the inertia of the work piece itself will complete the ejecting movement. By means of this mechanism, the operator may hold a work piece in position, ready to be inserted as soon as the finished work piece is automatically ejected, thus saving considerable time. As shown in Figure 5, electrical operation of the solenoid 42 is controlled by a switch member 46, which, upon movement in one direction, will interconnect contacts 47 and 48, thus completing a circuit from a power main 49 through line 50 to solenoid 42 and return line 51 to a second power main 52.

Referring to Figures 1 and 3, the shaft 20 is rotated by a manually operable lever 53 connected thereto, and since one hand of the operator is utilized for operating the lever 53, while the other hand is utilized for loading the work, means are provided whereby the control of the ejector is correlated with the movement of the grinding wheel so that as the grinding wheel approaches its return position after a grinding operation, the ejector will function automatically to eject the finished work piece. This is accomplished by the mechanism shown in Figures 2 and 3. As shown in Figure 2, use is made of a commercial snap switch such as the "Rees" having a switch member 46 operated by a pivoted lever 54 which has a roller 55 mounted in the end thereof. A hook-shaped actuating lever 56 is pivotally supported on a pin 57, and this lever partially surrounds the shaft 20 and rests on the roller 55. This lever carries a latch pawl 58 which is pivotally supported on the pin 59. The pawl 58 has a bifurcated end to form a face 60 which is normally held in engagement with a pin 61 by a spring pressed plunger 62. The spring 63 which actuates the plunger 62 is only a light spring.

The shaft 20, as shown in Figure 3, has keyed thereto a sleeve 20a with an integral lug 64 in which is inserted a pin 65 forming a connection to spring 66. The other end of the spring is connected to a pin 67 carried by the bed. The spring serves to return the shaft and thereby the infeed control cam to a starting position. This position is shown in Figure 2. Integral with the sleeve 20a is a lug 68 which has a beveled back 69 for engaging the beveled face 70 of the latch pawl 58, whereby upon rotation in a counterclockwise direction the lug will rotate the pawl 58 in a clockwise direction, overcoming the resistance of the spring 63 and eventually passing by the end of the pawl. During this rotation the grinding wheel is being fed into the work to effect the grinding operation.

Upon return movement of the shaft in a clockwise direction the lug 68 will engage the face 71 of the pawl 58 and through the pin 61 will rotate the lever 56 in a counterclockwise direction and thus depress the switch lever 54 which will close the switch and cause automatic ejection of the work. This movement of the shaft will continue a sufficient distance for the lug 68 to pass out of engagement with the face 71 whereby the spring in the switch housing will return the lever 54 to its normal position, taking the lever 56 with it, so that the parts will return to the position shown in Figure 2.

It will now be evident that an improved control means has been provided for a centerless grinder whereby a single lever may be utilized for feeding the grinding wheel and controlling automatic ejection of the work as the grinding wheel completes its return movement.

What is claimed is:

1. In a grinding machine having a work rest blade for supporting a work piece, a grinding wheel movable toward and from said blade on one side thereof, means on the other side of said blade for resisting the thrust of the grinding wheel on the work piece, the combination of a manually operable control lever, motion transmitting connections from said lever for causing opposite directions of movement of the grinding wheel for opposite directions of movement of the lever, a power operated work ejector associated with said blade, and means operable by the lever at a specific point in its travel for energizing said power operated ejector, said means including a power control device and a snap-by actuator therefor operable by the lever, whereby a uni-directional actuation of the lever effects projection and retraction of the ejector.

2. In a centerless grinding machine having opposed grinding wheels and a work rest blade forming a grinding throat, the combination of a cam for moving said grinding wheel toward and from the grinding throat, an ejector for removing a finished work piece from said grinding throat, an electrical solenoid for actuating said ejector, a rotatable shaft for actuating said cam, and an electrical circuit for said solenoid including a control switch and means operable by said shaft during one direction of rotation thereof for successively closing and releasing said switch, whereby the ejector is projected and withdrawn during uni-directional movement of the lever.

3. In a centerless grinding machine having opposed regulating and grinding wheels and an interposed work support, the combination of a pivoted support for the grinding wheel, a cam rotatable in opposite directions for effecting opposite directions of movement of the grinding wheel with respect to the work support, a work ejector pin supported for movement parallel to the face of said wheels, a solenoid for operating said ejector, a control switch, a pivoted lever for operating said switch including a latching pawl, a rotatable shaft for actuating said cam, and means on said shaft for engaging said pawl during rotation in one direction to close said switch and thereby effect ejection of the work.

4. In a grinding machine having a wheel mounted for movement in a direction toward and from the work piece to be operated upon, means for controlling said movement of the wheel, and means for ejecting a completed work piece, the combination with said ejector, of means for controlling the operation thereof including a power device, an actuator therefor, an operating lever for the actuator having a latch device pivoted

thereto for movement in one direction therewith and in the opposite direction with respect thereto, and a rotatable member coupled with the feeding mechanism having a portion movable in an arcuate path intersecting the latch member whereby said portion will temporarily engage the latch member to transmit movement therethrough to the lever in one direction of actuation of the projection and during continued uni-directional movement in its arcuate path will disengage the latch member to release the lever substantially as and for the purpose described.

5. In a grinding machine including work supporting means, a grinding wheel, and means for effecting relative approach and retraction of the grinding wheel and work supporting means, the combination with a projectible ejector disposed adjacent the work supporting means for effecting removal of a finished work piece, of a rotatably adjustable member for effecting the relative approach and retraction of the work supporting and grinding means, and means for effecting actuation of the ejector in timed relation to the rotation of said member, including an arcuate lever disposed in semi-circumscribing relation to the rotary member, means pivotally supporting the lever at one end thereof, an ejector control device engaging the free end of the lever, an actuator carried by the rotary member and projecting therefrom, and an actuating latch pivoted to the lever for movement therewith and with respect thereto, said latch having a portion projectible into the path of movement of the projection on the rotatable member for actuation thereby whereby an amplified movement is imparted to the free end of the lever, substantially as and for the purpose described.

6. In a grinding machine including work supporting means, a grinding wheel, and means for effecting relative approach and retraction of the grinding wheel and work supporting means, the combination with a projectible ejector disposed adjacent the work supporting means for effecting removal of a finished work piece, of a rotatably adjustable member for effecting the relative approach and retraction of the work supporting and grinding means, and means for effecting actuation of the ejector in timed relation to the rotation of said member, including an arcuate lever disposed in semi-circumscribing relation to the rotary member, means pivotally supporting the lever at one end thereof, an ejector control device engaging the free end of the lever, an actuator carried by the rotary member and projecting therefrom, an actuating latch pivoted to the lever for movement therewith and with respect thereto, said latch having a portion projectible into the path of movement of the projection on the rotatable member for actuation thereby whereby an amplified movement is imparted to the free end of the lever, means for yieldingly forcing the latch member into the path of movement of the projection and means on the lever for limiting the extent of said movement whereby the latch and lever will move as a unit under influence of the projection in one direction of shifting of the rotatable member, but the latch will yield with respect to the lever upon reverse rotation of the member.

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