Dec. 25, 1962 G. T. GILMORE 3,069,819

GRINDING MACHINE

Filed Oct. 1, 1959 4 Sheets-Sheet 1

Fig. 1

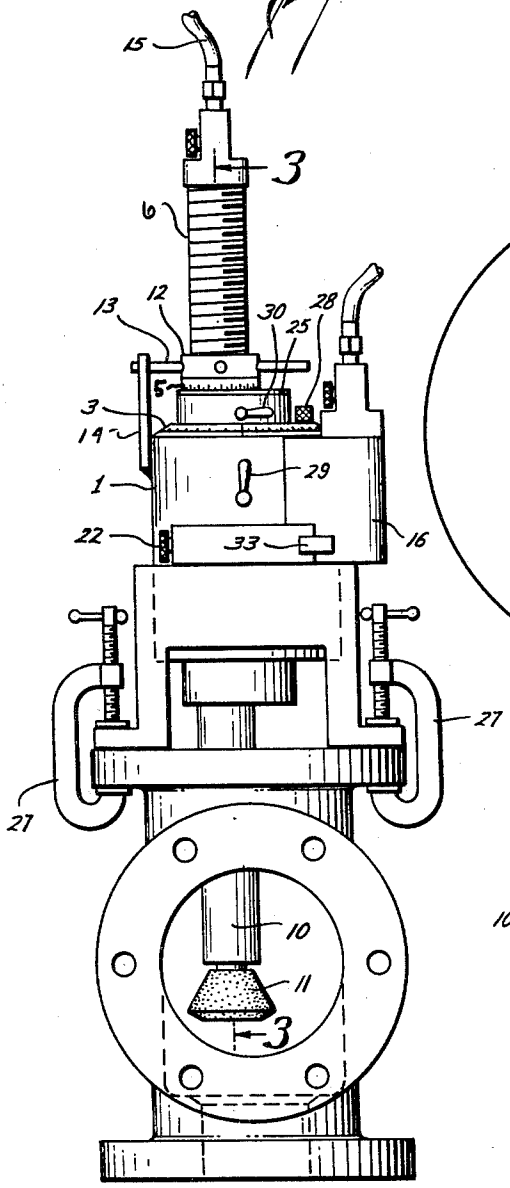


Fig. 2

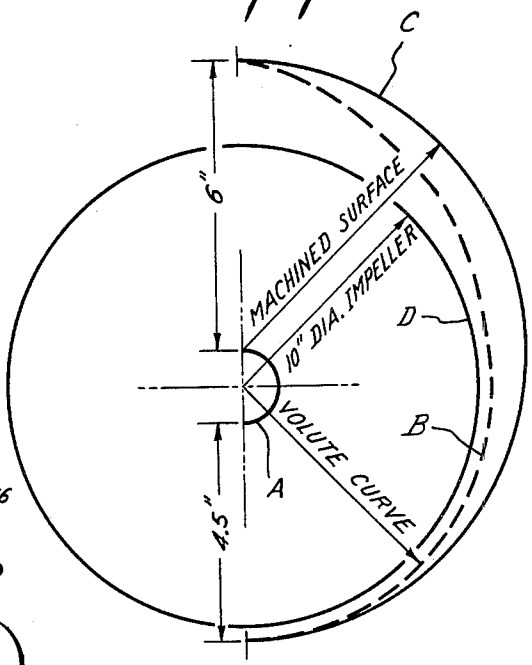
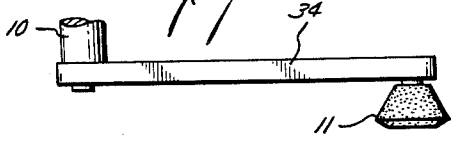


Fig. 7



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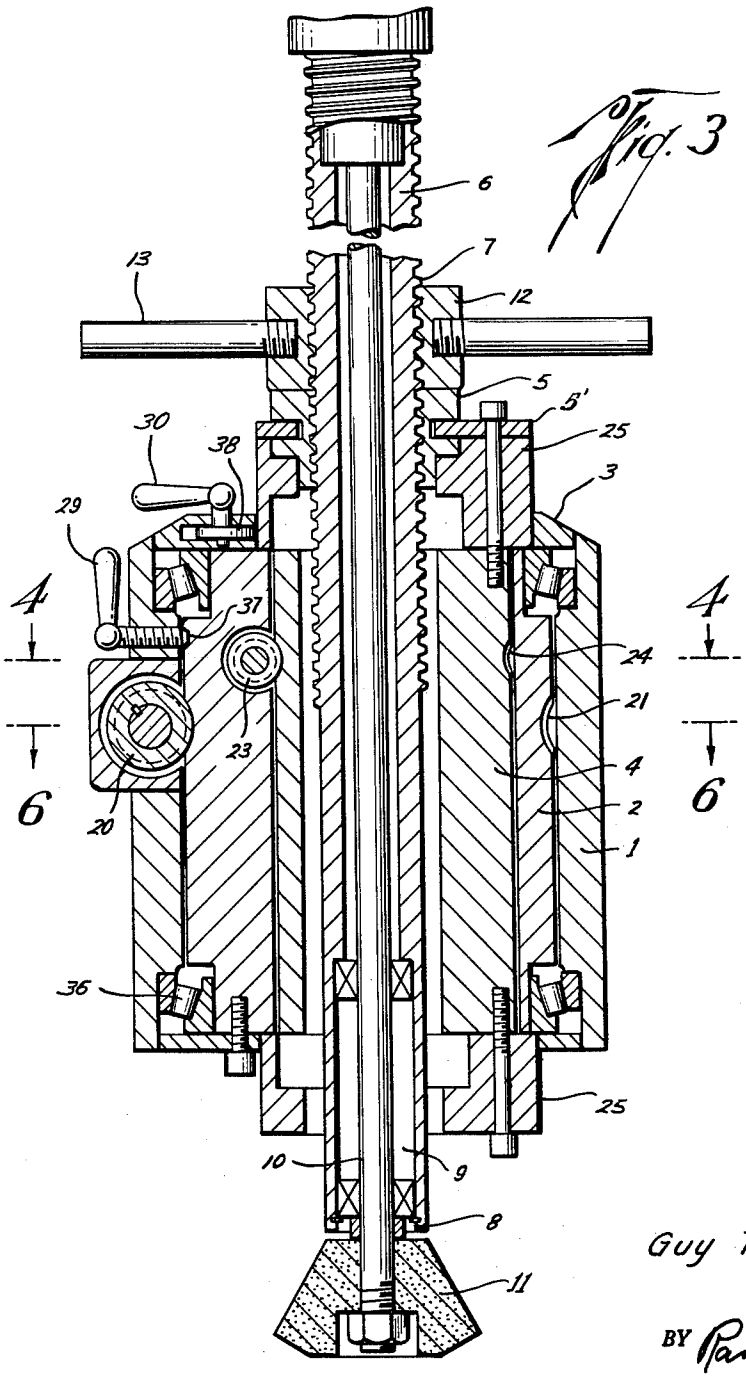
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GRINDING MACHINE

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Fig. 3



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GRINDING MACHINE

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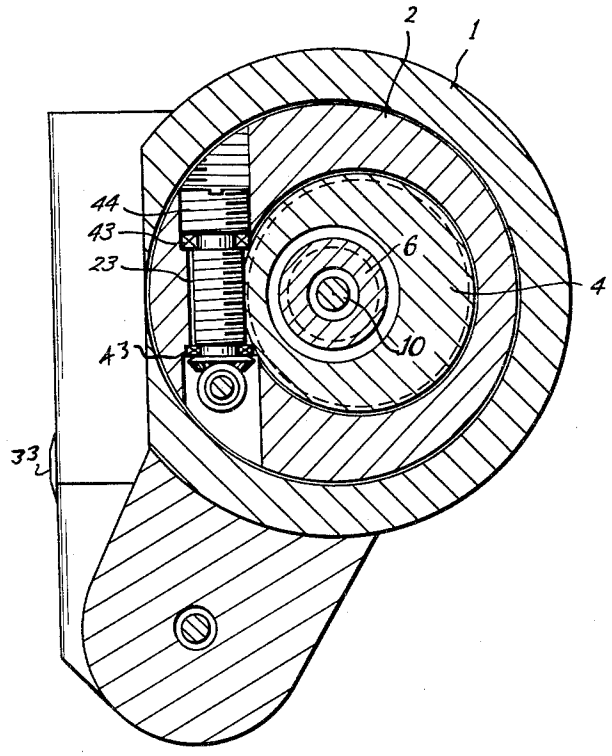


Fig. 4

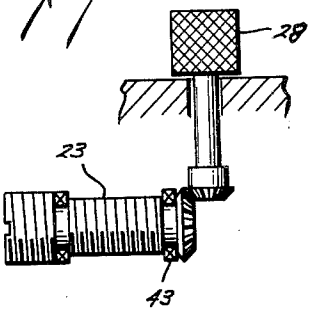


Fig. 5

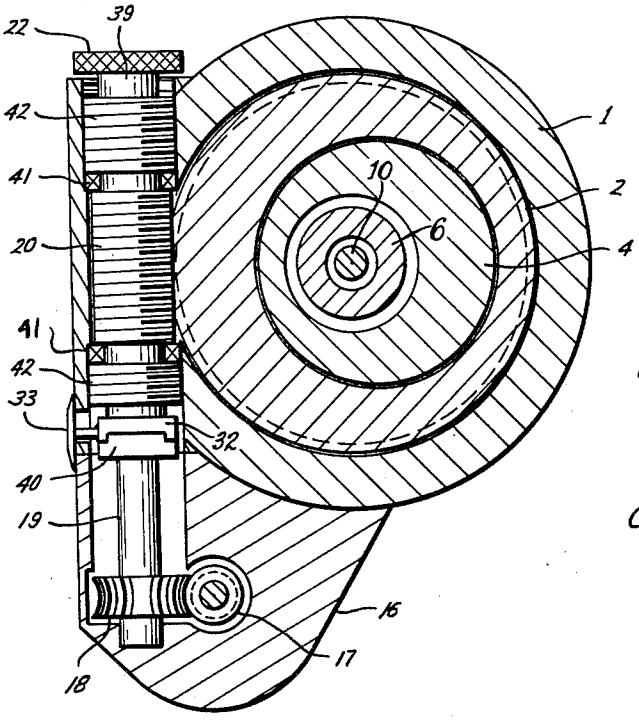


Fig. 6

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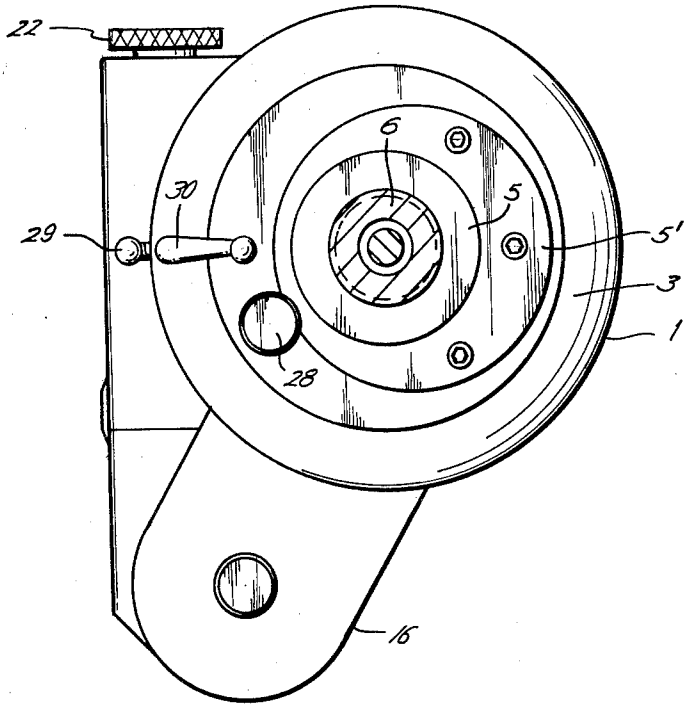
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GRINDING MACHINE

Filed Oct. 1, 1959 4 Sheets-Sheet 4

Fig. 8



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United States Patent Office 3,069,819 Patented Dec. 25, 1962

3,069,819
GRINDING MACHINE

Guy T. Gilmore, Corpus Christi, Tex., assignor, by direct and mesne assignments, to Gilmore Industrial Grinders, Inc., a corporation of Texas

Filed Oct. 1, 1959, Ser. No. 843,714
15 Claims. (Cl. 51—245)

This invention relates to new and useful improvements in a grinding machine.

It is an object of this invention to provide a machine for boring or grinding surfaces that can not be reached by ordinary boring or grinding machines such as the standard lathes, boring mills or grinders.

It is another object of the invention to provide a portable tool that may be readily applied to the object needing the work without the necessity of bringing the work into a shop. It is often necessary to grind a valve seat in a valve in a pipe line and it is an object of this invention to bring the machine to the pipe line and to grind the valve seat without removing the valve from the pipe line.

It is another object of the invention to provide a boring and grinding machine having novel means for rotating the head on an outer eccentric and rotating the cutter on an inner eccentric with means for varying the eccentrics.

It is still a further object of the invention to provide a boring and grinding machine that may be applied directly to the work in the field or that may be employed in a standard lathe, boring mill or grinder.

With the above and other objects in view, the invention has relation to certain novel features of construction, operation and arrangement of parts more particularly defined in the following specifications and illustrated in the accompanying drawings, wherein:

FIGURE 1 is a side elevational view of the device as applied to a valve in a grinding of the valve seat.

FIGURE 2 is a diagrammatic view illustrating several cutter paths to which the machine may be adjusted.

FIGURE 3 is a side elevational view, in cross section, of the device.

FIGURE 4 is a cross sectional end view taken on the line 4—4 of FIGURE 3.

FIGURE 5 is a fragmentary view of the manual adjustment means for determining the degree of eccentricity of the outer eccentric.

FIGURE 6 is a cross sectional end view taken on the line 6—6 of FIGURE 3.

FIGURE 7 is a fragmentary view showing an extension employed to obtain cuts at greater diameters, and

FIGURE 8 is a cross sectional end view taken on the line 8—8 of FIGURE 3.

Referring now more particularly to the drawings, the numeral 1 designates a housing in which is rotatably mounted the head 2 having suitable bearings as 36, 36 and having the marked cap 3, which may be provided with the degree markings of a circle. Eccentrically mounted in the head 2 is the outer eccentric having an intermediate body 4 which is maintained in the head by the end sections 25, 25, one of which has suitable markings to assist in adjusting the degree of eccentricity, if desired, such as in one-hundredths of an inch for an area of one and one-half inches. Eccentrically mounted on the uppermost end section 25 of the outer eccentric 4 is the inner eccentric 5 which acts as a thrust bearing in which the drive shaft housing 6 is mounted. The member 5 is grooved to receive the thrust plate 5' so that the plate 5' may rotate freely with respect to the member 5. The drive shaft housing 6 is externally threaded from its outwardly extended upper end to a point approximately midway of the ends thereof, as at 7, and the opposite, or lower end, when the device is in the

position shown in FIGURE 1, is internally enlarged as at 8 to receive suitable bearings as 9. A drive shaft 10 extends through the drive shaft housing 6 and a suitable cutter as 11 is mounted on the extended lower end thereof, of a size and shape selected for the work. A thrust nut 12 is mounted on the housing 6, and the nut 12 may be provided with suitable markings to aid in adjusting the degree of vertical thrust desired. Suitable star extensions as 13, 13 may be provided to automatically feed the housing 6 to the work, if desired. Suitable means, such as the extended bar 14, may be mounted on the housing 1 to manipulate the star thrust, as shown in FIGURE 1.

Locking means for locking the head 2 against rotation may be provided such as the locking lever 29 mounted in the housing 1, which bears against the shoe 37 to move it against or release it from pressure against the head 2. The cam locking lever 30, mounted in the cap 3, bears against a shoe, as the fiber shoe 38, moving same against or releasing same from pressure against the outer eccentric 4.

Suitable driving means such as an air motor (not shown) may be mounted in the upper end of the housing 6 and driven by air from a compressor, or the like, through the feed line 15 to rotate the drive shaft 10 and a similar motor (not shown) may be mounted in the motor housing 16 to rotate the head 2. Suitable gear connections as the gear 17, rotated by the driving means in the housing 16, which is in mesh with the gear 18, rotates the drive shaft 19, clutch 40, shaft 39 and worm gear 20, which is in mesh with a ring gear 21 on the head 2, provides means for rotating the head 2. The gear 20 is keyed, or otherwise secured, to the shaft 39 and suitable bearings as 41, 41 are maintained against the worm gear 20 by means of thrust nuts as 42, 42. Manual means for rotating the head 2 are provided such as the screw 22 which rotates the worm gear 20 which is in mesh with the ring gear 21 on the head 2. A clutch 32 connects the gear 20 with the shaft 19 and when it is desired to manually rotate the head 2 by means of the screw 22, the clutch control lever 33 is employed to disengage the clutch 32 from the shaft 19. Means for manually rotating the outer eccentric 4 are provided as the adjusting screw 28 which turns the gear 23 which is in mesh with the gear 24 on the outer eccentric 4. Suitable bearings as 43, 43 maintain the gear 24 in position and are in turn maintained in position by the thrust nuts 44.

When it is desired to employ the device in grinding a valve seat in a valve located in a pipe line, or the like, the device may be bolted or clamped to the valve, as shown in FIGURE 1, by means of suitable clamps as 27, 27 and the outer eccentric 4 adjusted to the circumference of the valve seat to be ground by means of the adjusting screw 28, and the nut 12 rotated to lower the cutter 11 onto the work. The drive shaft 10 is then rotated to rotate the cutter 11 and the housing 2 rotated at a much slower speed to move the cutter over the entire work. If desired, the vertical feed of the shaft 10 may be controlled manually through the nut 12, or automatically by use of the star extensions 13. Where it is desired to grind work such as an impeller volute, a volute curve path is formed for the cutter by adjusting the head 2 to the position "0." The outer eccentric 4 is also set to the position "0" and the manual adjustment screw 28 is rotated to feed the cutter 11 to the work. The head is rotated simultaneously with the outer eccentric 4 at a rate of fifteen degrees to every one-hundredths of an inch of rotation of the outer eccentric 4, so that the cutter 11 will form the volute curve as indicated by B in FIGURE 2.

If desired, horizontal extensions 34 may be mounted on the drive shaft 10 and the cutter 11 employed at greater

diameters such as in grinding heat exchange head seats.

In employing the device for gun drilling, the air motor in the housing 6 is removed; a gun drill is placed in the housing 6 with suitable bushings between the inner wall of the housing 6 and the drill, and the machine is secured to a lathe. The members 2 and 4 respectively are then adjusted so that the outer eccentric mounting is at the positon "0," which places the housing 6 concentric with the head 2, and a suitable motor is employed to rotate the drill and as the head rotates at a speed of about five revolutions per minute, the nut 12 may be adjusted to feed the drill to the work.

To cut on the path indicated as "C" in FIGURE 2, the head is set at the position "0" and the outer eccentric 4 is set at the position "0," and the head is locked in position by the lock 29. The outer eccentric 4 is rotated manually by the adjusting screw 28 for a distance of one hundred eighty degrees, which will move the cutter on a path as indicated by C, and the drive shaft 10 rotates the cutter to effect the cut.

While the foregoing is considered a preferred form of the invention, it is by way of illustration only, the broad principle of the invention being defined by the appended claims.

What I claim is:

1. In a grinding device, a housing, a head rotatably mounted in said housing, means for rotating said head, means for adjusting the pattern of rotation of said head having a ratio of from 0 to 360 degrees, an outer eccentric rotatably and eccentrically mounted in said head, an inner eccentric rotatably and eccentrically mounted in said outer eccentric, a drive shaft housing extending through said head and rotatably mounted in said inner eccentric, said drive shaft housing being externally threaded on the upper portion thereof to a point midway the ends thereof, said housing being movable longitudinally within the said inner eccentric, a drive shaft in said drive shaft housing, a cutter on one end of said drive shaft and a rotating means on the other end thereof.

2. In a grinding device, a housing, a head rotatably mounted in said housing, means for rotating said head, an outer eccentric rotatably and eccentrically mounted in said head, an inner eccentric rotatably and eccentrically mounted in said outer eccentric, a partially externally threaded drive shaft housing movable vertically through said head and being rotatably mounted in said inner eccentric, a cutter on said drive shaft, means engaging the said external threads on said drive shaft housing for feeding the cutter to the work, a drive shaft in said drive shaft housing, a cutter on one end of said drive shaft, a rotating means on the other end thereof and a clutch controlled means trnasmitting said rotation to said head and outer eccentric and means for disengaging said rotating means from said clutch and selectively manually adjusting the pattern of rotation of said head and outer eccentrics.

3. In a grinding device, a housing, a head rotatably mounted in said housing, means for rotating said head, an outer eccentric rotatably and eccentrically mounted in said head, means for selectively manually locking said head and outer eccentric, respectively, against rotation, an inner eccentric, a partially externally threaded drive shaft housing being longitudinally movable through said head and said drive shaft housing being rotatably mounted in said inner eccentric, a drive shaft in said drive shaft housing, a cutter on one end of said drive shaft and a rotating means on the other end thereof and means cooperating with the external threads on said drive shaft housing for feeding said cutter to the work.

4. In a grinding device, a housing, a head rotatably mounted in said housing, means for rotating said head and adjusting the pattern of rotation thereof, an outer eccentric housing rotatably and eccentrically mounted in said head, means for adjusting the pattern of rotation thereof, an inner eccentric housing rotatably and eccentrically mounted in said outer eccentric housing and an elongated and partially externally threaded housing extending through said head and being rotatably mounted in said inner eccentric housing and on which a cutting tool may be mounted, and means cooperating with said external threads on said last mentioned housing to feed said housing to the work.

5. In a grinding device, a housing, a head rotatably mounted in said housing, means for rotating said head, an outer eccentric rotatably and eccentrically mounted in said head, an inner eccentric rotatably and eccentrically mounted in said outer eccentric, and an elongated and externally threaded cutting tool housing movable vertically through said head and being rotatably mounted in said inner eccentric on which a cutting tool may be mounted, and means actuated by the rotation of said outer housing for rotating said cutting tool housing and vertically feeding the cutting tool to the work.

6. In a grinding device, a housing, a head rotatably mounted in said housing, means for rotating said head, an outer eccentric rotatably and eccentrically mounted in said head, an inner eccentric rotatably and eccentrically mounted in said outer eccentric, an elongated and externally threaded drive shaft housing extending through said head and being rotatably mounted in said inner eccentric, a drive shaft in said drive shaft housing, a feeding means on one end of said drive shaft housing, a cutter on one end of said drive shaft, a rotating means on the other end thereof and means cooperating with the external threads of said drive shaft housing for intermittently rotating said feeding means and vertically feeding the cutter to the work.

7. In a grinding device, a housing, a rotatable head in said housing, means for rotating said head, a plurality of housings rotatably and eccentrically mounted in said head, means for adjusting the relative positions of said housings within said head, a drive shaft housing axially mounted in the innermost of said housings, the upper portion of said drive shaft housing being externally threaded and in threaded connection with said innermost housing, a drive shaft rotatably mounted in said drive shaft housing, a cutter on one end of said drive shaft means, and means for causing longitudinal movement of said drive shaft housing.

8. In a grinding device, a housing, a rotatable head in said housing, a rotating means mounted in said housing, a rotatable outer eccentric housing in said head, a manually detachable gear connecting said rotatable head with said rotating means, an inner rotatable housing within said outer rotatable housing and mounted eccentrically therein, manually operable adjusting means for adjusting the position of said outer housing within said outer rotatable head, a drive shaft housing mounted in said inner housing, a drive shaft in said drive shaft housing, rotating means mounted on one end of said drive shaft housing and in rotatable connection with said drive shaft and a grinding means mounted on the other end of said drive shaft, the upper portion of said drive shaft housing being externally threaded and mounted through said rotatable head, a drive shaft housing feeding means mounted on said drive shaft housing in mesh with said external threads on said drive shaft housing for feeding said drive shaft housing vertically through the head as the said head rotates.

9. In a grinding device, a housing, a rotatable head in said housing, an air driven rotating means mounted in said housing, a rotatable outer eccentric housing in said head, a manually detachable gear connecting said head with said rotating means, an inner rotatable housing within said outer rotatable housing and mounted eccentrically therein, manually operable adjusting means for adjusting the position of said outer housing within said head, a drive shaft housing eccentrically mounted in said inner housing, a drive shaft in said drive shaft housing, air driven rotating means mounted on one end of said drive shaft housing and in rotatable connection with said drive shaft and a grinding means mounted on the other end of said drive

shaft, the upper portion of said drive shaft housing being externally threaded and mounted through said rotatable head, a drive shaft housing feeding means mounted on said drive shaft housing for feeding said drive shaft housing vertically through the head as the drive shaft housing rotates and independent locking means for selectively locking said outer rotatable housing and said head against rotation.

10. In a grinding device, a housing, a head rotatably mounted in said housing, means for rotating said head, an outer eccentric rotatably and eccentrically mounted in said head, an inner eccentric rotatably and eccentrically mounted in said outer eccentric, an elongated and externally threaded innermost housing extending through said head and being rotatably mounted in said inner eccentric in which a grinding wheel may be mounted and means for rotating said innermost housing and vertically moving said innermost housing through the head and feeding the grinding wheel to the work.

11. In a grinding device, a housing, rotatable head in said housing, a power driven rotating means mounted in said housing, a rotatable outer eccentric housing in said head, a detachable gear connecting said head with said rotating means, an inner rotatable housing within said outer rotatable housing and mounted eccentrically therein, manually operable adjusting means for adjusting the position of said outer housing within said head, a drive shaft housing mounted in said inner housing, a drive shaft in said drive shaft housing, a rotating means mounted on one end of said drive shaft housing and in rotatable connection with said drive shaft and a grinding means mounted on the other end of said drive shaft, the upper portion of said drive shaft housing being externally threaded and mounted through said rotatable head, a drive shaft housing feeding means mounted on said drive shaft housing for feeding said drive shaft housing vertically through the head as the drive shaft housing rotates.

12. In a grinding device, a housing, a head rotatably mounted in said housing, means for rotating the head, an outer eccentric rotatably and eccentrically mounted in the head, means for rotating said outer eccentric and an inner eccentric rotatably and eccentrically mounted in the outer eccentric, a drive shaft housing movable longitudinally through said head and a drive shaft in said drive shaft housing, rotating means on one end of said drive shaft and a working tool on the other end thereof.

13. In a grinding device, a housing, a head rotatably mounted in said housing, means for rotating the head, an outer eccentric rotatably and eccentrically mounted in the head, means for rotating said outer eccentric and an inner eccentric rotatably and eccentrically mounted in the outer eccentric, a drive shaft housing extending axially through said head and said inner eccentric, a drive shaft within the drive shaft housing, means mounted on the drive shaft housing and connected to the drive shaft for rotating same, means for moving the drive shaft housing longitudinally through said head as the head rotates and a cutter on the end of the drive shaft.

14. In a grinding machine, a housing adapted for connection to a workpiece, a head rotatably mounted in the housing, means for rotating the head, indexing means on the housing and head to determine the rotative position of the head with respect to the workpiece, an outer eccentric rotatably and eccentrically mounted in the head, means for rotating the outer eccentric, an inner eccentric rotatably and eccentrically mounted in the outer eccentric, a rotatable drive shaft having a cutter at one end, means for mounting the drive shaft for rotation and longitudinal movement within the inner eccentric.

15. In a boring and grinding machine, a housing adapted for connection to a work piece, a head rotatably mounted in the housing, power means and disengageable manual means for rotating the head, indexing means on the housing and head to determine the rotative position of the head with respect to the workpiece, an outer eccentric rotatably and eccentrically mounted in the head, means for rotating the outer eccentric, an inner eccentric rotatably and eccentrically mounted in the outer eccentric, a drive shaft having a cutter at one end, means for mounting the drive shaft for rotation and longitudinal movement within the inner eccentric.

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