

United States Patent

Kakumu et al.

[15] 3,674,003

[45] July 4, 1972

[54] APPARATUS FOR DRESSING GRINDING WHEELS

[72] Inventors: Ichizo Kakumu; Susumu Oshima, both of Aichi, Japan

[73] Assignee: Toyoda Koki Kabushiki Kaisha, Aichi-ken, Japan

[22] Filed: Feb. 2, 1971

[21] Appl. No.: 111,843

[30] Foreign Application Priority Data

Feb. 21, 1970 Japan.....45/14696

[52] U.S. Cl.125/11 H

[51] Int. Cl.B24b 53/02

[58] Field of Search.....125/11

[56]

References Cited

UNITED STATES PATENTS

3,339,537	9/1967	Stade.....	125/11
2,972,343	2/1961	Dunn.....	125/11 DF
2,077,363	4/1937	Hulbert.....	125/11 ST

Primary Examiner—Harold D. Whitehead

Attorney—Wenderoth, Lind & Ponack

[57]

ABSTRACT

In apparatus for dressing the opposite surfaces of a grinding wheel comprising rams mounted to be slidable along the opposite side surfaces of the grinding wheel, feed means for feeding dressing tools mounted on the rams toward the side surfaces of the grinding wheel in an interlocked relationship with the movement of the rams, there is providing a sizing device for measuring the side surfaces of a grinding wheel to control the feed of dressing tools.

11 Claims, 5 Drawing Figures

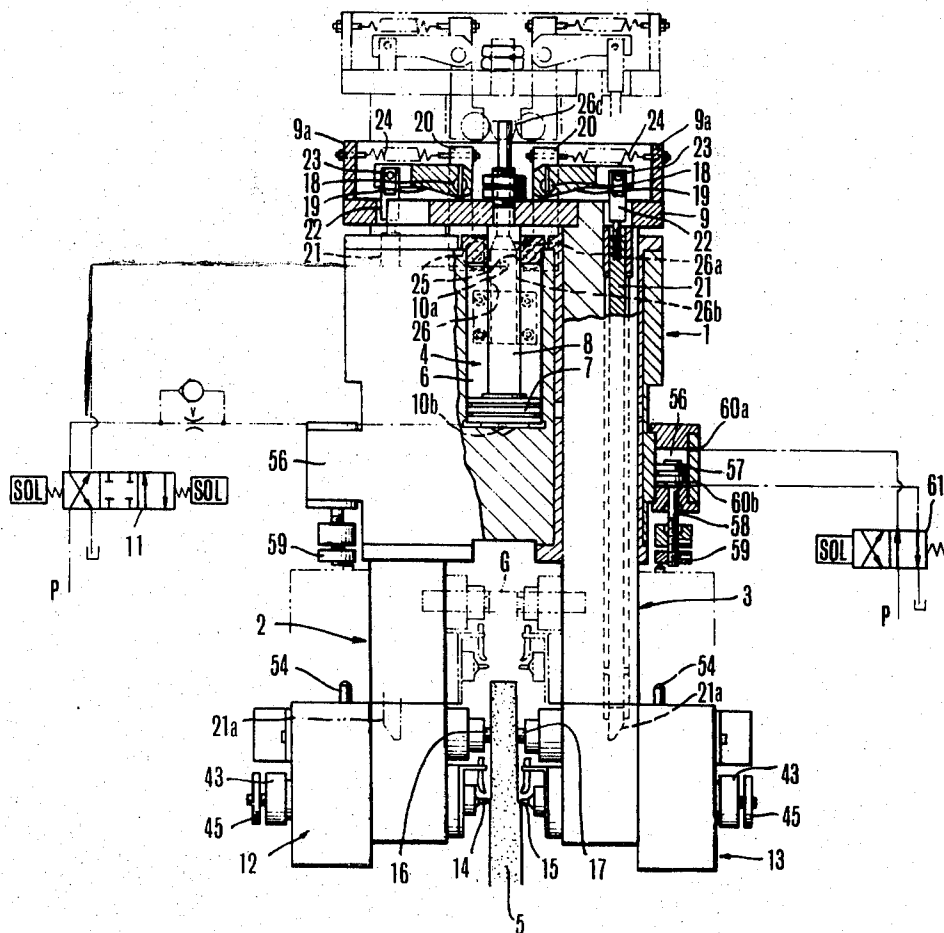
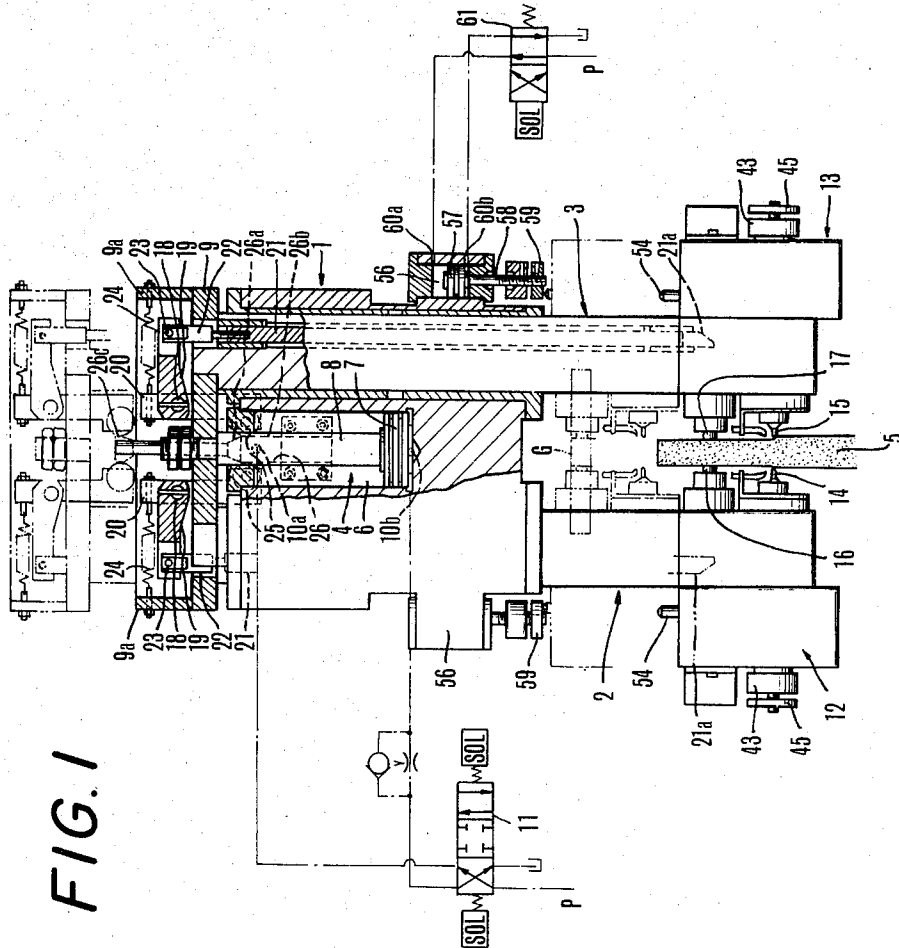


FIG. 1

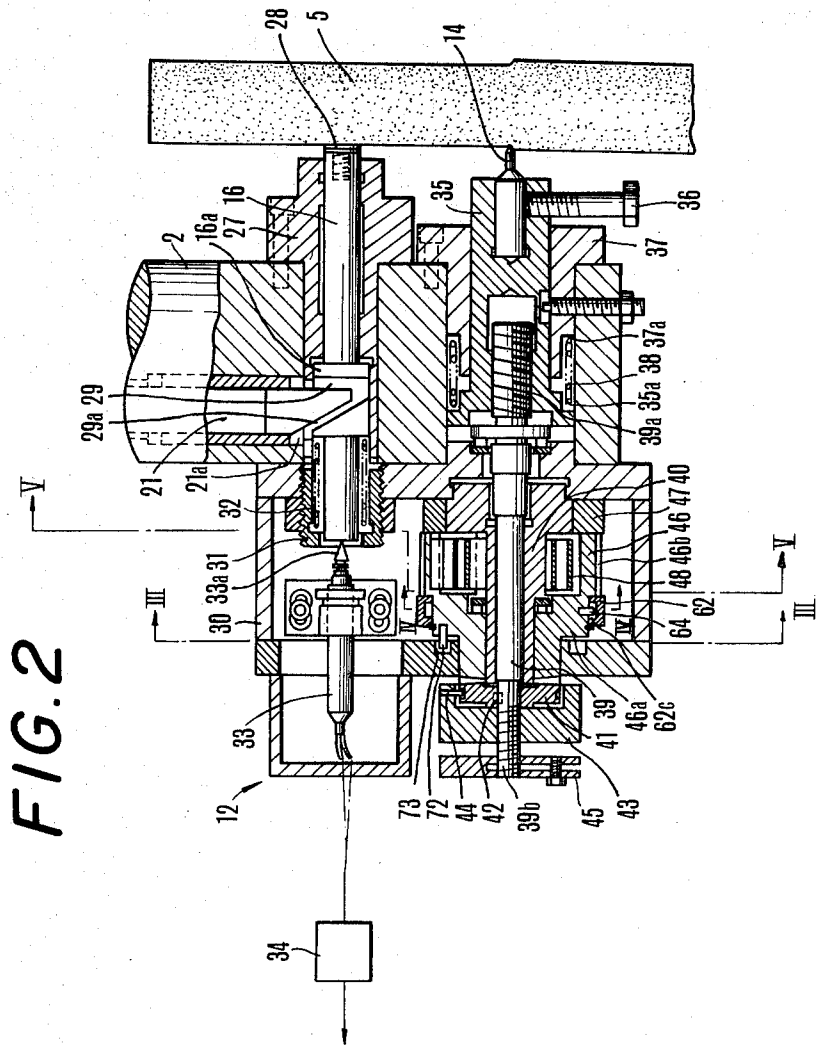


INVENTORS

Ichizo Kabe
Susumu Oshima

BY Wendert Lind & Ponack

ATTORNEY



INVENTOR
Ichizo Kakumura
Susumu Oshima
BY *Wendroth Lind & Ponack*
ATTORNEY

FIG. 3

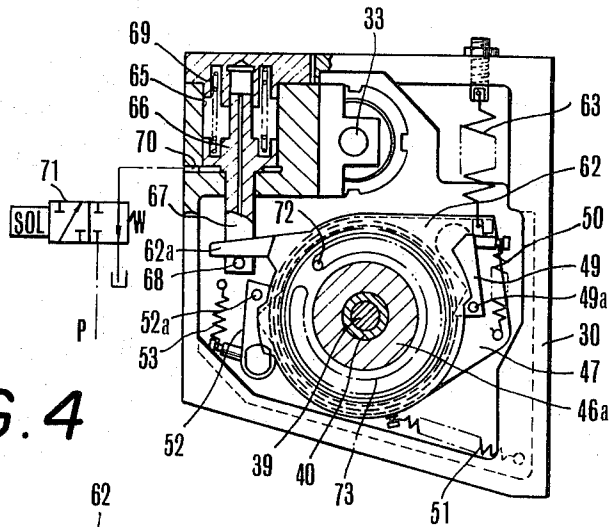


FIG. 4

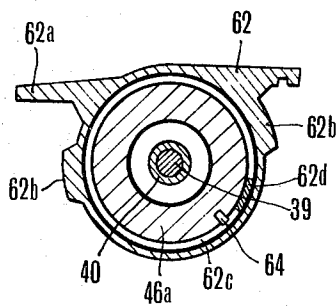
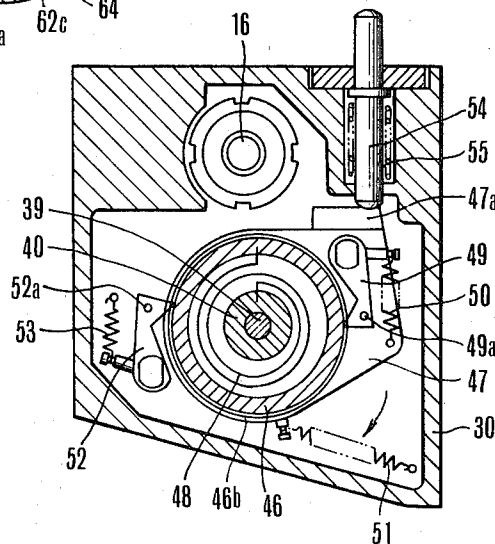


FIG. 5



INVENTOR

Ichizo Kakumura
Sasumu Oshima

BY *Wendroth, Lind & Ponack*

ATTORNEY

APPARATUS FOR DRESSING GRINDING WHEELS

BACKGROUND OF THE INVENTION

This invention relates to apparatus for dressing side surfaces of a grinding wheel so as to automatically dress the width of the grinding wheel to a desired width.

Generally, it is necessary to set the width of a grinding wheel to a given width when grinding an annular recess such as pin receiving portion of a crankshaft.

To dress the side surface of a grinding wheel a dressing apparatus is mounted on a table and the grinding wheel head is moved toward and away from the dressing apparatus to dress the side surface of the grinding wheel. Then the thickness of the grinding wheel is measured by a dial gauge or a micrometer at the worked portion. Such measurement has been made manually and the result has been read by the eyes of the operator. For this reason, it has been difficult to dress at high accuracies the grinding wheel so as to provide a definite width and yet long time has been required thus decreasing the operating efficiency of the grinding machine.

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide a dressing apparatus for automatically dressing the side surfaces of a grinding wheel to a predetermined size by means of a sizing device which measures the position of the side surface.

It is another object of the present invention to provide a dressing apparatus with a switching mechanism for switching the feed means between coarse and fine feeding conditions to increase the efficiency and the accuracy of the dressing operation.

It is another object of the present invention to provide a dressing apparatus with a sizing device which automatically measures the position of the side surface of a grinding wheel to control the feed of dressing tools.

According to this invention there is provided apparatus for automatically dressing the side surfaces of a grinding wheel comprising a pair of rams slidably mounted on a stationary member on the opposite sides of the grinding wheel, ram driving means for moving the rams along the side surfaces dressing heads respectively mounted on one end of the rams, dressing tools respectively mounted on the dressing heads to dress the side surfaces, feed means for imparting coarse and fine feeds to the dressing tools in an interlocked relationship with the movement of the rams and a switching mechanism for switching the feed between coarse and fine feeding conditions whereby to dress to a given width both side surfaces with coarse and fine feed. More particularly, there is the switching mechanism is provided for the automatic dressing apparatus just described for switching the feed means between coarse and fine feeding operations to increase the accuracy and efficiency of the dressing operation.

There are further provided a sizing device which measures the position of the side surface of the grinding wheel for generating a coarse fine-feed switching and sizing signals, and means responsive to the switching signal for operating the switching mechanism to switch the feed means from the coarse to the fine feeding condition.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings in which:

FIG. 1 shows a front elevation, partly in section, of one example of the dressing apparatus embodying the invention;

FIG. 2 shows a longitudinal section of a dressing head constructed in accordance with this invention; and

FIGS. 3, 4 and 5 show sectional views taken along lines III—III, IV—IV and V—V, respectively, of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, there is shown dressing apparatus of this invention, generally designated by a reference numeral 1, which is secured to a wheel head (not shown) of a grinding wheel of a grinding machine. A pair of rams 2 and 3 are mounted on the apparatus to be slidable at right angles with respect to the axis of a grinding wheel 5. Each of the rams is moved in the vertical direction by a predetermined stroke by a ram driving device 4 including a cylinder 6 and a piston 7. The rams are positioned on the opposite sides of the grinding wheel 5 and are moved toward and away from the grinding wheel by a mechanism to be described hereunder.

More particularly, piston 7 is slidably received in cylinder 6 formed in the main or stationary body 1 and the piston rod 8 is secured to a connecting plate 9 disposed above the main body 1. The upper end of rams 2 and 3 are connected to connecting plate 9. Ports 10a and 10b at the opposite ends of ram driving cylinder 6 are connected to a source of pressurized oil and reservoir (not shown) through a transfer valve 11. When the pressurized oil is admitted into the upper portion of cylinder 6 through upper port 10a, piston 7 is forced downwardly to lower rams 2 and 3 through piston rod 8 and connecting plate 9 whereas when the pressurized oil is admitted into the lower portion of the cylinder 6 through lower port 10b, rams 2 and 3 are raised.

A pair of dressing heads 12 and 13 are mounted on the lower ends of rams 2 and 3, respectively, for dressing opposite surfaces of the grinding wheel 5, and carry on their inner sides diamond tools and feelers 16 and 17 of the sizing device to be described later.

Arms 19 and cam follower 20 are secured to shafts 18 rotatably mounted on connecting plate 9. Each of the arms 19 is pivotally connected to connecting rod 22 by a pin 23, the lower end of connecting rod 22 being connected, as by screw threads, to the upper end of an operating rod 21 slidably extending through the ram. Each of the cam follower 20 is connected to a projection 9a on the outer end of connecting plate 9 through a helical spring 24 whereas a roller 25 is rotatably mounted on the lower end of cam follower 20. A rod shaped cam 26 is secured to the main body 1 to cooperate with rollers 25. Cam 26 has a lower wide section 26b and a tapered section 26a.

As the connecting plate 9 is moved in the vertical direction by piston 6 of ram driving cylinder 6, rams 2 and 3 are moved in the vertical direction together with operating rods 21 so that when these members are moved to their lower-most positions rollers 25 will engage the lower enlarged portion 26b of cam 26 to move outwardly the lower ends of cam followers 20 against the action of springs 24. Thus, the operating rods 21 are raised by arms 19 relative to rams 2 and 3. When rollers 25 are disengaged from lower enlarged portion 26b of cam 26 the lower ends of cam followers are rotated inwardly by the action of springs 24, thus lowering operating rods 21 with respect to rams 2 and 3.

Feelers 16 and 17 of the sizing device are projected from and retracted into dressing heads 12 and 13, respectively, by the vertical motion of the operating rods 21 relative to rams 2 and 3. As both dressing heads have identical construction, only lefthand head 12 will be described in detail hereunder with reference to FIG. 2. Thus, feeler 16 is slidably received in a sleeve 27 secured to the lower end of ram 2 at right angles with respect to the longitudinal axis thereof, and a hard tip 28 is secured to the outer end of feeler 16 projecting toward the side surface of the grinding wheel 5. Feeler 16 is formed with a large diameter portion 16a at its center, the large diameter portion having a notch 29 including an inclined surface 29a cooperating with an inclined surface 21a at the lower end of operating rod 21. A casing 30 is secured to the outer side of ram 2 and a compression spring 32 is interposed between a spring seat 31 threadedly connected to casing 30 and the large diameter portion 16a of feeler 16 to urge it against the grinding wheel 5. Further, a detector 33 of the sizing device is

mounted in casing 30 and a pointed contact 33a engaging the outer end of feeler 16 is formed on the inner end of detector 33. A control member 34 including a Schmidt circuit or the like is electrically connected to detector 33 for generating a switching signal adapted to switch the feed between the coarse and fine feeding operations and a sizing signal.

The control member 34 is manufactured by Tokyo Seimitsu Ltd., of Tokyo, Japan, and is widely sold as Delta Model E-MD-P5C-2p.

When operating rod 21 is lowered with respect to ram 2, the inclined surface 21a is urged against the cooperating inclined surface 29a of feeler 16 to retract it against the force of compression spring 32. As ram 2 reaches the lower-most position, and hence operating rod 21 is moved upwardly with respect to ram 2, inclined surfaces 21a and 29a disengage from each other. Consequently, feeler 16 is advanced by spring 32 to urge its hard tip 28 against the side surface of grinding wheel 8 to be dressed. Contact 33a of detector 33 follows this inward movement of feeler 16 to detect the position of the lefthand side surface of the grinding wheel. As the grinding wheel 5 is dressed to width the output from detector 33 causes control member 34 to first generates a coarse-fine feed switching signal and then a sizing signal.

Apparatus for feeding diamond tools 14 and 15 toward and away from the grinding wheel 5 in response to the switching and sizing signals will now be described in connection with the lefthand dressing head 12 shown in FIGS. 2 to 5 inclusive. More particularly, as shown in FIG. 2, the base portion of diamond tool 14 is removably received in the inner end of a feed ram 35 which is disposed in ram 2 beneath feeler 16 and in parallel therewith and the base portion is secured by a set screw 36 threaded into ram 35 which is received in a sleeve 37 inserted in ram 2 to be slidable axially but not rotatable. A compression spring 38 is interposed between a shoulder 37a on the inner side of sleeve 37 and a flange 35a at the inner end of feed ram 35 to normally urge ram 35 toward the left as viewed in FIG. 2 or to the retracted position, thus eliminating the backlash at the threaded connection between feed ram 35 and a feed shaft 39 to be described later. Left-hand screw thread 39a on the inner end of feed shaft 39 which is prevented from moving in the axial direction are threaded into the inner end of feed ram 35, the feed shaft 39 being rotatably journaled in a bearing sleeve 40 secured to casing 30. On the outer end of feed shaft 39 projecting from bearing sleeve 40 and casing 30 is mounted a clutch plate 41 by means of a key 42 to be slidable in the axial direction but not to rotate with respect to shaft 39. On the extreme outer end of shaft 39 are formed right-hand screw threads 39 to receive a clutch operating nut 43 which is connected to clutch plate 41 through a pin 44. Further, a hand operated knob 45 is mounted on the outer end of feed shaft 39. The boss 46a of a ratchet wheel 46 and a ratchet driving disc 47 are rotatably mounted on bearing sleeve 40 in an axially juxtaposed relationship so as to cause the outer end of ratchet wheel 46 to engage or disengage the inner surface of clutch plate 41. A spiral spring 48 is contained in ratchet wheel 46 with its outer end connected to ratchet wheel 46 whereas its inner end to bearing sleeve 40 as best shown in FIG. 5.

As shown in FIG. 5, a pawl 49 is pivotally mounted on ratchet driving disc 47, which is urged to engage teeth 46b formed on the outer periphery of ratchet wheel 46 by means of a spring 50. Ratchet driving disc 47 is normally biased in the counterclockwise direction by means of a restoring spring 51 connected thereto and to casing 30. A detent pawl 52 is pivotally mounted on casing 30 and is urged into engagement with teeth 46b by means of a spring 53. A push button 54 is mounted in casing 30 to be movable in the vertical direction and is normally urged upwardly by means of a spring 55. The lower end of push button 54 is in contact with a projection 47a on the ratchet driving disc 47 whereas the upper end of button 54 projects beyond the upper surface of casing 18 to be operated by a dog 59 of the switching cylinder 56 shown in FIG. 1.

As shown in section, the right hand switching cylinder is mounted on one side of main body 1 and comprises a cylinder 56, a piston 57 contained therein, and the dog 59 adjustably mounted on the lower end of piston rod 58 to engage push button 54 when dressing head 13 is elevated to substantially the upper-most position. Ports 60a and 60b at the upper and lower ends of switching cylinder 56 are communicated with the source of pressurized oil and the reservoir through a transfer valve 61.

The coarse-fine feed switching signal from control device 34 of the sizing device operates transfer valve 61 to supply the pressurized oil into cylinder 56 through lower port 60b to raise piston 57 and hence dog 59 via piston rod 58. The sizing signal from control member 34 operates transfer valve 61 to supply the pressurized oil into cylinder 56 through upper port 60a to lower dog 59. When rams 2 and 3 are raised, push button 54 is depressed by dog 59 to rotate ratchet driving disc 47 in the clockwise direction as shown by an arrow in FIG. 5 so as to rotate ratchet wheel 46 by pawl 49. As a result, feed shaft 39 is rotated by clutch plate 41 to advance feed ram 35 threaded on the threaded portion 39a at the inner end of shaft 39, thus dressing the side surface of grinding wheel by diamond tool 14.

In this case, when piston 57 is in its lower position, the extent of lowering of push button 54 depressed by dog 59 and hence the extent of rotation of ratchet driving disc 47 as well the extent of rotation of ratchet wheel 46 are also large so that feed ram 35 is also advanced largely thus imparting a coarse feed to diamond tool 14. When piston 57 is in its raised state as the extent of depress of push button 54 is small, the advance of feed ram is also small so that a fine feed is applied to diamond tool 14. When depression of push button by dog 59 is released due to lowering of rams 2 and 3, push button 54, is restored to its raised position by spring 55 thus restoring ratchet driving disc 47 by restoring spring 51.

During this motion, although driving pawl 49 slides over teeth 46b as this teeth is being engaged by detent pawl 52, ratchet wheel 46 will not be restored to maintain feed ram 35 and diamond tool 14 in the advanced state.

As shown in FIGS. 2 to 4 a pawl releasing plate cam 62 is rotatably mounted on the boss 46a of ratchet wheel 46, the plate cam being suspended by casing 30 through spring 63. Thus the plate cam 62 is normally biased to rotate in the counter-clockwise direction. An operating arm 62a, cams 62b engaging driving pawl 49 and detent pawl 52 are formed on the outer periphery of the pawl releasing plate cam 62 whereas an annular groove 62c is formed on the inner periphery for receiving a pin 64 secured in boss 46a of ratchet wheel 46. A stop member 62d is secured in annular groove 62c so that when ratchet wheel 46 is rotated in the clockwise direction more than a predetermined angle pin 64 comes to engage stop member 62d to rotate plate cam 62 in the same direction. Consequently, cams 62b depresses pins 52a and 49 respectively to rotate these pawls outwardly thus disengaging them from the teeth 46b of ratchet wheel 46. At this time, ratchet wheel 46 which has been rotated in the clockwise direction up to this time for providing feeding is now rotated in the counterclockwise direction by the force of spiral spring 48 so that the ratchet wheel 46 will be prevented from rotating beyond the predetermined angle. As shown in FIG. 3, casing 30 is also provided with a plate cam operating cylinder 65 which slidably receives a piston 66 and a supporting pin 68 is secured to the lower end of piston rod 67 to support operating arm 62a of plate cam 62. A compression spring 69 is contained in cylinder 65 to normally urge piston 66 downwardly. At the lower end of plate cam operating cylinder 65 is formed a port 70 that is communicated with the source of pressurized oil and the reservoir via a transfer valve 71.

This transfer valve 71 is operated by the sizing signal from the control device 34 to admit the pressurized oil into plate cam operating cylinder 65 via port 70 to raise piston 66 against the force of spring 69 thus rotating the operating arm

62a by pin 68 on the lower end of piston rod 67. Accordingly, the pawl releasing plate cam 62 is rotated in the clockwise direction to rotate detent pawl 52 and driving pawl 49 respectively by cams 62b whereby these pawls are disengaged from teeth 46b of ratchet wheel 46. Then, ratchet wheel 46 which has been rotated in the clockwise direction up to that time for effecting feeding will now be rotated to the original position in the counter clockwise direction by the action of spiral spring 48 with the result that feed shaft 39 is rotated by clutch plate 41 engaging ratchet wheel 46 to retract feed ram 35 and diamond tool 14 to the original position. As a circular groove 73 on the inner surface of an end wall of casing 30 receives a pin 72 on ratchet wheel 46, the restoring motion of ratchet wheel 46 effected by spiral spring 48 is limited by the engagement of pin 72 against one end of groove 73. By the operation of transfer valve 71, the communication between port 70 of plate cam operating cylinder 65 and the source of the pressurized oil is interrupted and the port 70 is now communicated with the oil reservoir. Then piston 66 is lowered by the force of spring 69 so that operating arm 62a is released from pin 68 of piston rod 67. Accordingly, pawl releasing plate cam 62 is rotated in the counterclockwise direction to the original position by the action of suspension spring 63, and detent pawl 52 and driving pawl 49 are released from cams 62b on plate cam 62 so that these pawls are again caused to engage teeth 46b of ratchet wheel 46 by the action of springs 53 and 50.

Since the novel apparatus is symmetrical with respect to grinding wheel 5 the operation of the dressing apparatus will be described hereunder with reference to the lefthand dressing head 12. Before commencing the dressing operation of the side surfaces of the grinding wheel, rams 2 and 3 are in their raised positions as shown by dot and dash lines in FIG. 1. Under these conditions, cam follower rollers 25 are separated from the lower section 26b of rod shaped cam 26, and operating rods 21 are depressed by coiled springs 24 through connecting arms 19 so that inclined surface 21a is engaging the inclined surface 29a of feeler 29a, thus retracting the feeler against the action of compression spring 32. To dress the side surfaces of a newly mounted grinding wheel 5, a cam 26c is mounted on the upper end of rod shaped cam 26 to permit free advancement of feeler 16 and a setting gauge G shown by dot and dash or phantom lines in FIG. 1 is used to adjust the null point of detector 33. Thereafter, cam 26c is removed. Further, in the initial condition, the position of the inner end of diamond tool 14 is adjusted so that the pointed end of the diamond tool 14 slightly penetrates into the side surface of the grinding wheel 5. Such adjustment is provided by loosening clutch operating nut 43 to retract clutch plate 41 to disengage the same from ratchet wheel 46 and then by rotating feed shaft 39 by manually operated knob 45 thereby advancing or retracting diamond tool 14 through feed ram 35. Then clutch plate 41 is caused to engage ratchet wheel 46 and the clutch plate 41 is axially fixed by clutch operating nut 43. The null point adjustment of righthand dressing head 13 and the adjustment of the position of the pointed end of diamond tool 15 at the initial condition are performed in the same manner as above described. The pressurized oil is admitted into switching cylinder 56 through its upper port 60a to descend dog 59.

Under these conditions, when piston 7 of ram driving cylinder 6 is lowered, both rams 2 and 3 are lowered by connecting plate 9 to dress both sides of grinding wheel 5 a definite quantity by diamond tools 14 and 15. When rams 2 and 3 reach their lower-most positions cam follower rollers 25 will engage lower enlarged portion 26 of rod shaped cam 26 whereby feelers 16 and 17 are advanced to cause their hand tips to engage the side surfaces of the grinding wheel. Thus, detector 33 measures the position of the side surface of the grinding wheel. As the rams 2 and 3 reach their lower-most position, the transfer valve 11 is switched to raise both rams 2 and 3. Consequently, cam follower rollers 25 are separated from lower enlarged portion 26b of rod shaped cam 26, and operating rods 21 are moved downwardly by the force of

springs 24 to lock feelers 16 and 17 in their retracted position. When push button 54 comes to engage dog 59 near the uppermost position of rams 2 and 3, a predetermined feed is applied to diamond tools 14 and 15 as above described. At this time, since dog 59 of the switching cylinder 56 is in its lowered position, a coarse feed is imparted to diamond tools 14 and 15. As rams 2 and 3 reach their upper-most position, transfer valve 11 is switched to again lower rams 2 and 3, whereby opposite side surfaces of the grinding wheel 5 are coarsely dressed by diamond tools 14 and 15 and the feelers 16 and 17 detect the positions of side surfaces of the grinding wheel at their lowermost positions. Similarly, in response to the coarse-fine feed transfer signal generated by control member 34 according to the output from detector 33, transfer valve 61 is switched to supply the pressurized oil into switching cylinder 56 through its lower port 60b to raise piston 57 together with dog 59. Thereafter although rams 2 and 3 repeat upward and downward movements as above described, since dog 59 is held in the raised position after transmittal of the coarse-fine switching signal, a fine feed is imparted to diamond tools 14 and 15. When the sizing signal is generated by control member 34 transfer valve 71 is switched to supply the pressurized oil into plate cam operating cylinder 65 through lower port 70 to rotate plate cam 62 in the clockwise direction to rotate outwardly detent pawl 52 driving pawl 49. Consequently, ratchet wheel 46 is rotated in the opposite direction to retract diamond tool 14 to the original position. The dressing operation of the grinding wheel is completed when both side surfaces of the grinding wheel are finished simultaneously to the finish dimension. However, the amount of dressing is not generally equal on both sides so that even when the lefthand surface, for example, has been dressed to the definite dimension, the dressing of the righthand surface will be continued for a while. In this case, as above described, since the pawl of the ratchet wheel on the side which has been dressed to the finish dimension has disengaged, no feed is imparted to the diamond tool on that side. Upon dressing both side surfaces of the grinding wheel to the finish dimension, rams 2 and 3 are stopped at their extreme upper positions to complete the dressing operation of the grinding wheel.

Thus, according to the novel dressing apparatus, the width of the grinding wheel is automatically determined and the dressing operation is performed in two stops, namely the coarse and fine feeds so that the determination of the wheel width can be made efficiently at high accuracies. Moreover, as the feed shaft and the ratchet wheel are coupled through a clutch plate, the feed shaft can be rotated by the operation of the clutch plate to readily set the position of the diamond dressing tool. Further, as the feeler is advanced only when it is used, wear of the tip of the feeler can be minimized.

It is clear that the switching cylinder for switching the coarse and fine feeds can be replaced by a solenoid operated mechanism.

As above described in accordance with this invention, a switching mechanism is provided for switching the feed of the dressing head between coarse and fine feeding conditions so that during the initial stage of the dressing operation the grinding wheel can be dressed at a high speed with the coarse feed and as the width of the grinding wheel approaches the predetermined dimension, the feed is switched to fine feed to dress the side surface at high accuracy.

In addition to the switching mechanism, there is also provided a sizing device which detect the position of the side surface of the grinding wheel being dressed for operating the switching mechanism by the coarse-fine feed switching signal generated by the sizing device to impart a fine feed by the feed means and then retract the diamond tool thus finishing the dressing operation. Thus it is possible to automatically and efficiently dress the side surfaces of the grinding wheel at high accuracies.

What is claimed is:

1. Apparatus for dressing the side surfaces of a grinding wheel rotatably mounted on a wheel head comprising: a pair

of rams slidably mounted on said wheel head on the opposite sides of said grinding wheel, rams driving means mounted on said wheel head for reciprocally moving said rams along said side surfaces, dressing heads respectively mounted on one ends of said rams, dressing tools respectively mounted on said dressing heads to dress said side surfaces, feed means respectively mounted on said dressing heads and actuated by the reciprocating movement of said rams to feed said dressing tools toward the side surfaces of said grinding wheel, and sizing devices respectively mounted on said dressing heads for measuring the position of the side surfaces of said grinding wheel to generate coarse-fine switching and sizing signals when said grinding wheel is dressed to predetermined grinding wheel widths, said sizing signal causing said ram driving means to stop the dressing operation.

2. The apparatus according to claim 1, wherein further comprises switching means mounted on said wheel head for switching coarse and fine feeding conditions in response to said coarse fine switching signal to impart coarse and fine feeds to said dressing tools through said feed means whereby to dress both side surfaces of said grinding wheel with coarse and fine feeds to said predetermined grinding wheel widths.

3. The apparatus according to claim 2, wherein said switching means comprises a cylinder mounted on said wheel head, a piston slidably received in said cylinder to be moved to a predetermined position in response to said coarse fine switching signal for switching said feed means from the coarse to the fine feeding conditions, a piston rod secured to said piston, and a dog fixedly mounted on said piston rod.

4. The apparatus according to claim 3, wherein said feed means comprises a feed shaft rotatably mounted on said dressing head in threaded engagement with said dressing tool for axially feeding the same, a ratchet wheel releasably engaged with said feed shaft and having the teeth formed on the outer periphery thereof, a driving disc rotatably mounted on said dressing head, a push rod slidably mounted on said dressing head for rotating said driving disc in one direction when actuated by said dog in the reciprocating movement of said rams, a restoring spring secured to said driving disc and said dressing head for normally urging said disc in the other direction, a driving pawl pivotally mounted on said disc to be urged into engagement with the teeth by means of a spring, and a detent pawl pivotally mounted on said dressing head to be urged into engagement with the teeth by means of a spring.

5. The apparatus according to claim 4, wherein further comprises a clutch plate slidably mounted on said feed shaft for releasably engaging with said ratchet wheel, a clutch operating not threadedly engaged with said feed shaft for axially moving said clutch plate, and a knob secured to said feed shaft for manually moving said dressing tool.

6. The apparatus according to claim 4, wherein further comprises a plate cam rotatably mounted on said ratchet wheel and having cams thereon for rotating outwardly said detent and said driving pawls relative to the outer periphery of said ratchet wheel, an actuator mounted on said dressing head for rotating said plate cam in response to said sizing signal, and a spiral spring secured to said ratchet wheel at one end thereof and to said dressing head at the other end thereof to be resiliently biased by the rotation of said ratchet wheel, whereby said ratchet wheel is rotated by the resilient force of

said spiral spring in the other direction to retract said dressing tool from said grinding wheel.

7. The apparatus according to claim 1, wherein said sizing device comprises a feeler slidably mounted on said dressing head for contacting with the side surface of said grinding wheel at one end thereof to measure the position of the side surface of said grinding wheel, said feeler having an enlarged portion thereon on which a notch including an inclined surface is formed, a spring interposed between said dressing head and said enlarged portion for resiliently urging said feeler against said grinding wheel, an operating rod slidably mounted on said ram and having an inclined surface at one end thereof for retracting said feeler relative to said grinding wheel by the cooperating engagement with the inclined surface of said feeler, actuating means for retracting said operating rod from said notch for permitting said feeler to be moved toward said grinding wheel by said spring, and a detector mounted on said dressing head for detecting the displacement of said feeler to generate said coarse fine switching and sizing signals.

8. The apparatus according to claim 7, wherein said actuating means comprises a cam mounted on said wheel head, a cam follower pivotally mounted on said ram and operably connected to said operating rod for retracting said operating rod from said notch by the cooperating engagement with said cam, and a spring for normally urging said operating rod into said notch.

9. The apparatus according to claim 7, wherein said switching means comprises a cylinder mounted on said wheel head, a piston slidably received in said cylinder to be moved to a predetermined position in response to said coarse-fine switching signal for switching said feed means from the coarse to the fine feeding conditions, a piston rod secured to said piston, and a dog fixedly mounted on said piston rod.

10. The apparatus according to claim 9, wherein said feed means comprises a feed shaft rotatably mounted on said dressing head in threaded engagement with said dressing tool for axially feeding the same, a ratchet wheel releasably engaged with said feed shaft and having the teeth formed on the outer periphery thereof, a driving disc rotatably mounted on said dressing head, a push rod slidably mounted on said dressing head for rotating said driving disc in one direction when actuated by said dog in the reciprocating movement of said rams, a restoring spring secured to said driving disc and said dressing head for normally urging said disc in the other direction, a driving pawl pivotally mounted on said disc to be urged into engagement with the teeth by means of a spring, and a detent pawl pivotally mounted on said dressing head to be urged into engagement with the teeth by means of a spring.

11. The apparatus according to claim 10, wherein further comprises a plate cam rotatably mounted on said ratchet wheel and having cams thereon for rotating outwardly said detent and said driving pawls relative to the outer periphery of said ratchet wheel, an actuator mounted on said dressing head for rotating said plate cam in response to said sizing signal, and a spiral spring secured to said ratchet wheel at one end thereof and to said dressing head at the other end thereof to be resiliently biased by the rotation of said ratchet wheel, whereby said ratchet wheel is rotated by the resilient force of said spiral spring in the other direction to retract said dressing tool from said grinding wheel.

* * * * *