

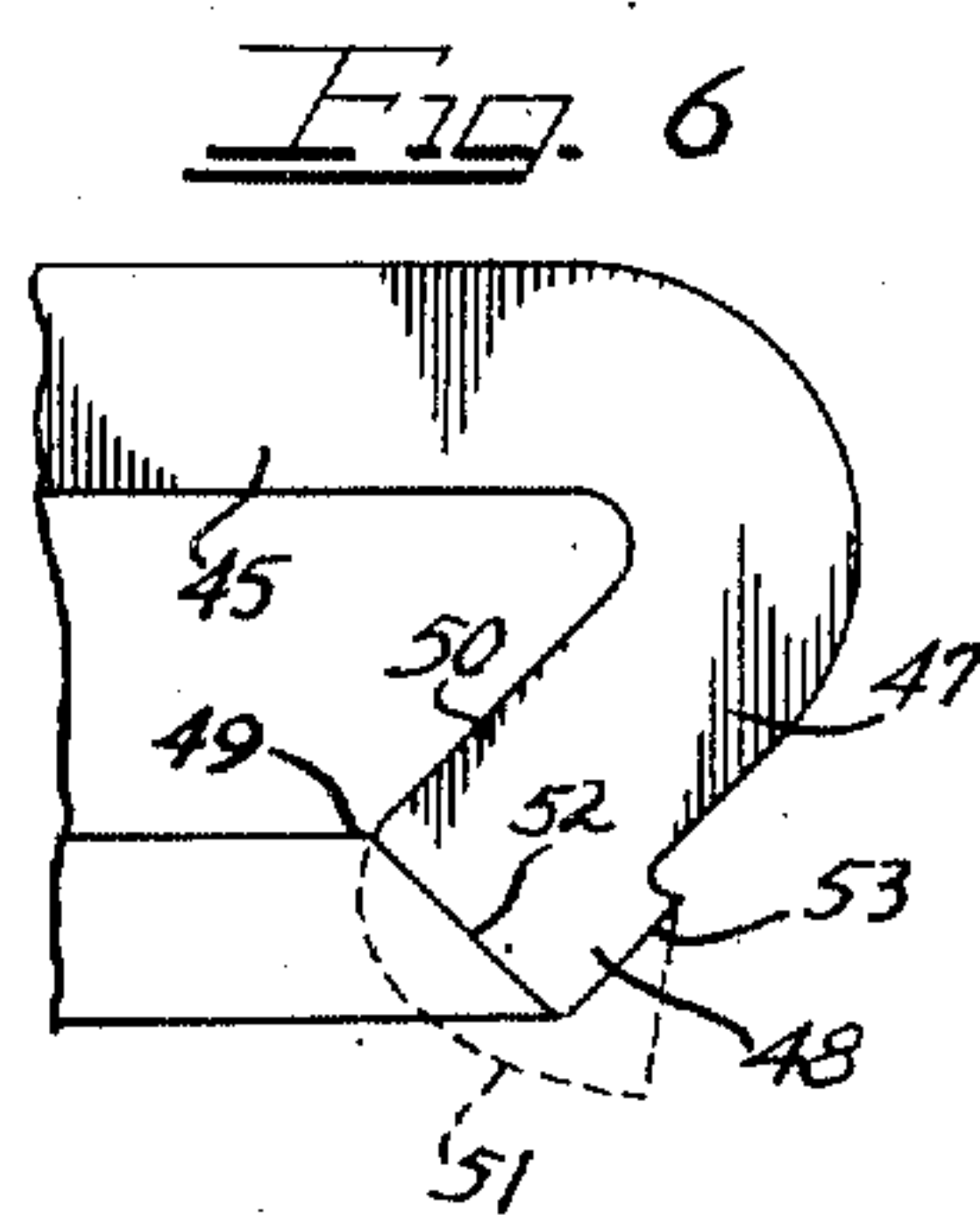
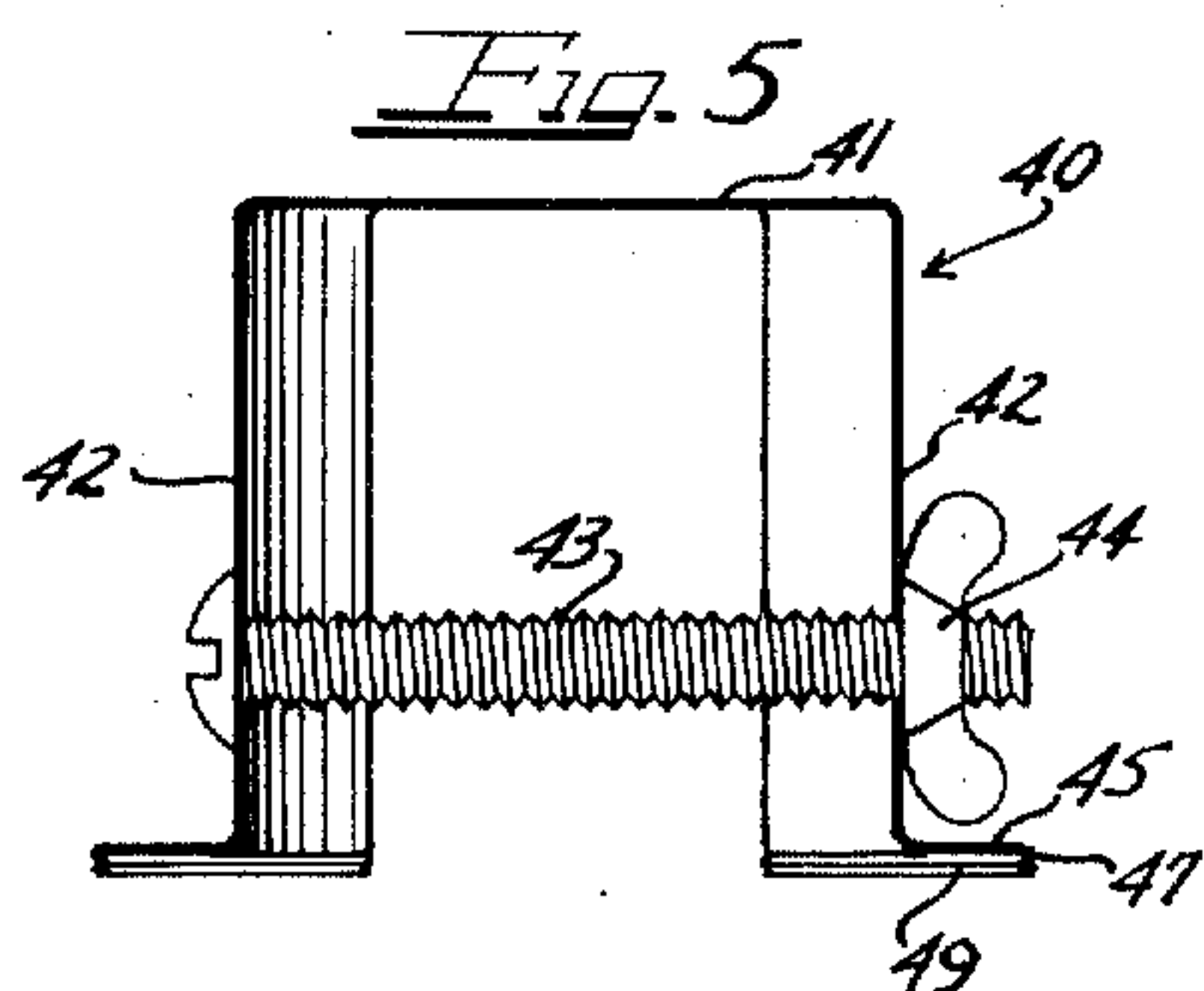
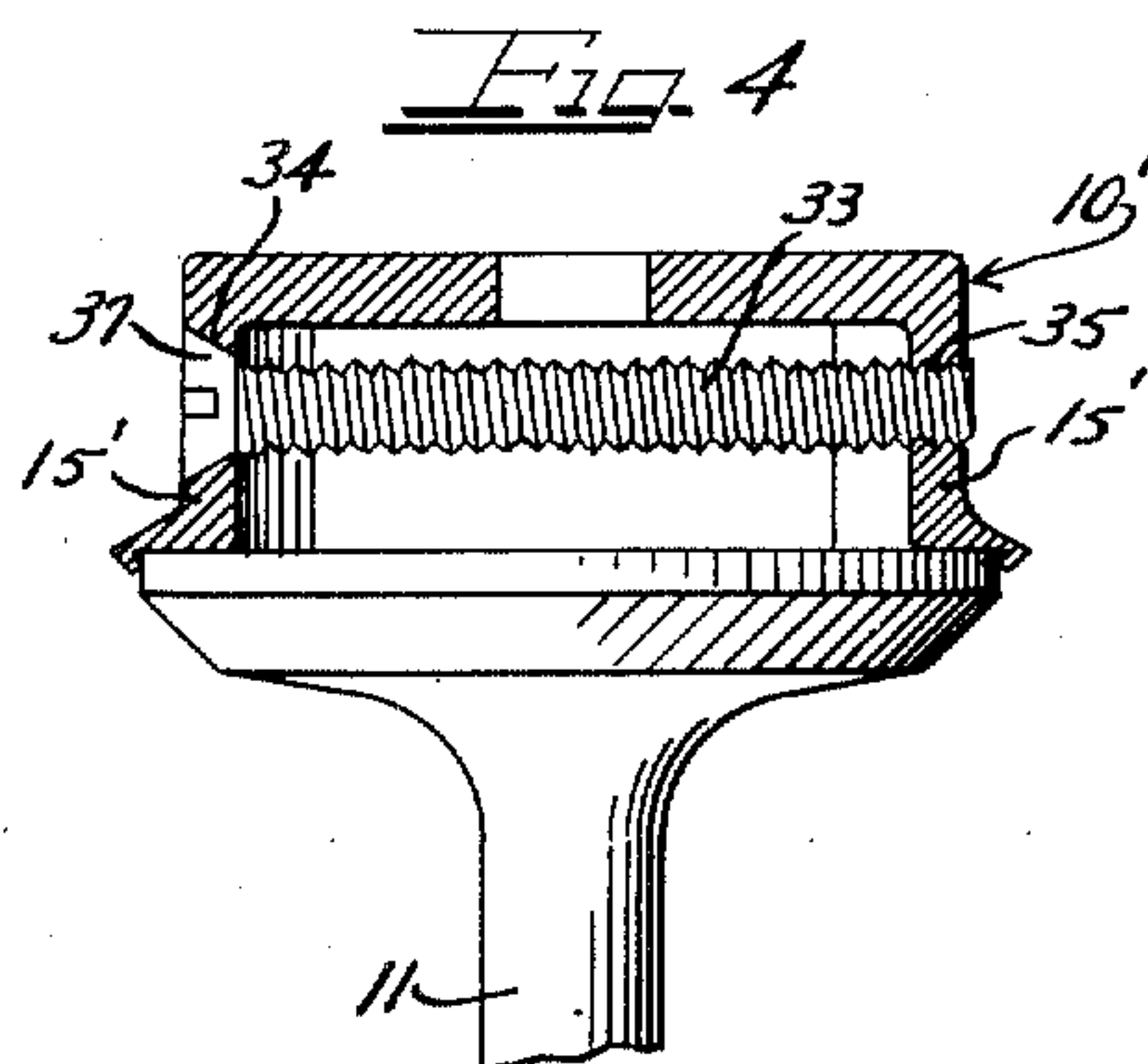
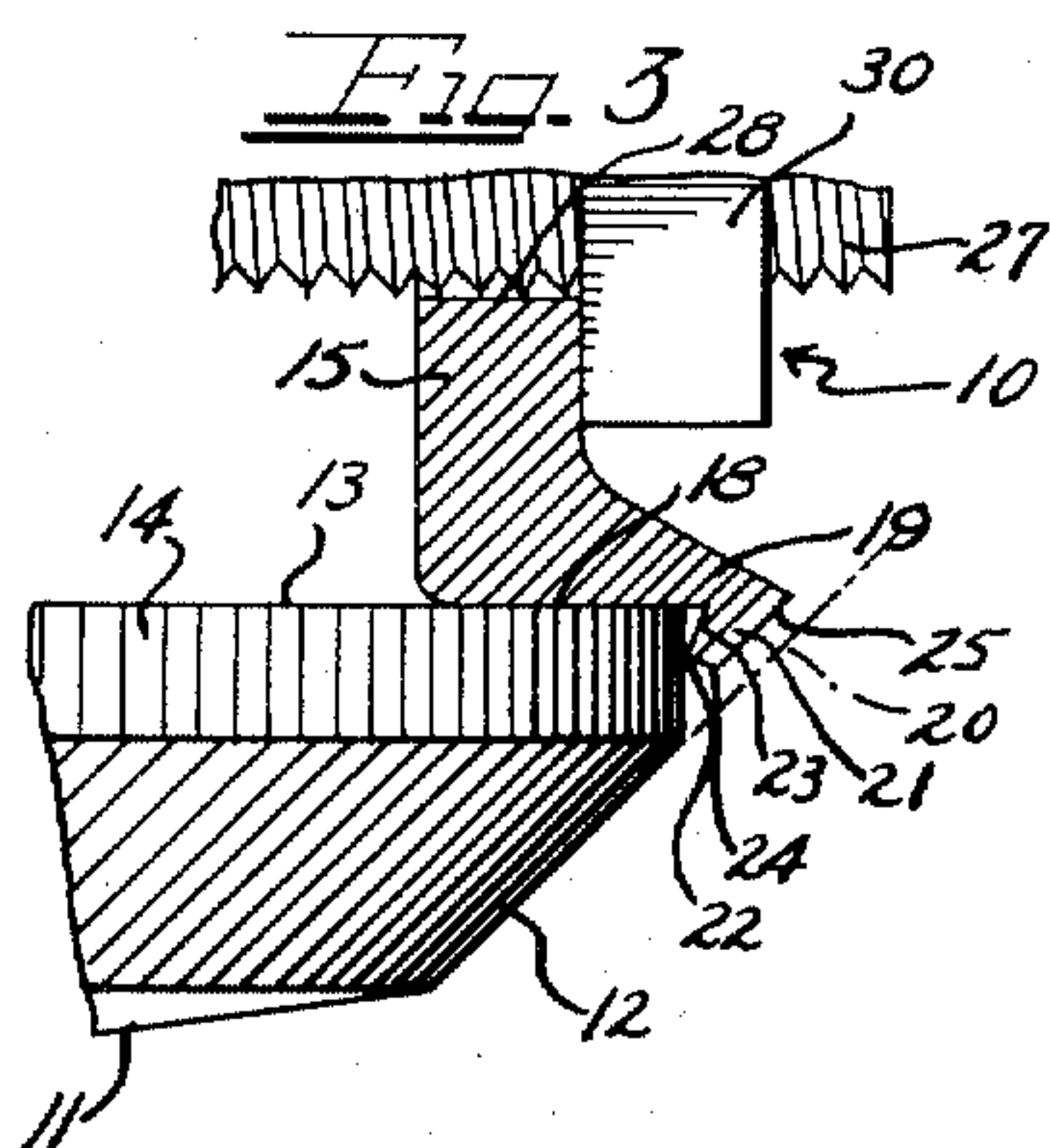
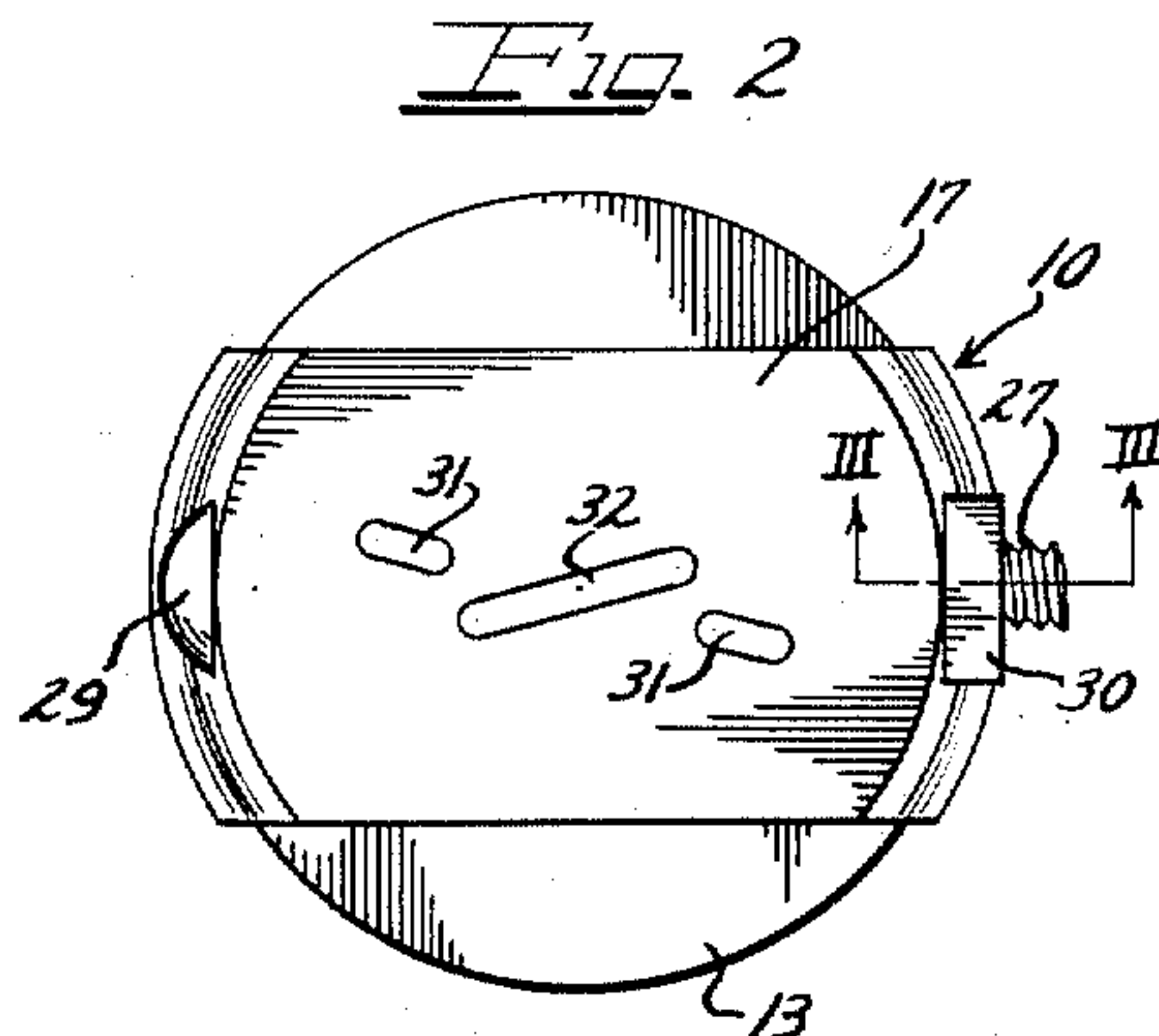
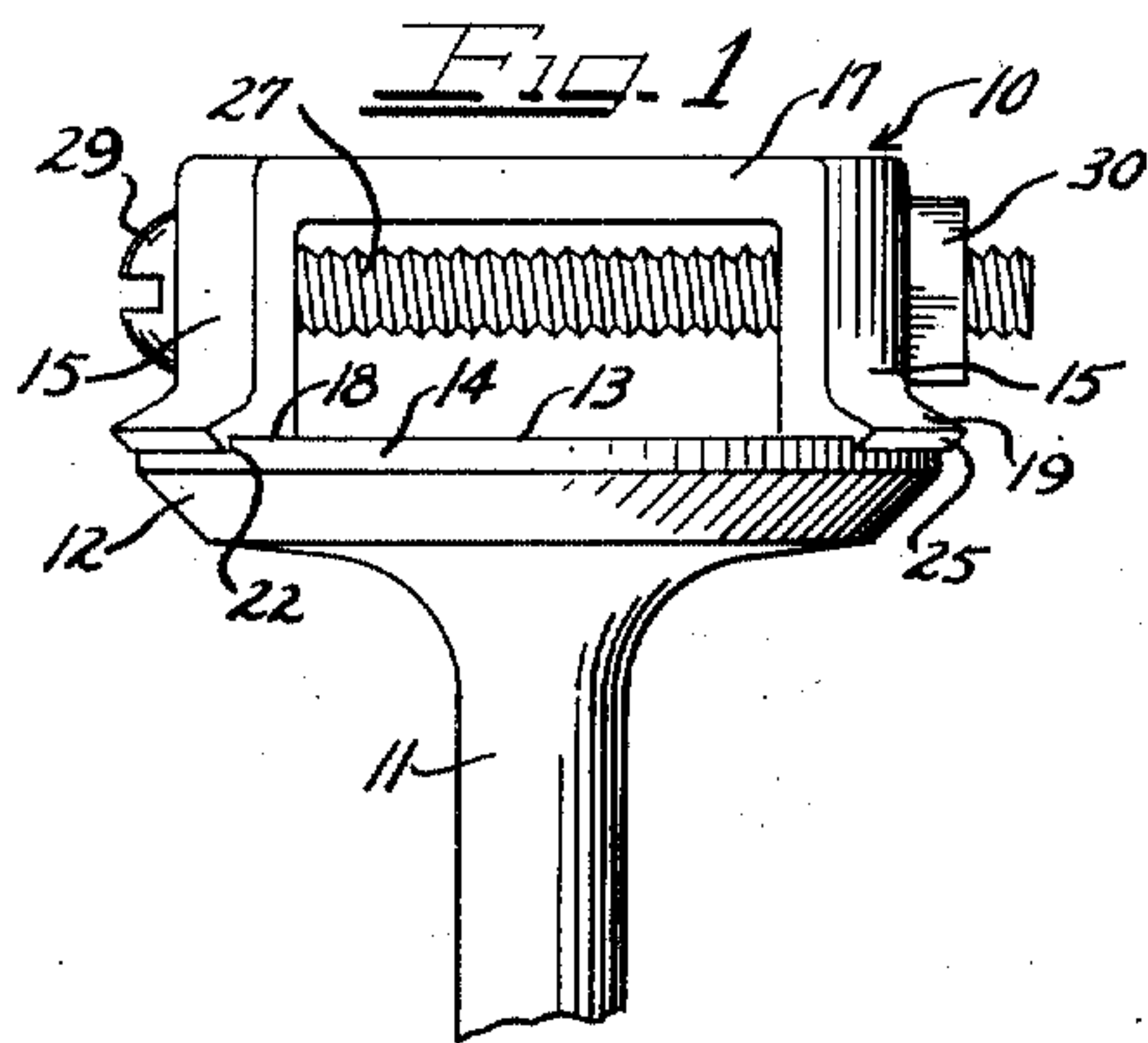
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VALVE GRINDING DEVICE

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VALVE GRINDING DEVICE

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This invention relates to improvements in valve grinding tools and more particularly concerns a device which is adapted to grip the head of a poppet valve for turning the same to grind the same into its seat.

In grinding a poppet valve to its seat, the head thereof is rotated against its seat in the presence of a grinding compound. The heads of some of the poppet valves are provided with sockets wherein lugs or prongs of a valve turning tool are received. Such sockets, however, usually fill up with hard carbon in the use of the valve. Moreover, more recently the poppet valve heads have been made without such sockets, for various reasons, among which may be mentioned the popularization of rubber suction cup grippers for engaging the valve head as part of the grinding tool.

While rubber suction cup type of grinding tool averts the difficulties encountered due to closing of valve tool sockets in the poppet valve head, the rubber suction cups are very short lived due primarily to the abrasive action of carbon deposited on the valve head. In other words, the carbon destroys the sealing surface of the vacuum cup and thereby allows the cup to slip relative to the valve head and thus become useless.

According to my invention, the various difficulties attendant upon engagement of the poppet valve head for grinding purposes are effectually overcome by the provision of a metallic valve head engaging device which is self-attaching, that is, requires no sockets in the valve head for its attachment, and effects a positive sustained grip upon the valve head in spite of carbon deposits, pitting, or any other conditions that may prevail on the valve head.

Another object of the invention resides in the provision of a valve grinding tool comprising a jaw-type metallic valve head gripping device which is simple in construction and utterly easy to apply and which can be used on successive valves an indefinite number of times without wearing out.

A further object of the invention is to provide a valve gripping device for grinding purposes which can be produced economically by mass production methods of manufacture.

Other objects, features and advantages of the present invention will be readily apparent from the following detailed description of certain embodiments thereof taken in conjunction with the accompanying drawings in which:

Figure 1 is a side elevational view of a valve grinding device according to the present inven-

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tion, showing the same applied to a poppet valve head;

Figure 2 is a top plan view of the device of Fig. 1;

Figure 3 is a substantially enlarged fragmentary vertical sectional view through the valve head engaging portion of the device, taken substantially on line III—III of Fig. 2;

Figure 4 is a medial sectional view through a modified form of the device;

Figure 5 is a vertical medial sectional view through a further modified form of the device; and

Figure 6 is a greatly enlarged fragmentary side elevational view of one end of the valve head engaging portion of the device of Fig. 5.

As shown in Figs. 1 to 3, inclusive, a valve grinding device 10 is constructed and arranged to seat upon and firmly grip a poppet valve 11 of the conventional form having a beveled, generally frusto conical seating surface 12 at the underside of a head 13 which is flat on top and has a cylindrical rim 14 between the upper edge of the seat 12 and the top.

The device 10 engages upon the top of the poppet valve head 13 and retainingly grips the rim 14. To this end the device comprises a pair of diametrically opposite, spaced, vertical legs 15 which are connected integrally and preferably in one piece by means of an upper body portion 17, and have lower end faces 18 formed coplanar and providing shoulders to rest flatwise upon the top of the poppet valve head. The device 10 may conveniently be made as a stamping, forging, or turning from suitable metal such as steel, and in generally inverted U-shape.

Each of the legs 15 is preferably of a length to be swingable in a limited range toward and away from the other leg and therefore, where, as in the present instance, the device is made in one piece, the material should be possessed of a certain degree of inherent resiliency. In addition, each of the legs is preferably formed, at least at the valve head abutting face 18 thereof with an outer margin or perimeter formed on an arc concentric with the valve head 13. Such perimeter, moreover, is formed as a flange 19 extending to a diameter greater than the diameter of the rim 14 so as to overhang the same cantilever fashion. The radial extent of the flange 19, however, is limited to remain substantially inside of an upward extension of the conical plane of the seating shoulder 12 of the valve head, such extension being shown by way of illustration by the dash line 20 in Fig. 3. This avoids

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any interference with the conical valve seat extension on an engine block with which the valve 11 may be associated.

Self-retaining gripping attachment of the device 10 upon the valve head 13 is effected through an integral downwardly and inwardly projecting attachment lip 21 formed at the extremity of the flange 19 of each of the legs of the device. For optimum gripping effectiveness of the lip 21 it is formed to make engagement with the valve head rim 14 on a substantial arcuate area of the rim. In addition, the lip 21 is formed to make biting line contact with the rim 14 and for this purpose is formed with a generally radially inwardly projecting biting line contact edge 22 of preferably substantially knife edge character defined at its upper side by a relief undercut 23 and at its lower side by an outwardly and downwardly tapering bevel 24. Extending from the bevel 24 to the outer tip of the flange 19 is a bevel 25 preferably generally parallel to and spaced inwardly from the plane 20 of the valve seat shoulder 12. As a result of this arrangement, the device 10 is adapted to be applied to the valve 11 while the valve is seated in operative relation to an engine block by pressing the device 10 down upon the valve head 13 until the abutment faces 18 of the legs 15 engage the head and the self-retaining biting, gripping edge 22 of each of the legs engages the valve head rim 14. It will be understood, of course, that the circle described by the retaining edges 22 of the legs of the device will be approximately the same as the perimeter described by the rim 14. That is, the device 10 is preferably dimensioned for a particular size of valve head 13. Initially the legs 15 may, if desired, be slightly toed in so that in applying the device to the valve head 13 the beveled surface 24 will come first into contact with the top edge of the valve head and cam thereover in response to downward pressure upon the device 10 until the retaining edges 22 of the legs snap over the rim 14 and the legs come to rest at their abutment faces 18 up on the valve head 13. With such an arrangement the resilience of the device effects a substantial gripping tension in the legs 15 which drives the retaining line contact edges 22 into substantial gripping engagement with the rim 14. The undercut 23 avoids interference with proper line contact engagement of the edges 22, especially should there be any carbon deposit on the rim 14. Whether or not there is carbon on the rim 14 or whether the rim is pitted or longitudinally striated as is so often the case since this rim is seldom finish ground in the course of manufacture, the fine, substantially knife edges 22 will afford adequate retaining grip upon the rim 14.

In order to make doubly sure that the legs of the device will retain their grip upon the valve head, tightening means may be provided such as a bolt 27 extending through appropriate apertures 28 in the respective legs 15 and having a slotted head 29 at one end engageable by a screw driver and a retaining and clamping nut 30 applied to the opposite end where it projects through one of the legs. Thus, before the device 10 is applied to the valve, the nut 30 may be loosened so that the legs 15 of the device can enter freely into engagement with the valve head, and thereafter the bolt is tightened to place the legs 15 under clamping stress and drive the line contact edges 22 into tight, non-slip retaining engagement with the valve head rim

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14. Thus, not only is the device 10 attached to the valve head 13 in a manner which will prevent its axial displacement from the valve head but, more importantly, the device is engaged upon the valve head against relative turning even in the presence of substantial resistance to joint rotation of the device and the valve during grinding.

After the device 10 has been applied to the valve 11, it is adapted to be turned by means of a suitable grinding tool crank (not shown) which may be of any conventional or preferred construction and provided with a lug or a plurality of lugs engageable with the head or body portion 17 of the device. As shown in Fig. 2, the head portion 17 of the device is preferably provided with spaced aligned lug sockets 31 for receiving a multi-lug engagement end of a grinding tool crank and also with a central elongated slot-like socket 32 for receiving a single lug turning crank. Of course, if preferred, a screw driver may be used for turning the device 10, the tip of the screw driver being inserted into the lug socket 32. By having the respective socket arrangements 31 and 32 disposed in angular relation as shown, they can be disposed relatively close together and weakening of the head 17 is avoided. Since the legs 15 of the device are formed on an arc of substantial length and the head 17 is of substantial width, it will be clear that force applied to the head portion 17 will be transmitted with substantial efficiency to the legs 15.

Where due to limited clearances, it is necessary to have as nearly as practicable freedom from any substantial projections beyond the outer faces of the legs of the valve head gripping device, a leg tightening arrangement such as shown in Fig. 4 may be employed. In this arrangement the various structural details of the device, here identified generically by the numeral 10' are identical with the device 10, but legs 15' thereof are tightened together for substantially setting the grip thereof on the head of the valve 11 by means of a screw 33 which extends through a countersunk aperture 34 in one of the legs and is threaded into a tapped aperture 35 in the other leg. A tapered slotted head 37 on the screw is engageable by a screw driver for loosening or tightening the screw and is received flush within the outer face of the contiguous leg 15'.

In the modification of Figs. 5 and 6, a valve grinding device 40 having substantially the same characteristics as the previously described forms of device, is formed from thin sheet metal, preferably spring steel so that the device can be substantially completed in a spring making machine. To this end the device 40 is made from one piece of spring steel bent to form a head or body 41 and a pair of opposing valve head engaging and clamping legs 42 connected together at their opposite ends by the integral body portion 41 formed in one piece therewith. The legs 42 may be formed somewhat longer than the legs of the device 10, for example, so as to attain substantial clamping leverage therein, especially where a tightening bolt 43 is used for effecting a positive clamping action of the legs after the device has been applied to a valve head. Herein the bolt is shown as secured between the legs adjacent to the lower ends thereof and as equipped with a thumb nut 44 to facilitate tightening the bolt.

The clamping legs 42 are preferably formed arcuately in cross section whereby they are substantially reinforced and stiffened against bend-

ing out of shape and will afford strong clamping action on the valve head. The circle described by the circumference of the legs 42 is preferably smaller than the circumference of a valve head to be engaged by the device and the lower ends of the legs are formed with radically outwardly projecting flanges 45 which are adapted to rest against the head of the valve. For gripping the valve rim, the terminal portions of the flanges 45 are turned down and in, obliquely to provide retaining flange portions 47 which are in turn formed at their extremities with diagonally downwardly and outwardly projecting extremity portions 48. This provides an inwardly directed valve head rim engaging lip 49 which is radially inset from the juncture bend between the flange 45 and the flange portion 47, whereby the inner diagonal surface of the flange portion 47, identified at 50 affords substantial undercut relief or clearance.

In order to provide for a substantially uniform knife edge engagement of the lip 49 with the valve head rim, the flange terminal 48 is preferably ground away on the lower portion thereof from an original outline or proportion as indicated by the dash line 51 in Fig. 6, so as to afford an oblique generally downwardly and radially outwardly extending surface 52 converging with the surface 50 at a sharp, uniform biting edge at 49. The diagonal surface 52 serves as a cam face engageable with the upper edge extremity of the valve head for resiliently spreading the legs 42 as an incident to applying the device 40 to the valve.

At its end the extremity flange portion 48 is trimmed back, as by grinding, close to the adjacent outer surface of the flange portion 47 to provide an edge surface 53 which is so related to the lip structure that it will lie inside of the valve seat plane of the associated valve head. It should be observed that both the surface 53 of the device 40 and the surface 25 of the device 10 should be so related to the respective lip structures that the valve seat plane will be cleared even after the valve seat shoulder has been ground down substantially and the valve head rim is substantially narrower than originally provided on the valve when it is new.

From the foregoing it will be apparent that there has been provided by the present invention an efficient, simple, and easily applicable device forming part of a grinding tool assembly for engaging with the head of a poppet valve so that the poppet valve can be readily turned for seat grinding purposes. The uniform fine line, substantially knife edge valve-rim engaging lip provided on each of the legs of the device in all forms thereof effects a strong, non-slipping engagement with the valve head rim by reason of the relatively large arc of interengagement with the valve head rim. As a result, it is only necessary to have moderate clamping pressure of the legs upon the valve head rim in order to assure effective non-slipping attachment of the device to the valve head. Although the several forms of the device have been shown as including means such as bolts for positively securing the legs into the clamping relation to the valve head, such means may be dispensed with where the legs of the device are of sufficient inherent resilient gripping strength. There is of course an advantage in not having the legs grip too tightly of their own accord since the device can thereby be more easily applied to and removed from the valve head. Of course, with a device such as that shown in Fig. 4 where the engagement legs

are relatively long, the device may very well be made to be self-retaining through the inherent resiliency of the legs 42 without a positive draw-up bolt since when the device is to be removed or applied the legs thereof are adapted to be flexed slightly apart manually or with a tool.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. In a device for engaging a poppet valve head in a grinding tool assembly, a head or body part, downwardly projecting legs at the ends of the body, said legs being of externally arcuate form concentric with the head of the valve to which the device may be applied but of a smaller diameter, each of said legs having at the lower end thereof a radially outwardly extending flange including a downwardly and inwardly extending lip engageable with the rim of the valve head throughout a substantial arcuate area of the rim, said head having a pair of lug sockets extending on a diagonal line across the axis of the head and a central elongated lug socket diagonally disposed between said first mentioned lug socket.

2. In a valve grinding tool, a member for gripping the head of a poppet valve for valve seat grinding purposes, said member comprising a pair of opposed arcuate gripper portions each of which has a shoulder to rest upon the head of the poppet valve to be gripped and an arcuate fine line self-retaining biting edge lip comprising a horizontal sector of substantial length offset from the plane of the shoulder and directed generally radially inwardly and generally conforming in radius to the cylindrical surface of the poppet valve rim for effecting biting engagement therewith, each of said lips being defined intermediate its biting edge and its companion shoulder by a substantial undercut and also being provided at its outer side by a tapered surface for clearance with respect to a valve seat surface into which the valve is to be ground.

3. In a valve grinding tool device adapted to be applied to the head of a poppet valve for gripping the same to effect rotation thereof for valve seat grinding, a pair of generally upright, spaced legs connected together at their upper ends and having at their lower ends radially inwardly projecting arcuate fine line self-retaining biting edge lips comprising horizontal sectors of substantial length generally conforming in radius to and thereby conformably securely engageable with the rim of a valve head, and means engageable with the top of the valve head for defining the vertical position of said lips to engage the peripheral surface of the rim close to its upper edge, the upper portion of the device being slotted to receive means for turning the device.

4. In a valve grinding tool device adapted to be applied to the head of a poppet valve for gripping the same to effect rotation thereof for valve seat grinding, a pair of generally upright, spaced legs connected together at their upper ends and having at their lower ends radially inwardly projecting arcuate fine line self-retaining biting edge lips generally conforming in radius to and thereby conformably securely engageable with the rim of a valve head, means engageable with the top of the valve head for defining the vertical position of said lips to engage the pe-

peripheral surface of the rim close to its upper edge, said legs being resiliently deflectable, and a draw-up bolt operably engaged between said legs and adapted to draw the same together for effecting a strong biting engagement between said biting edge lips and the valve head rim.

5. In a valve grinding tool device adapted to be applied to the head of a poppet valve for gripping the same to effect rotation thereof for valve seat grinding, a pair of opposed generally upright, spaced legs having at their lower ends radially inwardly projecting arcuate fine line self-retaining biting edge lips generally conforming in radius to and thereby conformably securely engageable with the rim of a poppet valve head, means engageable with the top of the valve head for defining the vertical position of said lips to engage the peripheral surface of the rim close to its upper edge, said legs being movable toward one another, and a draw-up element operably engaged between said legs and adapted to draw the same together for effecting a strong biting gripping engagement between the biting edge lips and the valve head rim.

6. In a poppet valve grinding tool device for grinding a poppet valve into its seat and wherein the poppet valve has a narrow rim, a unit including a plurality of generally upright legs each of which has an arcuate valve-head rim-engaging substantially knife edge lip formed on a horizontal radius to engage a substantial sector of the rim, and respective shoulders on said legs facing downwardly and spaced above said knife edge lips less than the width of the valve head rim so as to assure engagement of the rim closely adjacent to the top of the valve head and spaced from the lower edge of the valve head rim.

7. In a poppet valve grinding tool device for grinding a poppet valve into its seat and wherein the poppet valve has a narrow rim, a unit including a plurality of generally upright legs each of which has an arcuate valve-head rim-engaging substantially knife edge lip formed on a horizontal radius to engage a substantial sector of the rim, respective shoulders on said legs facing downwardly and spaced above said knife edge lips less than the width of the valve head rim so as to assure engagement of the rim closely adjacent to the top of the valve head and spaced from the lower edge of the valve head rim, and means on the upper portion of the unit to re-

ceive a member for turning the unit and a valve engaged thereby.

8. In poppet valve grinding tool device for grinding a poppet valve into its seat and wherein the poppet valve has a narrow rim, a unit including a plurality of generally upright legs each of which has an arcuate valve-head rim-engaging substantially knife edge lip formed on a horizontal radius to engage a substantial sector of the rim, respective shoulders on said legs facing downwardly and spaced above said knife edge lips less than the width of the valve head rim so as to assure engagement of the rim closely adjacent to the top of the valve head and spaced from the lower edge of the valve head rim, and means on the upper portion of the unit providing a body structure in one piece with the upper portions of the legs connecting the legs together in the unit.

9. In a poppet valve grinding tool device for grinding a poppet valve into its seat and wherein the poppet valve has a narrow rim, a unit including a plurality of generally upright legs each of which has an arcuate valve-head rim-engaging substantially knife edge lip formed on a horizontal radius to engage a substantial sector of the rim, and respective shoulders on said legs facing downwardly and spaced above said knife edge lips less than the width of the valve head rim so as to assure engagement of the rim closely adjacent to the top of the valve head and spaced from the lower edge of the valve head rim, said unit comprising a one piece sheet metal strip bent into substantially U-shape and with the legs comprising the opposite legs of the U and of arcuate outwardly bowed cross section.

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