The present invention relates to an attachment for a gun drilling machine having a traversing mechanism incorporated therein and more particularly relates to such an attachment for gun drilling guns.

Hereinafter, the sharpening of gun drills has required the exercise of considerable skill on the part of the person sharpening the gun drill, it being necessary that such a person accurately hold the gun drill manually and move it manually during the sharpening operation. Accordingly, it is the primary object of the present invention to provide a gun drill grinning attachment for use with existing gun drilling machines for the purpose of providing a controlled grinding operation which may be repeated as often as desired so that a uniform sharpening operation or grinding operation will be repeatedly performed.

The critical part of the sharpening of a gun drill is the configuration and orientation of the primary and secondary clearances of the outer angle relative to the oil clearance space. This critical part of the sharpening is controlled by the present invention in that it provides a special combination of cam risers with the grinding being put on the gun drill in one smooth operation or motion. The inner angle is ground onto the gun drill as a slab grind and the micrometer dial is set for a depth specified on tabulated instructions or the like thereby accurately locating the point of the drill which is formed by the apex where the outer and inner angles meet. The attachment of the present invention further provides means for effectively and accurately performing the third operation by the use of a slight chamfer around the peripheral edge of the gun drill. Thus, by employing the attachment of the present invention, the sharpening operation of the gun drill will be accurately and positively controlled for enabling a gun drill of a particular desired characteristic to be sharpened.

Another important object of the present invention is to provide a gun drill grinding attachment which enables the sharpening of gun drills or the grinding of gun drills to a controlled production operation which has not been possible with previous methods and apparatuses for grinding gun drills. The accurate grinding of the gun drills will result in quite large increases in expected tool life and the number of grinds per tool will also be increased and at the same time will be controlled and predictable. Closer dimensional tolerances can be held in the holes gun drilled or gun bored thereby providing a better finish to the holes thus eliminating to a large extent the finishing operations normally required after the hole has been gun drilled or gun bored.

Still another object of the present invention is to provide a grinding attachment for a conventional grinding machine having a traversing mechanism incorporated therein for use in grinding a gun drill in an accurate manner with the attachment being relatively simple in construction, easy to use by relatively unskilled labor and extremely effective for sharpening a gun drill in a repetitive manner.

These, together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

**FIGURE 1** is a top plan view of the grinding attachment of the present invention with portions thereof broken away;

**FIGURE 2** is a longitudinal sectional view taken substantially upon a plane passing along section line 2--2 of **FIGURE 1** illustrating the details of construction of the attachment of the present invention;

**FIGURE 3** is a transverse, sectional view taken substantially upon a plane passing along section line 3--3 of **FIGURE 2** illustrating further structural details of the component parts of the gun drill attachment with the locking mechanism for the angular position of the gun drill grinding attachment being broken away for illustrating the structure thereof;

**FIGURE 4** is an enlarged plan view of the central portion of the attachment, with portions broken away, illustrating the orientation of the multiple axial cams and the adjustable follower engageable therewith;

**FIGURE 5** is a transverse, sectional view taken substantially upon a plane passing along section line 5--5 of **FIGURE 4** illustrating the orientation of the cams;

**FIGURE 6** is an exploded group perspective view illustrating a removable insert for receiving different sizes of tools;

**FIGURE 7** is a detailed view with portions of the forward end of the work head broken away illustrating the construction of the rotatable gage which swings in front of the tool to properly orientate it in relation to the work head;

**FIGURE 8** is a perspective view of a sine plate used in setting the angular orientation of the protractor plate;

**FIGURE 9** is a plan view of the attachment of the present invention illustrating its orientation at a 30° angle whereby the gun drill may be engaged with the grinding wheel for grinding the inner angle;

**FIGURE 10** is a plan view illustrating the attachment at the angle for grinding the outer angle;

**FIGURE 11** is a side elevational view of a gun drill illustrating the relationship of the inner and outer angle;

**FIGURE 12** is an end view of the gun drill;

**FIGURE 13** is a side elevational view of the gun drill from the opposite side illustrated in **FIGURE 11**.

Referring now specifically to the drawings, the numeral 10 generally designates the gun drill grinding attachment of the present invention for mounting on any suitable conventional grinding machine generally designated by numeral 12 and which includes a rotatable driven grinding wheel 14 of any suitable construction together with a traversing guide mechanism 16 to which a base plate 18 is attached by suitable bolts 20 or other fastening means. The base plate is keyed by a key 22 for location and bolted onto the grinding machine table 12 which has the traversing mechanism 16 incorporated therein.

The base plate 18 is provided with a pair of upstanding lugs 24 adjacent the edge thereof nearest the grinding wheel 14. The central portion of the opposite edge of the base plate 18 is provided with a recess or pocket 26 for receiving a sine plate or gage 27 of a selected thickness. Pivotally attached to the base plate 18 is a protractor plate 29 hingedly attached to the lugs 24 by pivot pins 30 extending inwardly through the lugs 24 and received in pockets in the sides of the protractor plate 29 thus hingedly connecting the protractor plate 29 to the base plate 18 for pivotal movement about an axis generally parallel to but adjacent the side surface of the grinding wheel 14. This enables the outer edge of the protractor plate 29 to be moved upwardly or downwardly about the hinge axis defined by the pins 30 thereby forming a control for the clearance angles of a gun drill rela...
relative to certain of the structure explained hereinafter. The protractor plate 29 has a machined surface which may be in the form of a button or the like designated by numeral 32 which engages the top surface of the sine gage 27 thereby determining accurately the clearance angle for grinding operation.

The top surface of the protractor plate 29 is provided with a machined surface 34 forming a segment of a circle having a center defined by a center pivot bolt 36. The upper surface area of the protractor plate 29 adjacent to the pivot bolt 36 is also machined as indicated by numeral 38. The machined surface 34 is provided with a plurality of spaced bores or sockets 40 therein which are spaced apart a portion of a circle such as 5° with suitable indicia 42 being provided for designating the particular degree orientation of the hole in relation to a zero or index position 44. Thus, the holes or bores 40 are spaced 5° apart on either side of the zero position which is in direct alignment with the center of the bolt 36 and in perpendicular relation to the pivot axis defined by the pins 30.

A work head casting generally designated by numeral 46 is mounted on the protractor plate 29 and includes a generally cylindrical casting 48 having a base 50 provided with machined areas 52 and 54 for engagement with the machined areas 38 and 34 respectively of the protractor plate. The base 50 is provided with a forward extending portion 56 having the machined surface 58 thereon and having an opening 58 receiving the pivot bolt 36. The pivot bolt 36 is preferably countersunk in the aperture 58 to accurately retain the pivot axis of the work head 46 in relation to the protractor plate. At the rear end of the work head, there is provided a laterally extending lug 60 as illustrated in FIGURE 3. There is also provided a bore 62 receiving a spherical ball locking member 64 for engagement selectively with the holes or bores 40. Extending upwardly from the lug 60 is a cylindrical housing 66 secured to the lug 60 by a screw-threaded connection 68. Disposed in the housing 66 is a reciprocating rod or plunger 70 having a piston-like member 72 attached to the lower end thereof and in engagement with the ball detent 64. A coil compression spring 74 encircles the plunger 70 and has one end thereof engaging the top surface of the piston 72. The upper end of the spring 74 engages the inner surface of the converging end portion 76 of the housing 66. The plunging action is extended upwardly through the converging end or reduced end 76 of the housing 66 and is provided with a handle or knob 78 by virtue of which the piston 72 may be elevated while compressing the spring 74 thereby enabling the ball detent lock 64 to roll along the machined surface 34 without locking the work head 46. However, as soon as the handle 78 is released, the spring 74 will urge the piston 72 downwardly and will urge the ball detent 64 downwardly thereby securely locking the work head 46 in angularly adjusted position about the pivot bolt 36. The spherical construction of the ball assures accurate orientation of the work head in relation to the center of the holes 40 thereby assuring that the work head will be oriented accurately in the angular relation desired.

The cylindrical member 80 forming part of the work head 46 is provided with a cylindrical master liner 80 retained removable in position by a setscrew or lock screw 82. The master liner 80 rotatably receives an elongated spindle 84 which projects outwardly beyond the end of the work head 46 opposite from the projection 56. The spindle 84 is hollow and has an enlarged longitudinal bore 86 extending through. Also, the spindle 84 is hardened and ground to a machined finish. At the rear or outer end of the spindle 84, there is provided a handwheel 88 having a knurled peripheral surface 90 and being locked in position on the liner 84 by virtue of a removable setscrew or lock screw 92 whereby the handwheel 88 is securely locked in place on the rear end of the spindle 84 whereby the spindle 84 may be rotated in relation to the work head 46. Also, the spindle 84 is capable of longitudinal sliding movement in the liner 80 while being rotatable or at any time within limits defined hereinafter.

Disposed at the inner or forward end of the spindle 84 is a machined recess 94 receiving a relatively short master liner 95 which has a peripheral flange 98 abuttingly engaging the end of the spindle 84 for limiting the insertion thereof. The master liner 95 is retained in place by the use of a setscrew or lock screw 96 and the interior of the bore 100 extending through the master liner 96 is provided with a radial projection or locator 102 orientated in a particular relationship to a cam mechanism described hereinafter.

Disposed in the master liner 96 is a bushing type insert 104 having a tapered outer end 106 and being held in place by a lock screw or set screw 108. The insert 104 is longitudinally split at 110 and is provided with a threaded aperture 112 for receiving the lock screw 108 which also extends through into the interior of the insert which has a cylindrical longitudinal bore 114 for engaging the gun drill or tool 116. The setscrew 108 lightly clamps the gun drill 116 so that the gun drill 116 will contact the locator 102 which extends inwardly through the slot 110 in the insert 104. The setscrew also holds the gun drill 116 in position for grinding and the setscrew 108 is loosened for changing the tool 116 and may be removed for enabling removal of the insert 104 whereby an insert having a different sized internal bore may be inserted into the master liner 96.

The forward end of the cylindrical portion 48 of the work head is provided with a rotatable gaging member 118 protruding longitudinally outwardly thereof in parallel relation to the longitudinal axis of the spindle 84. The gaging member 118 is provided with an axial extension 120 of reduced cross-sectional area rotatably and longitudinally movable in a bore 122 formed in the casting 48. The extension 120 is provided with a pair of longitudinally spaced peripheral grooves 124 for receiving a setscrew or lock screw 126 for rotatably securing the gaging member 118 in adjusted position. The rotatable member 118 is provided with a laterally extending gaging arm or swinging gage 128 and the outer end of the gaging member 118 is provided with a gaging point 130. With the work head 46 set at a zero angle, the point 130 of the gaging member 118 is brought into contact with the surface of the diamond grinding wheel 14. This procedure is required only once whenever a specific sine gage 28 is put in the gage pocket. The point 130 engages the grinding wheel thereby presetting the spindle in relation to the face of the diamond wheel. The offset gaging arm 128 swings in front of the gun drill or tool 116 so that the tool may be brought forward until the tip thereof contacts the gage and the tool 116 is locked in place thereby properly orientating the tool in relation to the surface of the diamond grinding wheel 14. The point 130 being brought into engagement with the diamond wheel properly orientates the pivot axis of the bolt 36 in relation to the surface of the diamond wheel thereby setting up the attachment in proper orientation in relation to the diamond grinding wheel 14 for forming the gun drill 116 in a manner described hereinafter.

The opposite end of the casting or work head 46 is provided with a socket or recess 132 removably receiving an elongated rod 134 which may be removably secured in place by the use of a lock screw or setscrew 136. The rod 134 and the socket 132 are of correct cross-sectional configuration, preferably square. At the outer end of the rod 134, there is disposed a work support 138 forming a rest for engaging the gun drill 116. The rest 138 is removably mounted on the rod 134 by a setscrew or lock screw 140 having a knurled head 142 for ease of operation thereof whereby the setscrew 140 may be released so that the work rest or support 138 may be removed and replaced with a different type of work rest.
or inverted so that a work-engaging notch 144 in either end of the work support 138 may be engaged with the gun drill 116 thereby enabling the work rest or work support to effectively support different sized gun drills 116. So, the length of the support arm can be varied by using different extensions. This is desirable for long tools and the support acts as a guide for the gun drill during longitudinal and rotational movement thereof. The support rest may be provided with any desired number of supporting notches. For example, four radial arms may be provided with the support arm is square so that any one of the four notches on the ends of the arms may be brought into engagement with the tool.

Attached to the left rear corner of the cylindrical casting 48 forming a part of the work head 46 is a support arm 146 secured in place by mounting screws 148 and locator pins 150 to securely and accurately mount the support arm 146 on the casting 42. Intermediate the ends of the support arm 146, a threaded member 152 extends through the arm 146 and is provided with a knurled operating knob 154 on the outer end thereof. On the inner end of the threaded member 152, there is journaled a roller 156 which is in the form of a cam follower. This forms one control which is mounted on the arm 146 and the other control mounted on the arm 146 is in the form of a sliding rod or plunger 158 extending through a bore 160 in the end of the arm 146 remote from the fasteners 148. The outer end of the rod or plunger 158 is provided with a spherical bearing locating knob 162 and the inner end thereof is rounded as at 164 for a purpose described hereinafter. Adjacent the inner end 164, there is provided a retaining ring 166 which limits the outward movement of the plunger 158 in relation to the arm 146. Also, the upper surface of the arm 146 adjacent the outer end thereof is provided with a longitudinally elongated notched portion or cutaway portion 168 for engagement by a radially projecting pin 170 carried by a cylindrical cam carrier 172 which has on the inner end thereof a plurality of axial cam surfaces 174 which are concentrically arranged with each other and which have different camming characteristics and which are for the purpose of engagement by the cam follower or roller 156. As illustrated in FIGURE 4, by rotating the knob 154, the cam follower 156 will engage a selective one of the cam surfaces 174 thereby enabling the characteristics of reciprocatory movement of the cam carrier 172 to be determined by selecting which of the cam surfaces 174, the cam follower 156 is engaged with. As illustrated in FIGURE 5, the low and high ends of the cam surfaces 174 are separated by a vacant area 176 which generally is in alignment with the pin 170.

The sliding portion of the extender 158 is adapted to be received within a pocket or recess 178 milled into the peripheral surface of the cam carrier 172 when performing a portion of the grinding operation as defined hereinafter. By rotating the knurled knob 154, the anti-friction cam follower is advanced or retracted in order to allow contact with a specific cam required for the diametrical and grinding specification of the tool.

Referring now particularly to FIGURE 2, it is pointed out that the spindle 84 is provided with an accurate threaded portion 180 located immediately inwardly of the handwheel 88. The accurate threaded section threadedly carries a micrometer nut 182 having a knurled peripheral surface 184. The micrometer nut 182 has a cylindrical projecting portion 186 receiving an annular dial ring member 188 having a graduated scale 190 thereon. The annular dial member 188 is rotated in relation to the micrometer nut and is mounted thereon by friction or by a setscrew 192 whereby the dial may be set to a zero reading without disturbing the depth setting.

Disposed immediately forwardly of the dial is the cam carrier 172 which has a counterbore 194 therein receiving the forward end of the extension 186 of the micrometer nut 182. The cam carrier 172 is provided with a radially inwardly extending pin 196 which is received in a longitudinal groove 198 in the spindle 84 whereby the cam carrier is keyed to the spindle in order to time it in relation to the spindle.

The pin 170 on the cam carrier 172 engages the notch 168 on the arm 146 to form a zero stop in which position the cam members 174 are oriented with the spindle and tool at a zero setting inasmuch as the cam carrier is timed to the spindle and the spindle is timed to the gun drill by virtue of the locator 102 which is in timed relation to the spindle 84. Thus, in this position with the pin 170 engaged with the zero stop 168, the tool holding arrangement at the front of the spindle and the cams 174 are in true relative alignment. The number of cam surfaces or rings on the face of the cam carrier to the work piece. However, it has been found from a practical standpoint that six cam rings are usually sufficient although this number may vary. Each cam ring is provided with a particular rise and fall and the choice of the proper cam ring or surface as well as the dial settings and the size gage thickness as well as the protractor setting determines the low end of the grind obtained and this information may be obtained from a graph, printed tables or tabulations furnished with the fixture.

The cam carrier 172 is connected with the extension 186 on the micrometer nut by virtue of a setscrew 200 extending into a peripheral portion 202 formed in the micrometer nut extension 186 as illustrated clearly in FIGURE 2. Also, the micrometer nut 182 is provided with a setscrew 204 which enables the micrometer nut to be rotated or secured in position on the threads 180. As illustrated in FIGURES 11-13, the tool or gun drill 116 is provided with a longitudinal bore forming an oil passage 206, and the usual longitudinal notch or recess 208 is provided. It has been found that the sharpening of a gun drill cannot be accurately accomplished repeatedly by manual manipulation of the drill. The critical part of the sharpening of a gun drill resides in the particular configuration of the primary and secondary clearances of the outer angle relative to the oil clearance space. In order to control this critical part of the sharpening operation, a special combination of cam riser has been provided and it is desirable that the grind should be put on as one smooth motion. The inner angle is ground onto the gun drill as a slash grin with the micrometer dial set for a depth specified on the curve or tabulation and in this manner, an accurate point 210 may be obtained. The point 210 is the apex where the outer angle 212 and the inner angles 214 meet. By use of the machined pocket 200 in the cam carrier and the locating pin or plunger, the third grinding operation can be accurately performed by the proper micrometer setting according to the curve or tabulation and a change of lateral location of the spindle axis either by the traversing mechanism incorporated into the grinding machine table or by some other means. The fourth operation is a very slight chamfer 216 which is manually placed on the gun drill by holding it by hand and the chamfer runs from approximately 45° 45° 45° to the outer cutting corner of the top of the shoulder and this is the only operation done outside of the fixture or attachment.

Intemuch as all critical operations are controlled by the fixture, and instructions are by curves, tabulations and dials, unskilled operators can follow such instructions and grind tools to closer tolerances than the most experienced manual operators. Thus, in production, specific information would be provided on operation sheets thus eliminating any possibility of errors.

By using the present control, gun drill tool life will increase and the number of grinds per tool will be increased and at the same time such grinds will be controllable and predictable. By the same token, closer dimensions will be held in the holes gun drilled or gun bored thus influencing the finishes obtained thereby eliminating to a large extent the necessity of finishing operations being pro-
The structure which enables the gun drill grinding characteristics to be repeated time-after-time in an accurate and controlled manner eliminates variations between the different grinds provided on a tool and variations produced by different personnel grinding a tool while manually holding it thus enabling a tool of a particular characteristic to be ground repeatedly.

The outer angle generally is 30° although this angle may vary. The inner angle is usually at a 20° position as illustrated in FIGURES 9 and 10 respectively. The cutting depth is set on the dial by virtue of an index line appearing on the cam carrier for orientation in relation to the graduated scale for determining the cutting depth. The diamond wheel is grasped and rotated for the initial grinding operation for the outer angle when the work head is disposed in the position illustrated in FIGURE 9. The work head is then released by releasing the ball detent and swung past the zero position into the 20° angular position for the inner angle as illustrated in FIGURE 10. The handwheel is again rotated for grinding the inner angle whereby the first two operations are accurately controlled by the orientation of the spindle in relation to the surface of the diamond wheel. In each instance, the primary relief and secondary relief for the outer angle are controlled for producing a desired configuration on the gun drill.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A gun drill grinding attachment for use on a grinding machine comprising a base plate adapted to be attached to the grinding machine, a protractor plate pivotally attached to the base plate for pivotal movement about an axis adjacent the edge of the base plate generally parallel to the grinding surface of a grinding wheel, a cam plate having a pocket therein for receiving a sine gage, said protractor plate having means thereon engaging the sine gage for enabling angular adjustment of the protractor plate about a substantially horizontal axis, a work head pivotally mounted on said protractor plate for pivotal movement about an axis generally perpendicular to the pivotal axis of the protractor plate and located adjacent the pivotal axis of the protractor plate, said protractor plate and work head having engaging machined surfaces for retaining the work head accurately in position on the protractor plate, said protractor plate and work head including interengaging means for selectively locking the work head in angularly adjusted position, said work head including a spindle, means on said spindle for releasefully clamping a gun drill therein for rotation and reciprocating in relation to the work head, and a plurality of cam means interconnecting the work head and the spindle for permitting a selected distance of advance of the spindle during rotation thereof while pressure is exerted longitudinally on the spindle.

2. The structure as defined in claim 1 wherein said cam means includes a cylindrical cam carrier encircling the spindle, a plurality of concentric axial cam surfaces on the end of said cam carrier adjacent the work head, an arm rigid with the work head and extending alongside of the cam carrier, a cam follower roller radially adjustable mounted on said arm for selective engagement with one of said concentric cam surfaces.

3. The structure as defined in claim 2 wherein said follower is journaled on a threaded member, said threaded member extending through a threaded socket in the arm, and a knurled knob on the end of the threaded member for enabling rotation thereof.

4. The structure as defined in claim 2 wherein said cam carrier is provided with a pocket in the peripheral surface thereof, said arm also including a reciprocating pin slidably mounted thereon for selective engagement in the pocket for limiting the movement of the cam carrier when performing certain grinding operations.

5. The structure as defined in claim 2 wherein said arm is provided with a notch in the upper surface thereof, said cam carrier having a rigid pin projecting outwardly therefrom for engagement in the notch thereby setting the cam carrier at a zero position with the spindle retracted thereby providing proper indexing of the cam carrier to the zero setting.

6. The structure as defined in claim 1 wherein said spindle is provided with an insert at the end thereof receiving from the cam means, said insert including a longitudinal slot for receiving the locators.

7. The structure as defined in claim 6 together with an insert in the liner for receiving different sized gun drills, said insert including a longitudinal slot for receiving the locators.

8. The structure as defined in claim 1 wherein said work head includes a socket in the outer end thereof, an elongated work supporting arm received in said socket, a work rest mounted on the outer end of said arm for engagingly supporting the free end of a gun drill supported in the spindle.

9. The structure as defined in claim 1 together with a gage member projecting longitudinally outwardly from the forward end of the work head, said gage member being pointed for engagement with the surface of a diamond grinding wheel for orientating the pivotal connection of the work head to the protractor plate in proper relation to the grinding wheel.

10. The structure as defined in claim 9 wherein said gaging member is rotatable and provided with a laterally extending gaging arm overlying the end of the spindle for engaging the point of the gun drill for gaging the extent of the gun drill for properly orientating it in relation to the grinding wheel.

11. The structure as defined in claim 10 wherein said gaging member is rotatable to enable the lateral arm to swing to an out-of-the-way position after the gun drill has been secured in place.

12. The structure as defined in claim 1 wherein said means for locking the work head in place includes a plurality of accurately arranged spaced holes in the machined surface on the protractor plate, said work head including a base having a ball dent for engagement in the holes, manually retractable spring means engaging the ball dent for spring-biasing the ball dent in the holes for accurately centering the ball dent in relation to the holes but enabling the ball dent to retract away from the holes for enabling swinging movement of the work head.

13. The structure as defined in claim 12 wherein said spindle is provided with a handwheel on the outer end thereof, said handwheel being of sufficient size to rotate and move the spindle.

14. The structure as defined in claim 13 wherein a micrometer nut assembly is screw-threaded onto said spindle and engaged with the cam means for determining the depth of cut during the grinding operation.

References Cited in the file of this patent

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Date</th>
<th>Inventor</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,132,453</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>944,797</td>
<td>Mar. 1935</td>
<td>Williams</td>
<td></td>
</tr>
<tr>
<td>2,999,724</td>
<td>Nov. 1937</td>
<td>Cogdill</td>
<td></td>
</tr>
<tr>
<td>2,109,308</td>
<td>Feb. 1938</td>
<td>Adams</td>
<td></td>
</tr>
<tr>
<td>2,130,575</td>
<td>Sept. 1938</td>
<td>Adams</td>
<td></td>
</tr>
<tr>
<td>2,363,482</td>
<td>Nov. 1944</td>
<td>Clarke</td>
<td></td>
</tr>
<tr>
<td>2,795,085</td>
<td>June 1957</td>
<td>Rosenblon</td>
<td></td>
</tr>
<tr>
<td>3,972,859</td>
<td>Feb. 1961</td>
<td>Erdely</td>
<td></td>
</tr>
<tr>
<td>3,084,485</td>
<td>Apr. 1963</td>
<td>Garrison</td>
<td></td>
</tr>
</tbody>
</table>