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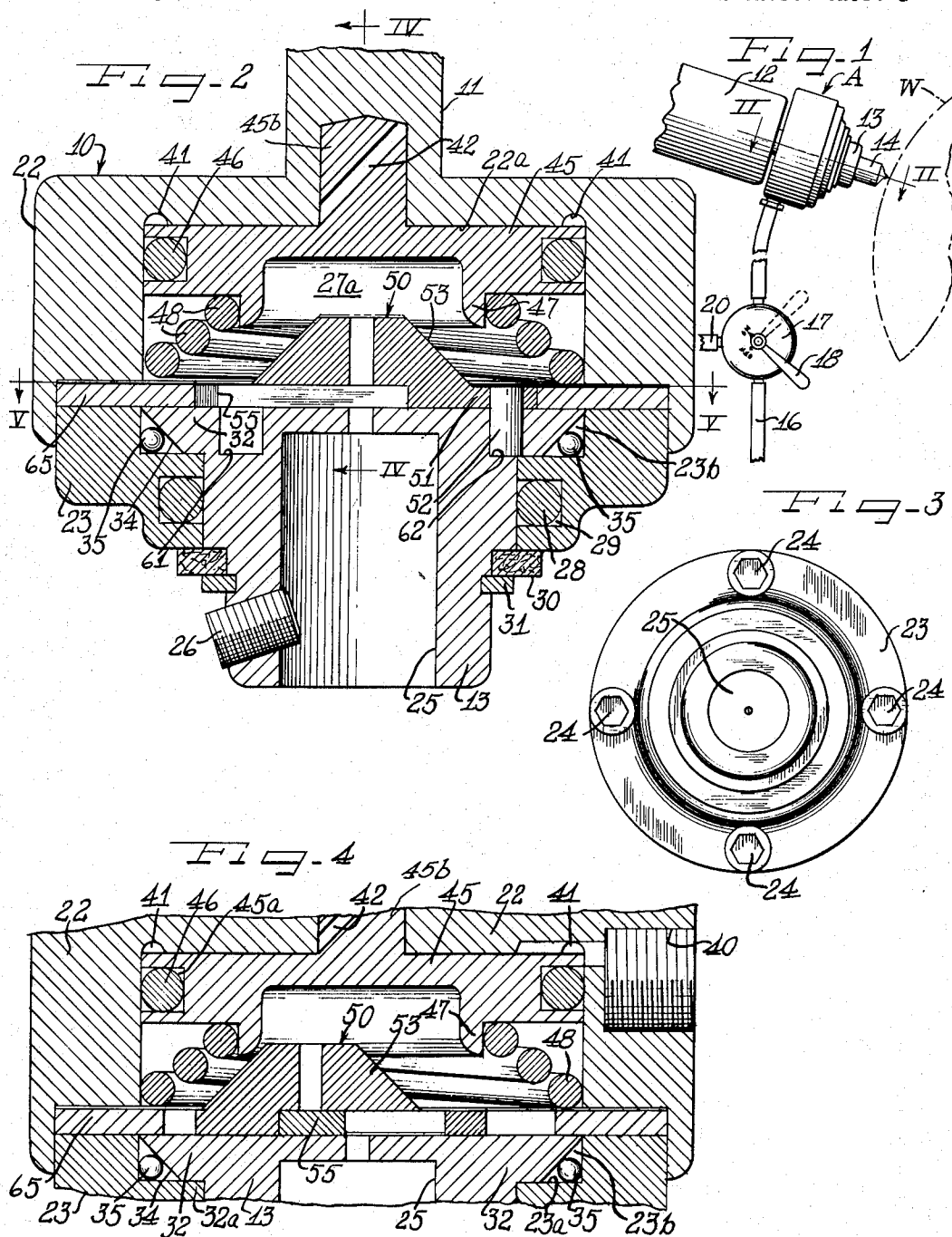
S. P. BRUCE

2,733,700

DRESSING MECHANISM

Filed July 17, 1951

2 Sheets-Sheet 1



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Fig-5

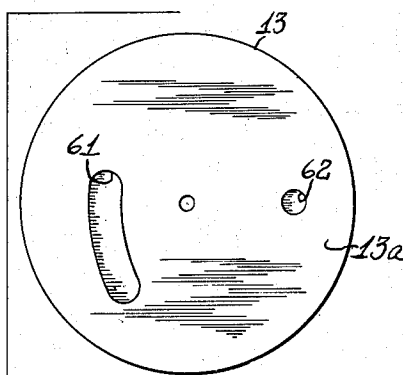
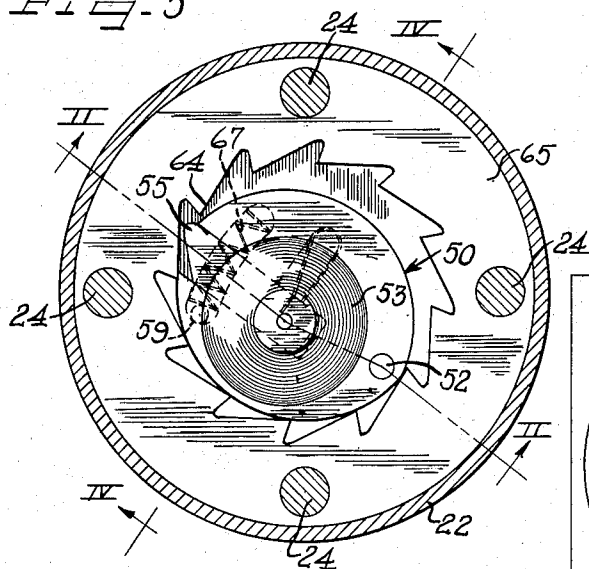


Fig-7

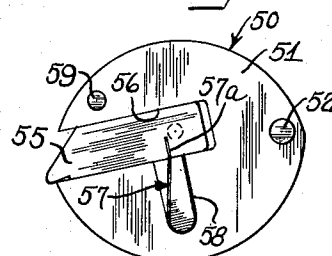
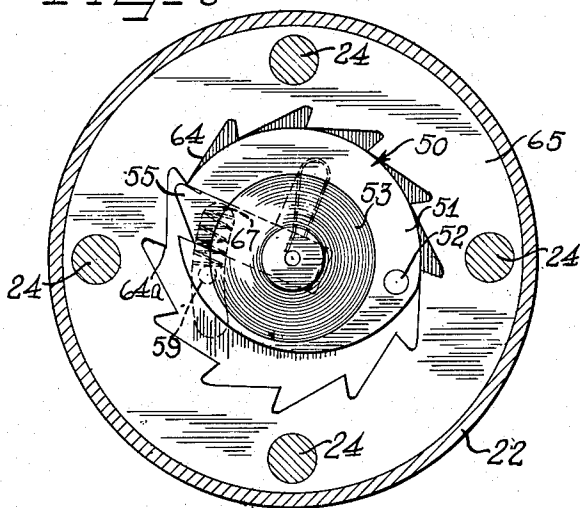


Fig-6



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2,733,700

DRESSING MECHANISM

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12 Claims. (Cl. 125—11)

The present invention relates to a dressing mechanism of the type commonly employed to dress or true an abrasive grinding wheel.

As abrasive wheels become worn or otherwise out of true from prolonged use, it is customary practice to dress or true the cutting surface of the wheel by passing a cutting tool, such as a diamond point, across the surface thereof parallel to the axis of rotation of the wheel, thereby dressing or reshaping the wheel to its proper configuration. Continued use of a dressing tool tends to wear the diamond point unevenly, resulting in worn surfaces or "flats" being formed on the diamond point, thereby decreasing its useful life.

To overcome this difficulty, I have previously suggested a grinding wheel dressing mechanism in which the dressing mechanism is provided with a rotatable tool holder. Periodic rotation of the tool holder during the wheel dressing or trueing operation is effected by providing an indexing mechanism which rotates the tool holder, and the tool contained therein, in a step-by-step sequence after the dressing tool has completed a traverse across the surface of the abrasive wheel being dressed. Such an arrangement is described and claimed in my copending application for patent entitled "Grinding Wheel Dressing Assembly," Serial No. 744,749, now Patent No. 2,597,616, issued May 20, 1952.

After continued indexing of the tool holder in the system described in my aforesaid copending application, the diamond point assumes a generally pyramidal shape which is not only the most effective shape for the diamond point from the standpoint of accurate dressing of the wheel, but which also insures effective use of the same diamond tool for longer periods of time than are possible in dressing assemblies not provided with this automatic indexing arrangement.

The present invention is concerned with a modified dressing assembly which also provides means for periodically indexing the diamond tool or other abrasive tool used to dress or true the surface of a grinding wheel. One of the distinctive features of the present arrangement is the provision of a hydraulically operated indexing mechanism. As many conventional dressing assemblies include a hydraulic system for effecting movement of the tool holder carriage across the face of the grinding wheel, the mechanism of the present invention can be conveniently operated by fluid from such hydraulically operated systems. Otherwise, a separate hydraulic system can be provided for operating my indexing mechanism.

Essentially, the mechanism of the present invention includes a casing arranged to be mounted in the usual quill on a movable carriage in the grinding wheel dressing assembly, a rotatable tool holder disposed within the carriage and arranged to receive a diamond tool or other dressing tool, a hydraulically operated piston in the casing, and an associated pawl and ratchet mechanism which translates the reciprocatory motion of the piston into rotation of the tool holder through a predetermined arc.

For a more specific explanation of one form of the

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invention, reference is made to the attached sheets of drawings, in which:

Figure 1 is a fragmentary elevational view of the dressing mechanism of the present invention mounted in position to dress the surface of a grinding wheel, the outline of which is indicated by a dotted line;

Figure 2 is an enlarged cross-sectional view taken substantially along the line II—II of Figure 1 and also along the line II—II of Figure 5;

Figure 3 is an end view of the assembly shown in Figure 2, with parts in elevation;

Figure 4 is a fragmentary cross-sectional view taken substantially along the line IV—IV of Figure 2 and IV—IV of Figure 5;

Figure 5 is a cross-sectional view taken substantially along the line V—V of Figure 2;

Figure 6 is a view similar to Figure 5 but illustrating the engagement between the pawl and ratchet assembly; and

Figure 7 is a detail view illustrating one surface of the tool holder and the surface of the pawl-carrying cam which engages the same.

As shown on the drawings:

The view of Figure 1 illustrates the complete assembly of a dressing mechanism A embodying my invention and arranged in position to dress the surface of a grinding wheel, the surface of which is indicated by the fragmentary dotted line W. This assembly includes a casing, generally indicated at 10 having a mounting shank 11 (Fig. 2) engaged within an axial recess provided in a quill 12 forming a part of a usual or conventional wheel dressing carriage.

Partially extending from the casing 10 is a tool holder 13 which carries a wheel dressing element such as a diamond dressing tool 14.

The carriage upon which the quill 12 is mounted in some grinding wheel dressing assemblies is operated by means of a hydraulic system to move the carriage laterally along a line parallel to the axis of the grinding wheel being dressed. A conduit 16 supplies fluid under pressure from the hydraulic system through a two-way valve 17 into the casing 10. The valve 17 is provided with an operating lever 18 so that when the lever 18 is in the "on" position indicated in Figure 1, high pressure fluid is being supplied to the mechanism included in the casing 10, and when in its "off" position, indicated by the dotted lines of Figure 1, the fluid is drained from the casing 10 into a conduit 20 for return to a liquid reservoir of the hydraulic system.

The valve 17 may be operated manually, but is preferably operated automatically in timed relationship with the travel of the dressing tool across the face of the grinding wheel so as to index the tool at an end of its traverse while the tool is out of contact with the wheel. The introduction of the fluid under pressure can be accomplished by a timer mechanism controlled by the movement of the carriage so that after the carriage has completed one or more traverses, high pressure fluid will be admitted into the indexing mechanism to cause incremental rotation of the diamond tool. Other systems for periodically admitting a pressured fluid for control of the indexing operation will suggested themselves to those skilled in the art.

The casing 10 includes a hollowed cylindrical body portion 22 and an annular ring 23 secured to the body member 22 by a plurality of circumferentially spaced bolts 24 (Fig. 3).

Within the casing formed by the body member 22 and the annular ring 23 is the rotatable tool holder assembly 13, which has an axial recess 25 for receiving the diamond dressing tool 14 illustrated in Figure 1. A set screw 26

holds the diamond tool 14 seated within the axial recess 25.

A sealing ring, such as an O ring 28 is displaced in an internal annular groove 29 provided in the ring 23, while an annular felt sealing washer 30 and a metallic locking washer 31 are engaged within suitable annular recesses provided in the projecting end of the tool holder 13.

To permit free rotation of the tool holder 13 within the casing 10 while restraining relative axial movement therebetween, the tool holder 13 is provided with a flanged portion 32, which provides a plane annular shoulder 32a for abutment against an inwardly facing shoulder 23a provided by a cylindrical recess 23b in the ring 23. The flanged portion 32 has a beveled edge 34 formed thereon and a plurality of ball bearings 35 are disposed between the beveled face 34 and the adjacent walls of said annular recess 23b in the annular ring 23.

The hydraulically operated indexing mechanism associated with the rotatable tool holder 13 includes an inlet port 40 (Fig. 4) through which the pressured fluid from the hydraulic system passes into the interior of the casing 10 for distribution therein by an annular recess 41 provided in the body member 22.

Mounted for reciprocatory travel in response to the pressure of the fluid introduced into the housing 10 is a piston 45 of generally cylindrical configuration. An O sealing ring 46 is positioned in a suitable annular groove 45a in the outer edge of the piston to provide a continuous seal between the fluid chamber behind the piston and the forward part of the assembly. An angularly disposed bore 42 is provided in a piston guide rod 45b, slidably received within the shank 11 to allow any hydraulic fluid trapped in back of the rod 45b to escape.

The central portion of the piston 45 includes a hub 47. A coiled spring 48 engages the piston 45 around the periphery of the hub 47 to urge the piston into seating relation against the rear wall 22a of the body member 22.

In the indexing of the tool holder, the piston 45 operates with a cam 50, which will now be described in detail. The cam 50 includes a flat base portion 51 having an aperture therein for snugly receiving a pin 52 (Figs. 2 and 7). The pin 52 is snugly received in a bore 62 in the tool holder 13 to provide a pivot for the cam 50. Said cam is thus capable of pivotal movement over the surface of the rear end wall of the tool holder 13, which it abuts.

The central portion of the cam 50 includes a frusto-conical piston-engaging portion 53, the axis of which is normally displaced laterally from the axis of the piston 45, as shown in Figure 4.

The diameter of the cylindrical recess 27a defined by the inner wall of the hub portion 47 on the piston 45 is intermediate between the two extreme diameters of the frusto-conical piston engaging portion 53. Thus, as the piston 45 is moved toward the cam 50 against the compression of the spring 48 by reason of the pressure of the fluid introduced through the inlet 40, the hub 47 engages the frusto-conical portion 53 and tends to center or align the axis of the frusto-conical portion 53 with the axis of the piston 45. During the initial contact of the piston 45 with the cam 50, the cam is free to pivot about the pin 52 so that the piston 45 can urge the cam 50 toward a centered position.

As shown in Figure 7, the bottom 51 of the cam 50 carries a tapered pawl member 55 freely slidable within a slot 56 formed therein. A U-shaped spring member 57 is disposed in a well 58 also formed in said cam bottom 51 but at right angles to said slot 56 and opening thereinto. The spring member 57 is positioned with the bight of the U bottomed in the well 58 and with a longer leg 57a engaging the pawl member 55 and biasing the leading edge of the pawl member 55 outwardly beyond the periphery of the cam 50. The undersurface of the cam 50 also carries a detent pin 59. In their assembled position, the

detent pin 59 fits into an elongated arcuate slot 61 and the pivot pin 52 snugly fits into the bore 62 in the rear surface 13a of the tool holder 13, as shown in Figure 7.

The position of the indexing mechanism at the time prior to the introduction of fluid under pressure into the casing is illustrated in Figure 5. As the piston 45 is moved by the fluid pressure toward the cam 50 against the compression of the spring 48 the cam 50 pivots about the pin 52. The movement of the cam 50 to a centered position causes the pawl member 55 (Fig. 6) to be brought into contact with a tooth 64 formed in a stationary ratchet ring 65. As shown in Figures 2 and 4, the ratchet ring 65 is positioned between the annular ring 23 and the body member 22. The bolts 24 (Figs. 5 and 6) prevent relative movement between the ratchet ring and the casing 10.

The arrangement of the teeth 64 about the ratchet ring 65 will depend upon the amount of indexing which the tool holder 13 should have during each cycle of operation. In the arrangement shown in the drawings, twelve equally spaced teeth 64 are provided on the ratchet ring 65, so that the indexing of the tool holder and the tool contained therein will extend through an arc of 30° for each indexing operation.

As the cam 50 is pivoted about the pin 52, the detent pin 59 is moved within the slot 61 against the action of a coiled spring 67. As the cam 50 moves toward a centered position, the pawl 55 eventually engages a tooth 64 on the ratchet disk 65, as shown in Figure 6. As soon as engagement between the pawl 55 and a tooth 64 occurs, the cam 50 is no longer free to pivot about the pin 52 and the continued pressure of the piston 45 against the cam 50 causes the cam 50 to move bodily about the fulcrum defined at the point of contact between the pawl 55 and a tooth 64. Because of the engagement of the pin 52 within the bore 62 of the tool holder 13 such movement of the pawl 55 causes rotation of the tool holder 13 about its axis and consequent indexing of the diamond dressing tool 14. The amount of rotation is limited by engagement of the periphery of the cam 50 with the points of the teeth 64 on the ratchet ring 65 (Fig. 6).

When the valve 17 is again turned to release fluid from the casing, the spring 48 associated with the piston 45 returns the piston 45 to a seated position against the rear wall 22a of the body member 22, disengaging the hub portion 47 of the piston from the cam 50. When this happens, the cam 50 is pivoted in the opposite direction about the pin 52 by the action of the spring 67 against the detent 59. During such pivotal movement the pawl member 55 is retracted into the slot 56 against the action of the spring 57 in the act of riding over the rear surface of the next succeeding tooth 64a. In this manner, the pawl member 55 progressively moves between adjacent teeth of the stationary ratchet ring 65 for each indexing operation.

The hydraulically operated indexing mechanism of the present invention has the advantages of simplicity of construction, and a durability not usually possible in wheel dressing mechanisms of this nature. The structure of the wheel dressing mechanism has a further advantage that it can be readily incorporated into existing hydraulically operated systems of grinding wheel dressing assemblies with a minimum amount of labor and expense.

It will be evident that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. A dressing mechanism comprising a casing, a tool holder rotatably supported within said casing, said tool holder having a recess therein for receiving a dressing tool, means in said casing for admitting fluid under pressure into said casing, a piston disposed within said casing and reciprocable in response to the pressure of the fluid introduced therein, pivotal means operatively disposed within said casing to engage said piston during move-

ment of said piston in one direction and mounted to pivot first in one angular direction and then in the opposite angular direction, means interconnecting said pivotal means and said tool holder to rotate incrementally said tool holder upon continued movement of said piston in said one direction and during pivotal movement of said pivotal means in said opposite angular direction, and means in said casing for limiting the rotation of said tool holder to a predetermined arc in said opposite angular direction.

2. A dressing mechanism comprising a casing, a tool holder rotatably supported within said casing, said tool holder having a recess therein for receiving a dressing tool, means in said casing for admitting fluid under pressure into said casing, a piston disposed within said casing and reciprocable in response to the pressure of the fluid introduced therein, pivotal means including a pawl member operably disposed within said casing to engage said piston during reciprocation of said piston to displace said pivotal means, a stationary ratchet secured to said casing and arranged to contact said pawl upon displacement of said pivotal means, and means interconnecting said pivotal means with said tool holder to rotate said tool holder upon displacement of said pivotal means.

3. A dressing mechanism comprising a casing, a tool holder rotatably supported within said casing, said tool holder having a recess therein for receiving a dressing tool, a piston reciprocably disposed within said casing, spring means biasing said piston in one direction, means for admitting fluid under pressure into said casing to move said piston against the biasing action of said spring means, pivotal means disposed within said casing and engageable with said piston during such movement of said piston to displace said pivotal means, a pawl carried by said pivotal means, a ratchet secured to said casing and arranged to engage said pawl upon displacement of said pivotal means, and means interconnecting said pivotal means with said tool holder to rotate said tool holder upon displacement of said pivotal means.

4. A dressing mechanism comprising a casing, a tool holder rotatably supported within said casing, said tool holder having a recess therein for receiving a dressing tool, means for admitting fluid under pressure into said casing, a piston within said casing movable in response to the pressure of the fluid introduced into said casing, a pivotally supported cam within said casing, said cam being arranged to pivot upon engagement with said piston during movement of said piston, a pawl member carried by said cam and extending therefrom, spring means urging said pawl member outwardly from said cam, a stationary ratchet secured to said casing and arranged to engage said pawl upon pivotal displacement of said cam, and means interconnecting said cam with said tool holder to rotate said tool holder upon displacement of said pivotal means.

5. A dressing mechanism comprising a casing, a tool holder rotatably supported within said casing, said tool holder having a recess therein for receiving a dressing tool, means in said casing for admitting fluid under pressure into said casing, a piston in said casing movable in response to the pressure of fluid introduced therein, a cam including a piston-engaging portion radially offset from the axis of said piston, said piston being arranged to engage said piston-engaging portion and move said cam toward alignment with the axis of said piston, means interconnecting said cam and tool holder to rotate said tool during the engagement of said piston with said cam, and means in said casing cooperating with said cam to limit the rotation of said tool holder to a predetermined arc.

6. A dressing mechanism comprising a casing, a tool holder rotatably supported within said casing, said tool holder having a recess therein for receiving a dressing tool, means for admitting a fluid under pressure into said casing, a piston movable in said casing in response to the

pressure of fluid introduced therein, a cam pivotally arranged within said casing and having a piston-engaging portion offset from the axis of said piston, said piston being arranged to engage said piston-engaging portion and move said cam toward alignment of said portion with the axis of said piston, and means including a pawl and ratchet assembly interconnecting said cam and said tool holder to effect a limited rotation of said tool holder upon movement of said cam by said piston.

7. A dressing mechanism comprising a casing, a tool holder rotatably supported within said casing, said tool holder having a recess therein for receiving a dressing tool, means for admitting a fluid under pressure into said casing, a piston movable in said casing in response to the pressure of fluid introduced therein, a cam pivotally arranged within said casing and having a piston engaging portion offset from the axis of said piston, said piston being arranged to engage said piston-engaging portion and move said portion toward alignment of said portion with the axis of said piston, a pawl carried by said cam, a ratchet secured to said casing and engageable with said pawl upon movement of said cam, and means interconnecting said cam and said tool holder to rotate incrementally said holder upon movement of said cam by said piston.

8. Mechanism for translating linear movement into rotational movement, comprising a linearly movable first member providing an inner cylindrical wall, a rotatably mounted second member coaxial with said first member, a frusto-conical cam pivotally mounted on said second member about a pivot point eccentric of the axis of said second member and of the axis of said cam, means for moving said first member and said cam relatively toward and into engagement with each other to cause said wall to center said cam and thereby pivot said cam about said pivot point, and means providing a fixed fulcrum point for said cam diametrically opposite said pivot point limiting further pivotal movement of said cam, whereby upon further centering action of said cam the latter is caused to rotate about said fulcrum point with consequent rotational movement imposed upon said rotatably mounted member.

9. In combination, a casing, a tool holder rotatably supported within said casing, means for admitting a fluid under pressure into said casing, a piston in said casing movable in response to the pressure of fluid introduced therein, a cam having a piston-engaging portion radially offset from the axis of said piston, said piston being arranged to engage said portion and move said portion toward alignment with the axis of said piston during movement of said piston, a pawl carried by said cam, a ratchet secured to said casing and engageable with said pawl upon movement of said cam, means interconnecting said cam and said tool holder to rotate incrementally said holder upon movement of said cam by said piston, and a spring engaging a portion of said cam to pivot said cam in the opposite direction upon disengagement of said piston and said cam.

10. In combination, a casing, a tool holder rotatably supported within said casing, means for admitting a fluid under pressure into said casing, a piston disposed within said casing and movable in response to the pressure of fluid introduced into said casing, a cam having a frusto-conical portion offset from the axis of said piston, a pin pivotally connecting said cam with said tool holder, whereby said cam is pivoted about said pin upon engagement of said piston with said frusto-conical portion, a pawl carried by said cam, a ratchet secured to said casing to engage said pawl upon pivoting of said cam about said pin in one direction, said cam being bodily movable upon continued engagement of said piston with said frusto-conical portion to thereby incrementally rotate said tool holder by virtue of the engagement of said tool holder with said pin, a detent carried by said cam, and a spring bottomed on said tool holder and engaging said detent to pivot said cam in the reverse direction upon disengagement of said piston and said frusto-conical portion.

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11. In combination, a casing, a tool holder rotatably supported within said casing, means for admitting a fluid under pressure into said casing, a piston disposed within said casing and movable in response to the pressure of fluid introduced therein, a cam having a frusto-conical portion offset from the axis of said piston, a pin pivotally connecting said cam with said tool holder, whereby said cam is pivoted about said pin upon engagement of said piston with said frusto-conical portion, a pawl carried by said cam, a spring urging said pawl beyond the periphery of said cam, a ratchet secured to said casing to engage said pawl upon pivoting of said cam about said pin in one direction, said cam being bodily movable upon continued engagement of said piston with said frusto-conical portion to thereby incrementally rotate said tool holder by virtue of the engagement of said tool holder with said pin, a detent carried by said cam, and a spring bottomed on said tool holder and engaging said detent to pivot said cam in the reverse direction upon disengagement of said piston and said frusto-conical portion.

12. A dressing assembly comprising a tool holder, a pivot, tool holder moving means associated with said tool holder through said pivot, a pawl carried by said means, a stationary ratchet having teeth engageable by said pawl, and power means operably associated with said tool holder moving means to sequentially rotate said moving means

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about said pivot until said pawl engages a tooth of said ratchet, thereby providing a fulcrum point, and to thereafter rotate said moving means about said fulcrum point to rotate said tool holder through a preselected arc in an opposite angular direction to first pivotal movement of said moving means.

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