

May 31, 1960

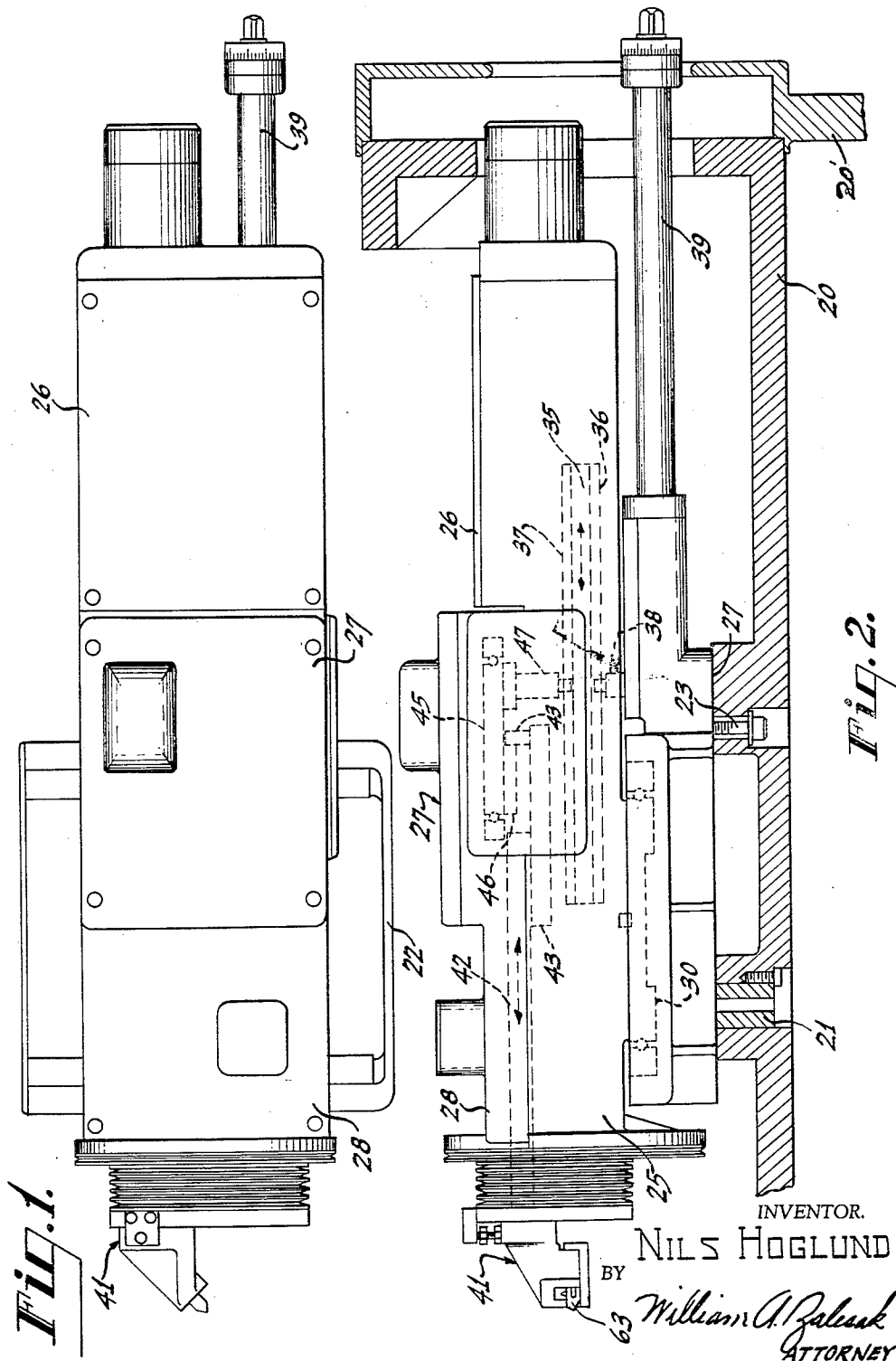
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APPARATUS FOR FORMING CONTOURS

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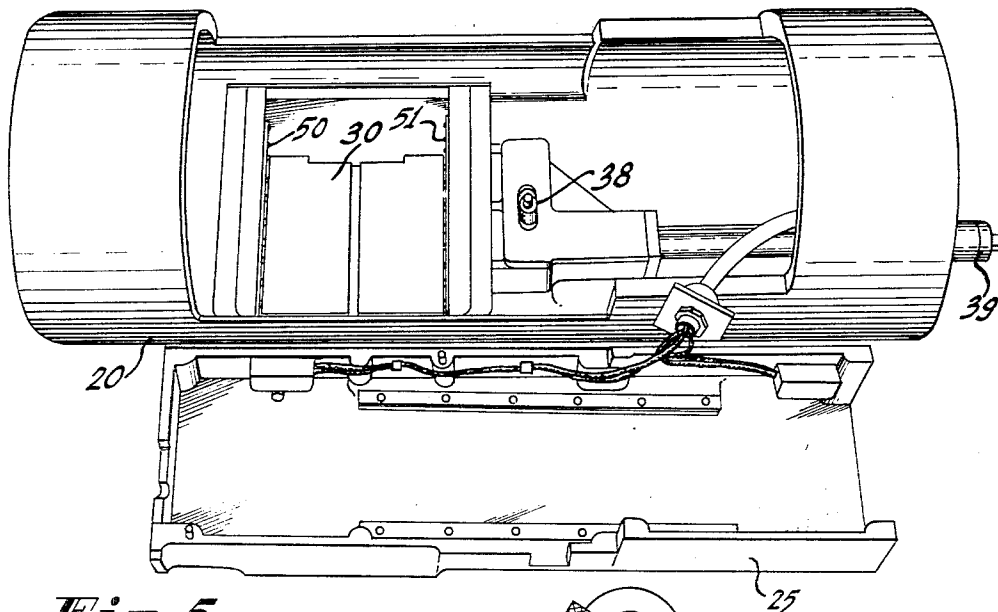


Fig. 5.

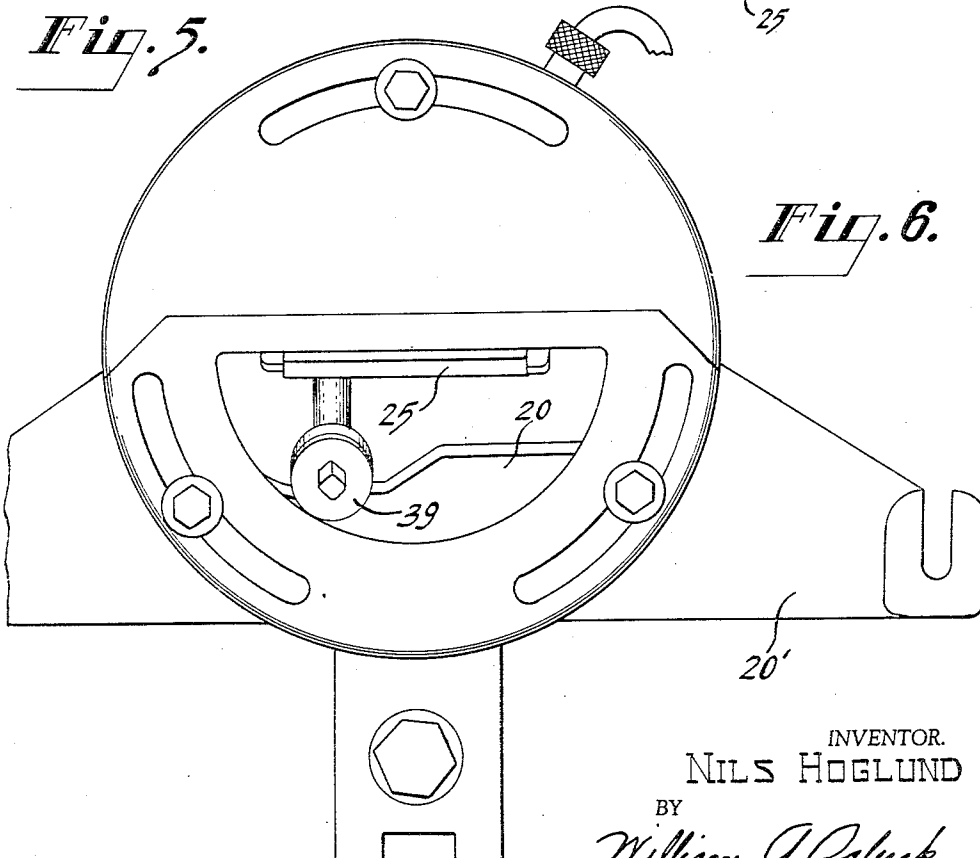


Fig. 6.

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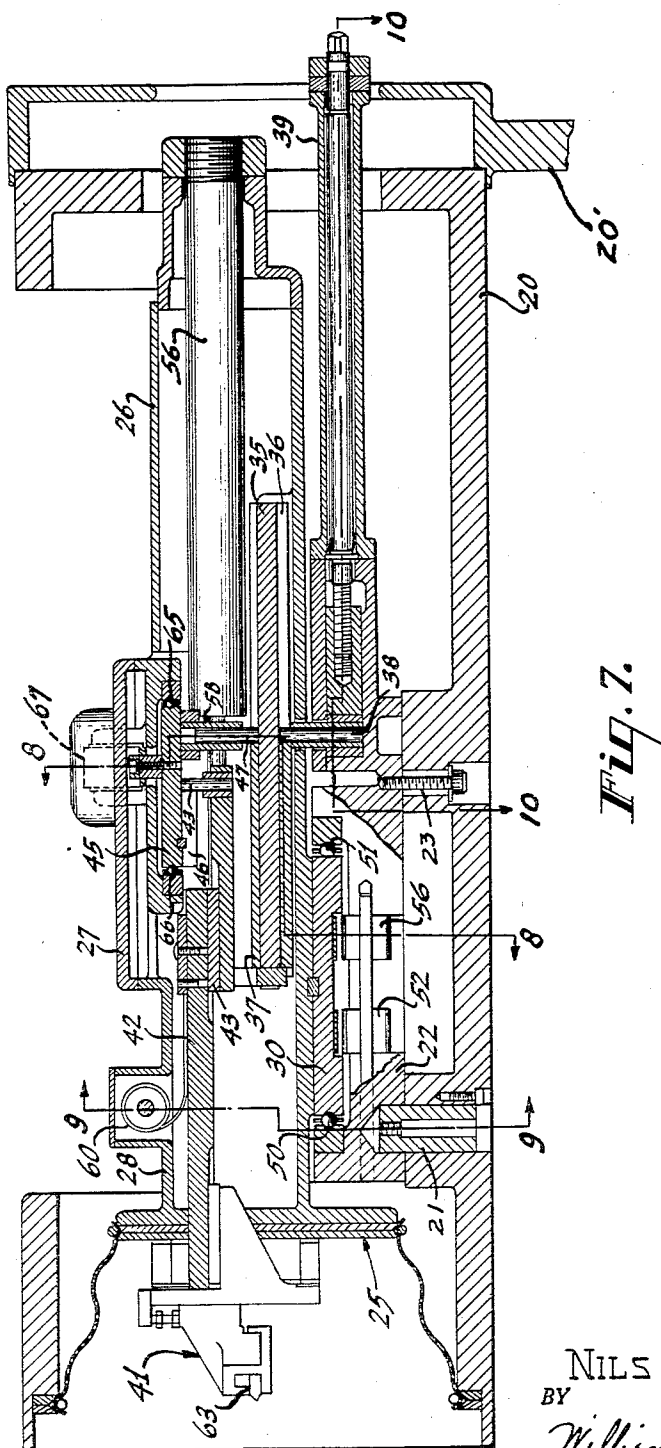


Fig. 7.

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Fig. 8.

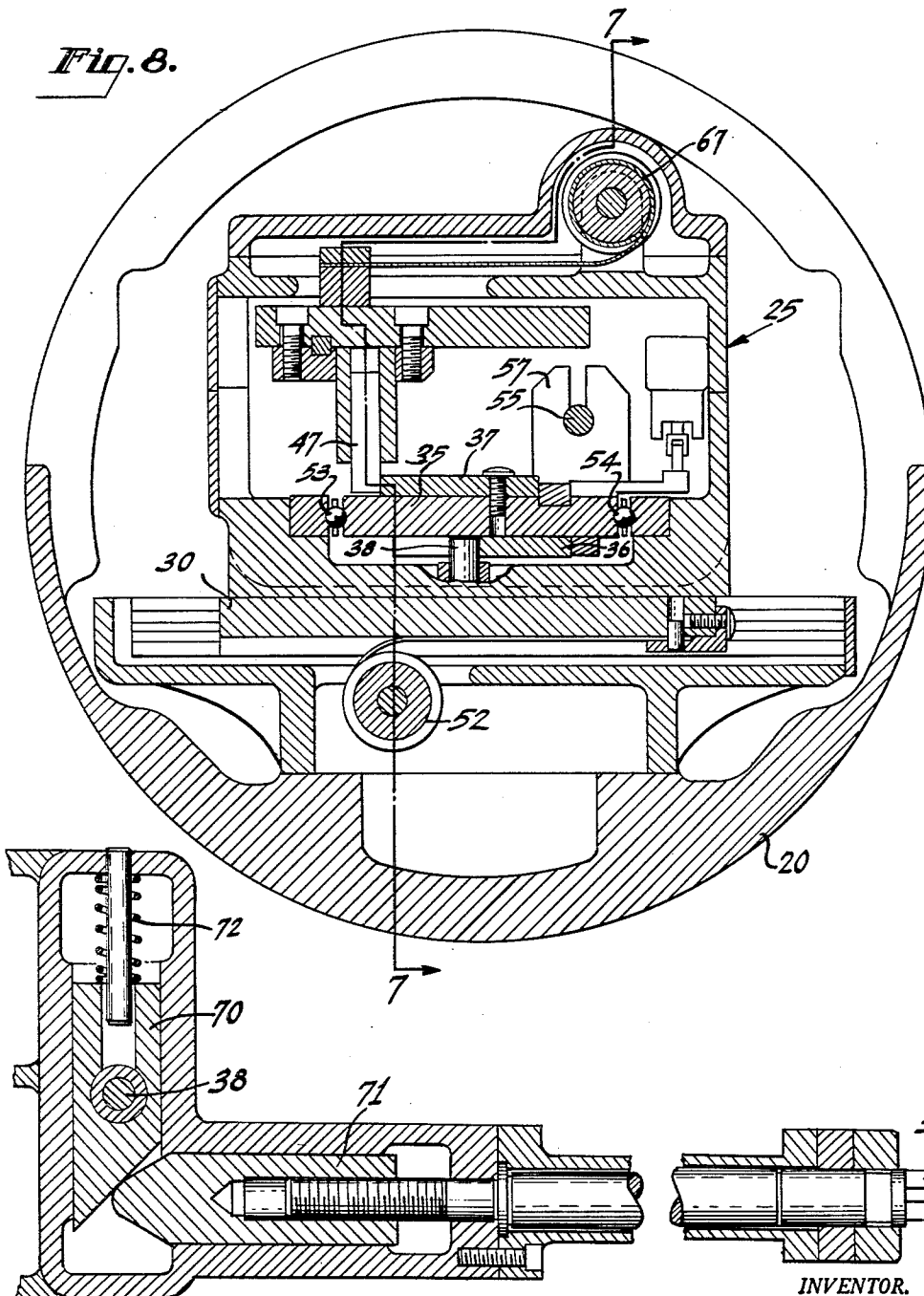


Fig 10.

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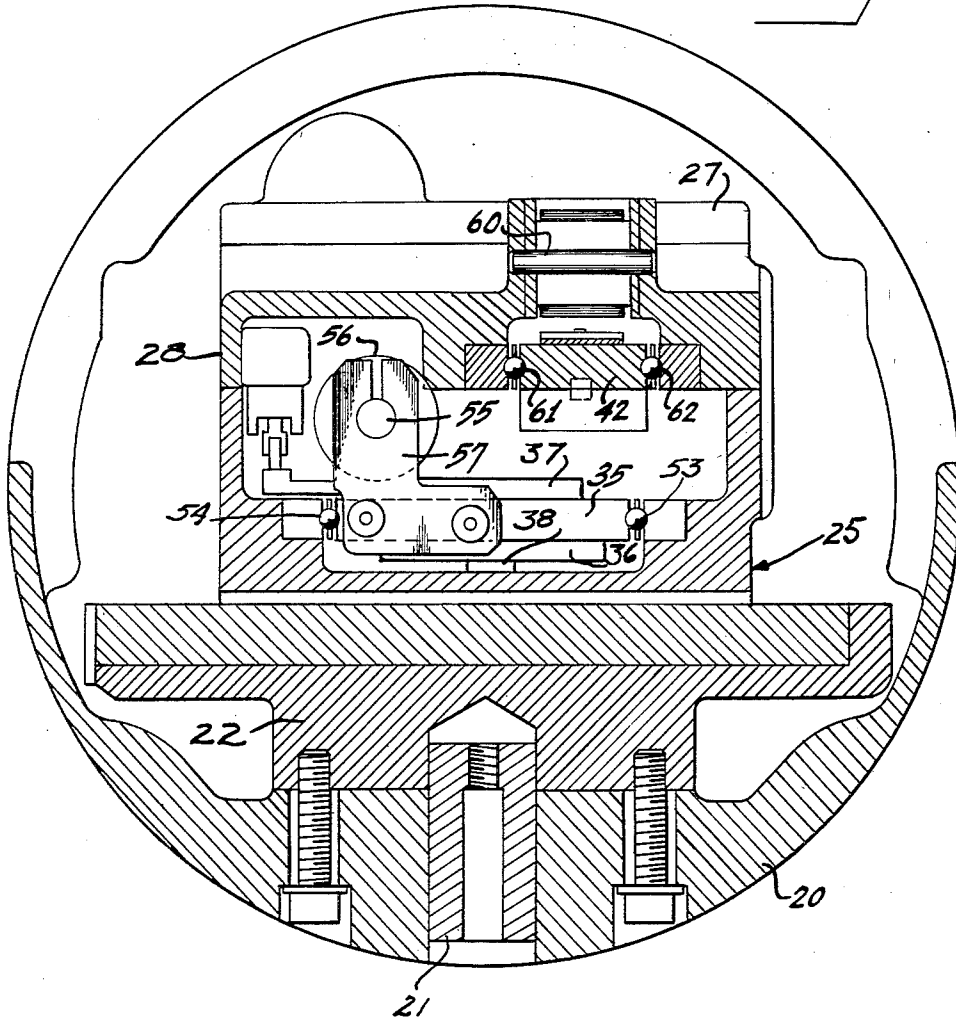
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Fig. 9.



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APPARATUS FOR FORMING CONTOURS

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9 Claims. (Cl. 125—11)

My invention relates to apparatus for forming contours, more particularly, grinding wheel dressing apparatus which must operate within small areas, specifically cylindrical chambers.

In some form of grinding wheel apparatus such as those for grinding turbine buckets or thread grinders for single or multiple threads, the dresser must operate within confined quarters such as cylindrical chambers.

It is an object of my invention to provide an improved grinding wheel dressing mechanism which can be readily mounted as a unit within certain types of grinding wheel apparatus and which is readily accessible and adjustable after being placed in working position.

In accordance with my invention, I provide a main cylindrical barrel housing having a removable top for supporting within the barrel housing, a dressing mechanism assembly. One end of the housing is supported by a mounting bracket to which the housing is adjustably attached for rotation about the axis of the housing.

Mounted within the barrel housing is a swivelled sub base carrying the main or cross-motion slide for supporting the dressing tool housing assembly for movement across the wheel being dressed. The sub base also carries an adjustable feed cam follower which controls the movement of the tool housing assembly.

Mounted on and supported by the main slide is the tool assembly housing within which is mounted the main cam slide for movement transversely of the main slide or radially of the wheel to be dressed. This main slide is operated by a hydraulically operated piston and cylinder fixed to the tool housing. On the under surface of the main slide is fixed the feed cam contacted by the adjustable feed cam follower for controlling the transverse movement of the tool assembly housing axially of the wheel being dressed. On the upper surface of the slide is fixed the contour cam which determines movement of the dressing tool radially of the wheel being dressed.

The tool slide is mounted above the main slide for movement parallel thereto and carries at its outer end the diamond dressing tool. A dust cover is connected between the outer end of the slide and the tool assembly housing. The inner end of the tool slide carries a ratio cam follower.

Slidably mounted above the tool slide is a ratio cam and follower slide supporting a ratio cam contacting the follower on the tool slide and a contour cam follower contacting the contour cam on the main slide.

Spring biasing means keep all the followers and cams in contact so that upon operation of the hydraulic cylinder, the tool is carried axially across the wheel being dressed and radially thereof to form the desired contours.

This invention will be more clearly understood from the following detailed description when told in conjunction with the accompanying drawings, wherein:

Figure 1 is a plan view with the main housing in sec-

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tion showing apparatus made according to my invention;

Figure 2 is a side elevation with parts in section showing apparatus made according to my invention;

Figure 3 is a perspective of the apparatus made according to my invention with parts removed to show details of construction;

Figure 4 is a perspective with parts removed to show the main slide and its operating cylinder;

Figure 5 is a perspective with the bottom portion of the tool assembly housing displaced showing the main slide on the sub base and the adjustable feed cam follower;

Figure 6 is an end view showing the supporting bracket;

Figure 7 is a vertical section taken along the line 7—7 of Figure 8;

Figure 8 is a transverse vertical section taken along the line 8—8 of Figure 7;

Figure 9 is a transverse vertical section taken along the line 9—9 of Figure 7; and

Figure 10 is a section taken along the line 10—10 of Figure 7.

Referring now to the drawings, in Figures 1, 2 and 6, the main barrel housing 20 is provided with a stud 21, upon which is pivotally mounted the sub base 22. A locking screw 23 locks the base after proper adjustment. The tool assembly housing 25 is provided with the covers 26, 27 and 28. The tool assembly housing 25 is slidably supported on the sub base 22 by the main or cross motion slide 30, to permit movement of the diamond dressing tool across the wheel being dressed.

The main cam slide 35, movable transversely of slide 30 or radially of the wheel being dressed, carries the feed or cross movement cam 36 on its underside and the contour cam 37 on its upper side. The adjustable feed cam follower 38 on the sub base 22 and adjustable by means of the adjusting screw 39 is in contact with the feed cam 36 and controls the movement of the tool assembly housing and the dressing tool across the grinding wheel.

The tool assembly 41 is mounted on the tool and ratio cam slide 42. This slide supports follower 43. A ratio cam and follower slide 45 has attached thereto the ratio cam 46 and contour cam follower 47. Further details of construction and operation are discussed below.

Referring now to Figures 7 to 10 inclusive, the tool assembly housing 25 is supported on the main slide 30 by means of the ball bearing assemblies 50, 51. The slide 30 and the tool assembly housing 25 are urged toward the viewer, Figure 7, or the left Figure 8, by means of the biasing springs 52. This keeps follower pin 38 and feed cam 36 of triangular shape in contact with each other. As will be described, when the main cam slide 35 is moved by the hydraulic piston and cylinder, the housing moves transversely of the wheel being dressed.

Within the housing 25 is slidably mounted the main cam slide 35 by means of the ball bearing assemblies 53, 54. The feed cam 36 mounted on the underside of slide 36 is in contact with the follower pin 38. Once adjusted, the pin 38 is in effect a stationary pin as far as the tool assembly housing is concerned. The contour cam 37 is mounted on top of slide 35. Slide 35 is connected to piston rod 55, mounted within the fluid pressure operated cylinder 56 by means of the bracket 57. The piston and cylinder are controlled automatically by means of switches at the end of travel of the main cam slide contacted by cams on the slide. These in turn control valves and feed lines from a source of fluid under pressure to control the flow of fluid to either side of the piston to cause it to move back and forth. These last

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devices are more or less conventional and are not further described.

The tool slide assembly 41 includes the slide 42 spring urged to the left or toward the wheel being dressed, Figure 7, by means of the biasing spring 60. The slide is mounted in the ball bearing assemblies 61, 62. The diamond cutting tool 63 is mounted at the end of the slide and dust cover connects between the end of the slide 35 and housing 25. The inner end of the tool slide 42 carries the follower plate 43' and follower 43 supported thereon.

Slidably mounted within the tool slide assembly housing is the ratio cam and follower slide 45 mounted in the bearing assemblies 65, 66 spring biased by biasing spring 67. It carries the ratio cam 46 and the follower 47. Thus, as slide 35 moves back and forth, slide 45 moves axially of the wheel being dressed in turn causing tool slide 42 to move radially so that the proper contour is formed as the housing 25 moves across the wheel being dressed carrying the tool 63 with it.

Thus, as slide 35 is moved radially by means of the cylinder 56, the housing will move parallel to the grinding wheel axis as the tool is fed radially under the control of the various cams and followers.

Follower pin 38 is mounted on a slide 70, spring pressed against slide 71 by spring 72 as shown in Figure 10. Thus, as adjusting screw 39 is rotated, the position of pin 38 can be changed to vary the initial position of the housing.

What is claimed is:

1. A grinding wheel dressing apparatus including a main housing adapted to be mounted on a grinding wheel apparatus, a sub base pivotally mounted in said housing, a main slide mounted on said sub base, a tool assembly housing mounted on said slide for movement in one direction, a main cam slide supporting a feed cam and a contour cam and mounted within said tool assembly housing for movement transversely of said main slide, a follower on said sub base contacting said feed cam, a tool slide within said tool assembly housing supporting at one end thereof a tool and at the other a follower, and movable parallel to said main cam slide, a ratio cam slide in said tool assembly housing and supporting a ratio cam in contact with the follower on said tool slide, a follower on said ratio cam slide contacting said contour cam, and means connected to said main cam slide for operating said main cam slide for causing movement of said tool assembly housing parallel to the axis of the grinding wheel being dressed and said tool radially thereof.

2. A grinding wheel dressing apparatus including a main housing adapted to be mounted on a grinding wheel apparatus, a tool assembly housing slidably mounted within said main housing, a main cam slide slidably mounted within said tool assembly housing and supporting a feed cam and a contour cam, a follower in said main housing contacting said feed cam, a tool slide within said tool assembly housing supporting at one end thereof a tool and at the other a follower and movable parallel to said main cam slide, a ratio cam slide in said tool assembly housing supporting a ratio cam in contact with the follower on said tool slide and a follower contacting said contour cam, and means connected to said main cam slide for operating said main slide and causing movement of said tool assembly housing and said tool.

3. A grinding wheel dressing apparatus including a barrel shaped main housing, a sub base pivotally mounted within said housing, a tool assembly housing slidably supported on said sub base within said main housing, a main cam slide supporting a feed cam and a contour cam mounted within the tool assembly housing for movement transversely of the movement of said tool assembly housing, a follower on said sub base contacting said feed cam,

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a tool slide within said tool assembly housing supporting at one end thereof a tool and at the other a follower and movable parallel to said main cam slide, a ratio cam slide in said tool assembly housing supporting a ratio cam in contact with the follower on said tool slide, a follower on said ratio cam slide contacting said contour cam, biasing means connected to the tool slide and ratio cam slide for maintaining said cams and followers in contact, and fluid pressure operated means connected to said main slide for operating said main slide.

4. A grinding wheel dressing apparatus including a barrel shaped main housing, a sub base pivotally mounted in said housing, a main slide slidably mounted within said housing on said sub base, a tool assembly housing mounted on said main slide, a main cam slide within said tool assembly housing and supporting a feed cam and a contour cam, a follower on said sub base contacting said feed cam, a tool slide within said tool assembly housing and movable parallel to said main cam slide, connections between said tool slide and said contour cam for controlling movement of said tool slide upon movement of said main cam slide, fluid pressure operated means connected to said main cam slide for operating said main cam slide and for moving said tool assembly housing and said tool.

5. A grinding wheel dressing apparatus including a main housing, a tool assembly housing slidably mounted within said main housing, a main cam slide within said tool assembly housing and supporting a feed cam and a contour cam, a follower within said main housing contacting said feed cam, a tool slide within said tool assembly housing and movable parallel to said main cam slide, connections between said tool slide and said contour cam for controlling movement of said tool slide upon movement of said main cam slide, and means connected to said main cam slide for operating said main cam slide and for moving said tool assembly housing and said tool.

6. A grinding wheel dressing apparatus including a barrel shaped main housing adapted to be mounted on a grinding wheel apparatus, a sub base extending longitudinally of and pivotally mounted within said housing, a main slide within said housing, a tool assembly housing slidably supported on said main slide, a main cam slide supporting a feed cam and a contour cam and mounted within the tool assembly housing for movement transversely of the movement of said tool assembly housing, a follower on said sub base contacting said feed cam, a tool slide within said tool assembly housing supporting at one end thereof a tool and movable parallel to said main cam slide, connections between said tool slide and the contour cam on said main cam slide, biasing means connected to said main slide and tool slide for maintaining said cams and slides in operative relationship, and fluid pressure operated means connected to said main cam slide for operating said main cam slide.

7. A grinding wheel dressing apparatus including a main housing adapted to be attached to a grinding wheel apparatus, an elongated sub base pivotally mounted at one end within said housing, a main slide mounted in said main housing, a tool assembly housing slidably supported on said main slide within said main housing, a main cam slide mounted within said tool assembly housing and supporting a feed cam on one side thereof and a contour cam on the other side thereof and mounted within the tool assembly housing for movement transversely of the movement of said tool assembly housing, an adjustable follower on said sub base contacting said feed cam, a tool slide within said tool assembly housing supporting at one end thereof a tool and at the other a cam follower and movable parallel to said main slide, a ratio cam slide in said tool assembly housing supporting a ratio cam in contact with the follower on said tool slide, a follower on said ratio cam slide contacting said contour cam, biasing means connected to the main slide, tool

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slide and ratio cam slide for maintaining said cams and followers in contact, and fluid pressure operated means having a cylinder connected to said tool assembly housing and a piston connected to said main slide for operating said main slide.

8. A grinding wheel dressing apparatus including a main housing adapted to be mounted on a grinding wheel apparatus, a tool assembly housing slidably mounted within said main housing for movement in one direction, a cam slide supporting a feed cam and a contour cam on opposite sides of said slide and mounted within said tool assembly housing for movement transversely of said tool assembly housing, means connected between said housings for controlling movement of said tool assembly housing, a tool slide within said tool assembly housing supporting at one end thereof a tool and movable parallel to said main cam slide, means connected between said slides for causing movement of said tool slide when said cam slide is moved, and means connected to said main cam slide for operating said main cam slide for causing movement of said tool assembly housing parallel to the axis of the grinding wheel being dressed and said tool radially thereof.

9. A grinding wheel dressing apparatus including a

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supporting member adapted to be mounted on a grinding wheel apparatus, an elongated tubular main slide housing mounted on said supporting member, a tool assembly housing mounted in said tubular main slide housing for movement in one direction, a main cam slide supporting a plurality of cams and mounted within said tool assembly housing for movement transversely of said main slide, means connected between said supporting member and one of said cams for controlling movement of said housing, a tool slide within said tool assembly housing supporting at one end thereof a tool and movable parallel to said main cam slide, connections between another of said cams and said tool slide for controlling movement of said tool slide, and means connected to said main cam slide for operating said main cam slide for causing movement of said tool assembly housing parallel to the axis of the grinding wheel being dressed and said tool radially thereof.

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