

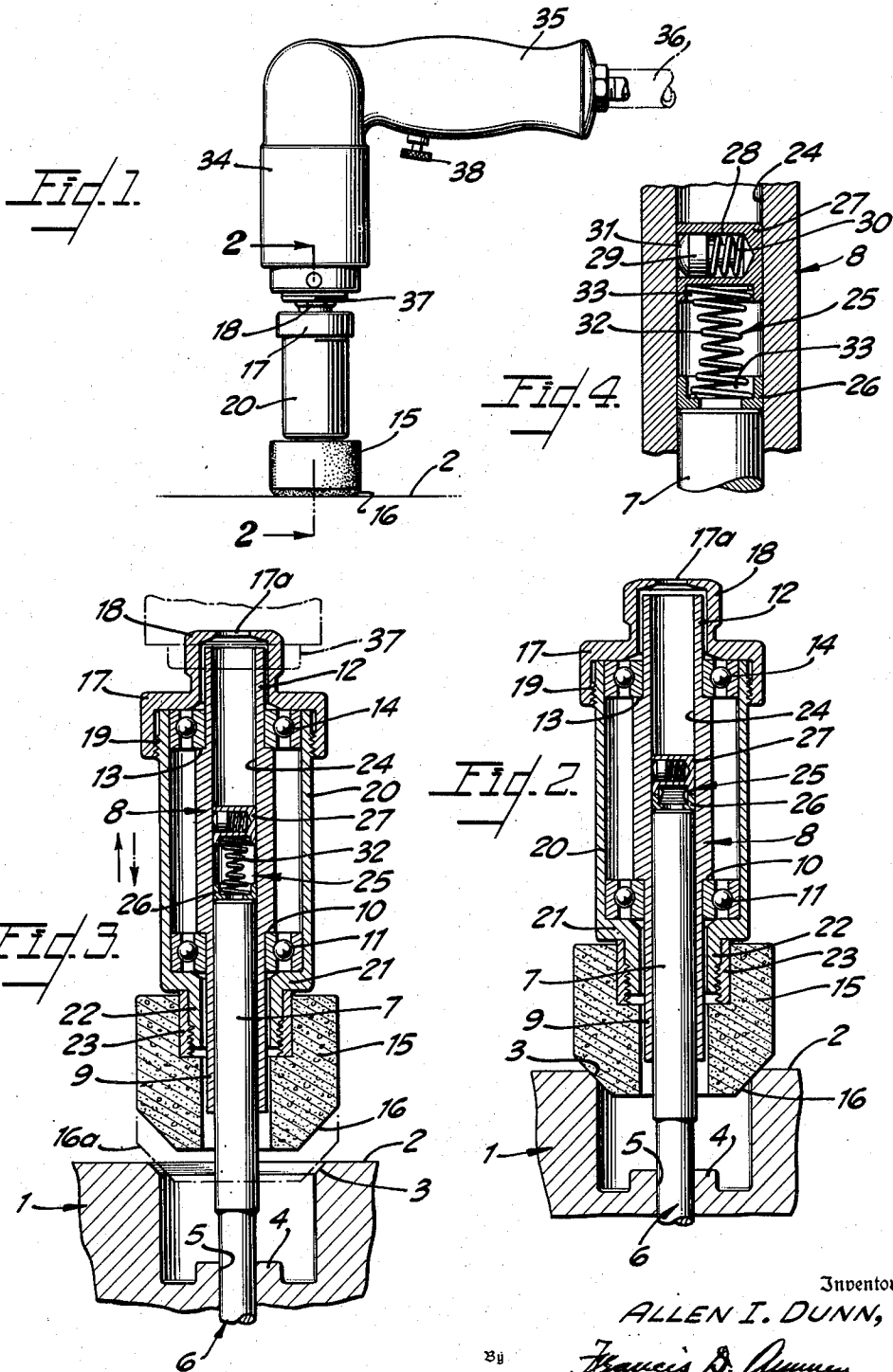
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VALVE SEAT GRINDING MEANS

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VALVE-SEAT GRINDING MEANS

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This invention relates to mechanism for grinding valve-seats or the like, and is particularly useful for grinding valve-seats of internal combustion engines, for example, automobile engines.

In grinding valve-seats, it is the common practice to remove the valve and its stem from the cylinder block or head in which the valve-seats are located, and to insert the shank of an arbor of either the tapered or expanding type in the bore of the valve stem guide. The body of the arbor above the shank, is of a uniform diameter and sufficiently long to project a considerable distance above the valve-seat to be serviced. In effecting the grinding operation, a portion of the mechanism is supported on this arbor, with the rotary grinder wheel in contact with, or touching, the valve-seat. The grinder is usually rotated through the agency of a motor. The driving means is usually attached by a driving connection to the upper end of the grinder assembly. The operator pushes down on the motor, which in turn bears down against the grinder assembly below it, thus applying pressure between the grinding wheel and the valve-seat. This movement is preferably intermittent, so that after each contact is effected with the seat, the grinder is raised slightly. This allows the cuttings to free themselves from the wheel; also eliminates all contact during acceleration or deceleration, which is very desirable.

All valve seat grinders in present use are of one of two types, either detachable or non-detachable. In the former a drive from the motor is accomplished, but heretofore no means has been provided to raise the grinding wheel off the seat, and hence intermittent grinding movement is impossible.

In the latter, the motor and grinder assembly are non-detachably connected, which loses the advantage of being able to raise the grinding wheel at will. This disadvantage is aggravated by the fact that since several different types of grinding wheels should often be used on the same valve-seats, for example, a roughing wheel, a finishing wheel and a wheel of a different angle for narrowing the seat, usually on the top side, the process of changing wheels on the grinding assembly adds materially to the time consumed in doing a "valve job." In fact, rather than take this additional time, the temptation to be content with an inferior job usually prevails, simply because convenient wheel changing is impossible.

One object of this invention is to provide a means of obtaining the advantages of both the detachable and non-detachable type of grinders, which to my knowledge is entirely novel.

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Another object of this invention is to provide a grinder assembly having a combination of parts, which will operate, in a sense, as a "pilot," for finding the proper level for the grinding assembly, and for supporting the same at that level.

The grinder unit involved in this invention, includes an inner sleeve having a bore that telescopes over the arbor referred to, and the driving head and the rotary grinder are rotatably supported on this sleeve. One of the objects of this invention is to provide means mounted within the bore of the sleeve, for holding the sleeve, against any substantial amount of rotation; that is to say, the rotation of the sleeve is not positively prevented, but prevented by a frictional force.

Another object of the invention is to provide frictional resistance within the sleeve of the grinder assembly, which is of such construction that it can be readily adapted, if desired, to permit a slight rotation of the sleeve to attain the advantage of increased accuracy in the centering of the ground seat, which will result from the occurrence of such slight rotation.

Another object of the invention is to produce a friction device capable of being inserted in the bore of the sleeve of a grinder unit of the type referred to, which includes means for seating itself upon the upper end of the arbor on which the grinder unit is centered, and which also includes means for developing frictional resistance against the inner face of the bore of the sleeve for the general and specific purposes referred to above, and for such purposes as will appear in the following specification.

Further objects of the invention will appear hereinafter.

The invention consists in the novel parts and combinations of parts to be described hereinafter, all of which contribute to produce an efficient valve-seat grinding means.

A preferred embodiment of the invention is described in the following specification, while the broad scope of the invention is pointed out in the appended claims.

In the drawings:

Fig. 1 is a side elevation illustrating a grinder mechanism embodying my invention, and representing also a handled motor with a driving connection to the same, and indicating in dotted lines the end of a compressed air hose such as may be used in case the motor is driven by compressed air.

Fig. 2 is a vertical section taken on the line 2-2 of Fig. 1, through the mechanism embodying my invention, and illustrating the same ap-

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plied over the arbor that is staked in the valve stem guide in the upper end of a cylinder block, the body of which is broken away. In this view the parts of my invention that are located in the bore of the sleeve, are represented in the relation that they will have when the grinder assembly has been applied to the arbor and forced downwardly on the same until the grinding face of the rotary grinder contacts the valve-seat that it is to grind.

Fig. 3 is a view similar to Fig. 2, showing all the same parts, but illustrating the friction device that I employ within the bore of the sleeve in its extended or normal position, at which time it holds the body of the grinder assembly and the rotary grinder in an elevated position with the rotary grinder at a considerable distance above the valve-seat.

Fig. 4 is a fragmentary view, and is a vertical section upon an enlarged scale, taken through a portion of the sleeve of the grinder assembly, and illustrating more in detail the construction of the friction device that I employ in the bore of the grinder sleeve; and this view shows the upper end of the arbor broken away, with the lower portion of the friction device resting upon the same.

Referring more particularly to the parts, I indicate a portion of a cylinder block, or head, or other housing in which a valve chest is formed, and presenting a face 2 at which valve-seats are formed, such as the seat 3 shown in Figs. 2 and 3. The usual valve stem guide 4 is illustrated, with a bore 5 for the valve stem.

It is common practice to insert an arbor in this guide bore 5, for which purpose I employ an arbor with a tapered shank 6 that fits tightly in the bore 5, and which is provided above with a straight, round, or cylindrical body 7. On this body 7 the grinder assembly is mounted, and of course this arbor functions as a guide for the inner sleeve 8 of the grinder assembly, the bore 24 of which fits neatly on it. The lower end of this inner sleeve 8 is of reduced diameter to form a downwardly extending neck 9 so that a bearing shoulder 10 is formed at the lower end of the body of the sleeve, at which a bearing is placed, preferably a ball bearing 11.

The upper end of the sleeve has a similar reduced neck 12 so that a bearing shoulder 13 is formed, at which a ball bearing 14 is mounted.

Adjacent to the seat 3 a rotary grinder 15 is supported for rotation on the bearings 11 and 14. This grinder is in the form of a small wheel or burr, the lower end of which has a conical face 16 on the taper that is desired for seat 3, and this taper is of course usually the same as the taper of the seat when the grinder unit is to perform a re-grinding job.

Permanently cemented in the upper end of this grinding wheel 15 is an internally threaded bushing 23, which fits onto the externally threaded nipple 22 which constitutes, through the horizontal wall 21, an extension of the outer shell or casing 20 of the grinder assembly. At the upper end of this shell 20, externally formed threads 19 provide a mounting for the internally threaded cap 17, on the upper end of which is formed a polygonal (preferably hex) coupler head 18, over which a coupling socket of similar shape projecting from the output shaft of the driving motor, can be placed at will for rotating the assembly.

The bore 24 of the inner sleeve 8, fits neatly to the diameter of the body of the arbor 7, and tele-

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scopes over it when the grinder assembly is put in place for a grinding operation. In this bore 24 I provide means for enabling the grinder assembly to set itself automatically, as it were, at the proper level to enable the grinder wheel to engage the seat 3 on application of downward pressure of the motor against the grinder assembly, and to lift the grinder assembly away from the seat, when the operator raises the motor. This means that I employ within the bore 24, is indicated generally by the reference numeral 25, and this assembly 25 constitutes frictional means not only for accomplishing the purpose of setting the grinder wheel 15 at the proper level, but also operates to develop a frictional resistance against the face of the bore 24 so as to hold the inner sleeve against rotation when the driving head 18 rotates the outer sleeve 20 and the grinder wheel at a high speed. In my invention the rotary grinder is supported so that it is "floating" over the valve-seat, that is to say, it is freely movable up or down.

Fig. 2 shows the assembly 25 in a collapsed condition, which it will have if it has been placed in the lower end of the bore 24 when the grinder assembly is applied and pushed down over the arbor 7. This friction device 25 includes a base 26 which is adapted to rest upon the upper end of the arbor body 7, and includes also the head 27 that fits neatly within the bore 24. The construction at the head 27 provides means for developing lateral pressure against the face of the bore 24, and in order to accomplish this, I prefer to provide a small bore or drilled socket 28 that is drilled into the side of this head 27; and in this socket a friction head 29 fits, that is forced outwardly by a coil spring 30 seated at the bottom of the socket. This small friction head 29 may be provided with a convex tip 31 on a small radius, preferably equal to the radius of the bore 24, where it thrusts against the wall of the bore. Although this spring is a small spring, it exerts considerable force, and this force is sufficient to support the weight of the grinder assembly.

Between the base member 26 and the friction head 27, resilient means in the form of a coil spring 32 is provided, and the ends of this spring are secured respectively to the base member and to the under side of the friction head 27, and are set in counterbores 33 that center the end wraps of the coil. These wraps are brazed or otherwise secured to these parts. This spring is preferably of hourglass type so as to prevent its wraps at its waist, from interfering with the free collapsing of this spring.

As already stated above, when the grinder assembly is applied over the body 7 of the arbor, this friction device 25 is inserted in the lower portion of the bore 24, that is to say, it is far enough down in the bore to insure that when the grinder assembly is pushed down far enough to bring the tapered face 16 against the seat 3, the upper end of the arbor body will stop the downward movement of the base member or spring seat 26 and cause the compression of the spring 32 against the friction head 27, as illustrated in Fig. 2. Then when the grinder assembly is released, the spring 32 will extend itself as indicated in Fig. 3, and this will lift the grinder assembly to a considerably elevated position above the seat 3 by reason of the substantial frictional force that is developed at the friction head 29 against the face of the bore 24. So, when the grinding operation is ready to be accomplished, the grinder assembly will be supported above the seat 3. This is

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the normal position for the grinder when the grinding operation starts.

Any suitable means may be employed for rotating the driving head 17 at a high speed. There are several types of driving heads, some of which include an electric motor, and others of which include a small motor operated by compressed air. This is the type of driving device illustrated in Fig. 1, which includes a substantially cylindrical body portion 34 that houses the air motor (not illustrated) which is made integral with a handle 35, the outer end of which is provided with means for attaching an air hose indicated by the dotted lines 36. Projecting down from the lower end of the motor is a driving socket 37, the chamber of which fits over the hexagonal head 18 of the driving head 17 of the assembly. However, the connection between the driving socket 37 and the hexagonal head 18, is merely a telescoping connection. The grinding operator presses the operating head 38 of the valve, to admit compressed air to the motor in the motor housing 34, to effect the driving of the grinder assembly, and as he does so, of course he exerts a downward pressure on the handle 35 that carries the grinder wheel 15 down against the seat 3. This operation is accomplished intermittently for practical reasons. After each downward pressure, the operator pulls up slightly on the handle 35, and when he does so, the spring 32 elevates the grinder assembly so that it "follows" the driving socket 37. In practice, of course the lift of the grinding face 16 above the seat 3, is very slight, and would be even less usually, than that indicated by the dotted line 16a in Fig. 3, that indicates a position the grinding face 16 may have with relation to the seat after each lifting movement.

An opening 17a is provided in the upper end of cap 17 for the insertion of a small pin (not shown). Such a pin must be used, after the completion of each seat, provided the arbor in the next seat to be ground happens to be lower than the one just finished. The function of this pin is to push the friction device downward far enough to contact the top of the arbor in this lower position.

It will be observed that the employment of my friction device 25 determines a level for the grinder assembly that will maintain the grinding face 16 normally at a slight elevation above the seat 3, regardless of the height of the upper end of the body 7 of the arbor above the seat.

Furthermore, by reason of the fact that the friction device is completely encompassed by the bore 24, the grinder assembly balances itself perfectly with respect to its axis of rotation. And the pressing force of the friction head 29 against the wall of the bore 24, is perfectly balanced by the force exerted by the opposite side of the friction head or piston head 29 against the opposite side of the bore. Although the friction device does hold the inner sleeve 8 substantially fixed, nevertheless, by reason of the fact that this holding is accomplished by frictional means, there usually is a slight creeping of the sleeve 8 around the axis of the arbor, and this creeping effect is most desirable, and assists in accomplishing perfect centering of the ground seat on the axis of the arbor body 7.

Many other embodiments of the invention may be resorted to without departing from the spirit of the invention.

I claim as my invention:

1. In grinding mechanism to be applied to a

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centering arbor when grinding a valve-seat or the like, co-axial with the arbor, the combination of a sleeve having a bore fitting freely over the arbor, a rotary grinder mounted for rotation on said sleeve, and a friction device received within the bore of the sleeve, including a base adapted to rest against the end of the arbor, a spring seating on said base and extending upwardly in said bore, and a friction-head within the bore against which said spring thrusts, said friction-head having means for maintaining pressure against the face of said bore.

2. In grinding mechanism to be applied to a centering arbor when grinding a valve-seat or the like, co-axial with the arbor, the combination of a sleeve having a bore fitting freely over the arbor, a rotary grinder mounted for rotation on said sleeve, and a friction device received within the bore of the sleeve, including a base adapted to rest against the end of the arbor, a spring seating on said base and extending upwardly in said bore, and a friction-head within the bore against which said spring thrusts, said friction-head having means for maintaining pressure against the face of said bore, said friction-head being capable of developing sufficient frictional resistance on the face of the bore, to effect the compression of said first named spring.

3. A friction device for insertion into the bore of the sleeve of a valve-seat grinder or the like, which sleeve is to be telescoped over the end of a centering arbor, the combination of a base member and a friction-head capable of being introduced into the bore of the sleeve, said base member being of substantially disc form and adapted to seat against the end of the arbor; a spring connecting said base member and said friction-head, said friction-head having a spring and means associated therewith for exerting lateral thrust against the face of the bore of the sleeve to develop frictional resistance upon the sleeve.

4. In grinding mechanism to be applied to a centering arbor when grinding a valve-seat or the like, co-axial with the arbor, the combination of a sleeve having a bore telescoping freely over the arbor, a rotary grinder mounted for rotation on said sleeve and having a driving-head at its upper end adapted to be rotated, and pressed downwardly intermittently to bring the grinding face of the grinder into contact with the seat being ground; and a friction device carried in said bore at a sufficiently low level to be engaged by the upper end of the arbor when the sleeve is telescoped over the same, said friction device including a compression spring to thrust against the end of the arbor, and a friction-head operatively connected with the upper end of said spring, said friction-head having means for developing sufficient friction against the face of said bore to effect a compression of the spring when the sleeve is forced downwardly far enough to bring the rotary grinder substantially into contact with the valve-seat, thereby enabling the spring to lift the rotary grinder and support the same out of contact with the valve-seat.

5. In a valve-seat grinding mechanism for supporting a rotary grinder floating adjacent to the valve-seat, for co-operation with a rotary driving head; the combination of an arbor supported with its axis coinciding with the axis of the valve-seat, a centering bearing mounted to slide freely along said arbor, a rotary member mounted for rotation on said bearing member and for movement in unison with the bearing member along

said arbor, a rotary grinder carried by said rotary member, a friction-head carried by said bearing member, guided along the same, and having means for engaging the bearing member to develop frictional force resisting movement of the friction-head along said bearing member, said frictional force capable of supporting the weight of the grinder and its attached parts, compressible means located between the end of said arbor and said friction head, said friction-head operating when the driving head exerts downward pressure, to compress the said compressible means; said compressible means operating to lift the rotary grinder off the seat when the said downward pressure ceases.

6. In a valve-seat grinding mechanism for supporting a rotary grinder floating adjacent to the valve-seat, for co-operation with a rotary driving head; the combination of an arbor supported with its axis coinciding with the axis of the valve-seat, a centering bearing mounted to slide freely along said arbor, a rotary member mounted for rotation on said bearing member and for movement in unison with the bearing member along said arbor, a rotary grinder carried by said rotary member, a friction-head carried by said bearing member, guided along the same, and having means for engaging the bearing member to develop frictional force resisting movement of the friction-head along said bearing member, said frictional force capable of supporting the weight of the grinder and its attached parts, compressible means located between the end of said arbor and said friction-head, said friction-head operating when the bearing member is forced down over the arbor to compress said compressible means against the end of the arbor, so that when the force acting on the bearing member ceases, the compressible means will expand and lift the grinder away from the valve-seat.

7. In a valve-seat grinding mechanism for supporting a rotary grinder floating adjacent to the valve-seat, for co-operation with a rotary driving head; the combination of an arbor supported with its axis coinciding with the axis of the valve-seat, a centering bearing mounted to slide freely along said arbor, a rotary member mounted for rotation on said bearing member and for movement in unison with the bearing member along said arbor, a rotary grinder carried by said rotary member, a friction-head carried by said bearing member, guided along the same, and having means for engaging the bearing member to develop frictional force resisting movement of the friction-head along said bearing member, said frictional force capable of supporting the weight of the grinder and its attached parts; and a spring between the end of the arbor and the friction-head for returning the grinder to its floating position adjacent the valve-seat; the frictional force between the friction head and the bearing member being capable of supporting the grinder and its attached parts in its floating position with the grinder out of contact with the valve-seat.

8. In grinder mechanism to be applied to a centering arbor when grinding a valve-seat or the like, coaxial with the arbor, the combination of a sleeve having a bore fitting freely over the arbor, a rotary grinder, a driving-head connected with the rotary grinder for rotating the same, and adapted for connection to a rotary driving member; bearing means for rotatably mounting the rotary grinder on the sleeve, a friction-head fitting within the bore of the sleeve, with resilient means for exerting lateral pressure against

the face of the bore to develop resistance to the rotation of the sleeve; all of said parts cooperating to enable the rotary grinder to be supported out of contact with the valve-seat when the operator of the grinder reverses the direction of his downward pressure on the driving head.

9. In grinder mechanism to cooperate with a rotary driving socket, for grinding a valve-seat or the like, the combination of an arbor supported with its axis coinciding with the axis of the seat, an inner sleeve telescoped over said arbor, a piston in said sleeve above the upper end of the arbor, so that a chamber is formed within said sleeve below the piston, a grinder, an outer sleeve with bearing means supporting the same for rotation on the axis of said first named sleeve, and having a coupler head at its upper end for driving the same, yielding means within said chamber for exerting force against the under side of said piston, said piston having friction means associated therewith for developing sufficient friction against the bore of the inner sleeve to enable said yielding means to normally support the grinder floating yieldingly above, and adjacent to, the said seat, all of said parts cooperating when a driving socket is pressed down on the driving head, to impart movement through the friction means to the grinder to depress the same into contact with the valve-seat, said yielding means operating when the downward pressure ceases at the outer sleeve, to lift the grinder out of contact with the valve-seat.

10. In grinder mechanism to be applied to a centering arbor when grinding a valve-seat or the like, coaxial with the arbor, the combination of a sleeve having a bore fitting freely over the arbor, a rotary grinder, a driving-head connected with the rotary grinder for rotating the same, and adapted for connection to a rotary driving member, bearing means for rotatably mounting the rotary grinder on the sleeve, a friction means mounted in the bore for developing frictional resistance between the sleeve and the arbor, including a friction shoe touching against the surface of the bore, a spring thrusting substantially radially with respect to the arbor, pressing the shoe against the surface of the bore, another spring located between the friction means and the arbor for exerting thrust upwardly against the friction means, said friction means and said last named spring cooperating to normally support the grinder floating yieldingly out of contact with the work except when downward pressure is applied to the driving head to overcome the resistance of said friction connection and depress the grinder onto the valve-seat; said friction connection and said last named spring cooperating when downward pressure on the driving head ceases, to lift the grinder off of the valve-seat.

11. In grinder mechanism to be applied to a centering arbor when grinding a valve-seat or the like coaxial with the arbor, the combination of a sleeve having a bore fitting freely over the arbor, a rotary grinder, a driving-head connected with the rotary grinder for rotating the same, and adapted for connection to a rotary driving member, bearing means for rotatably mounting the rotary grinder on the sleeve, and friction means located wholly within the circumference of said bore, and seating on the end of the arbor for frictionally resisting the shifting of the sleeve, up and down on the arbor, the said friction means capable of supporting the outer sleeve floating yieldingly, with the grinder out of contact with

the valve-seat; and a spring associated with the arbor and the friction means for normally maintaining the grinder above the valve-seat.

12. Grinder mechanism according to claim 11, in which the means for frictionally resisting the shifting of the sleeve, includes a friction-shoe fitting within the bore of the sleeve, and resilient means for exerting lateral pressure against the face of the bore to develop resistance to the rotation of the sleeve.

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