July 1, 1941. M. G. FIEDLER 2,247,994

LAPPING MACHINE

Filed June 13, 1940

Fig. 1.

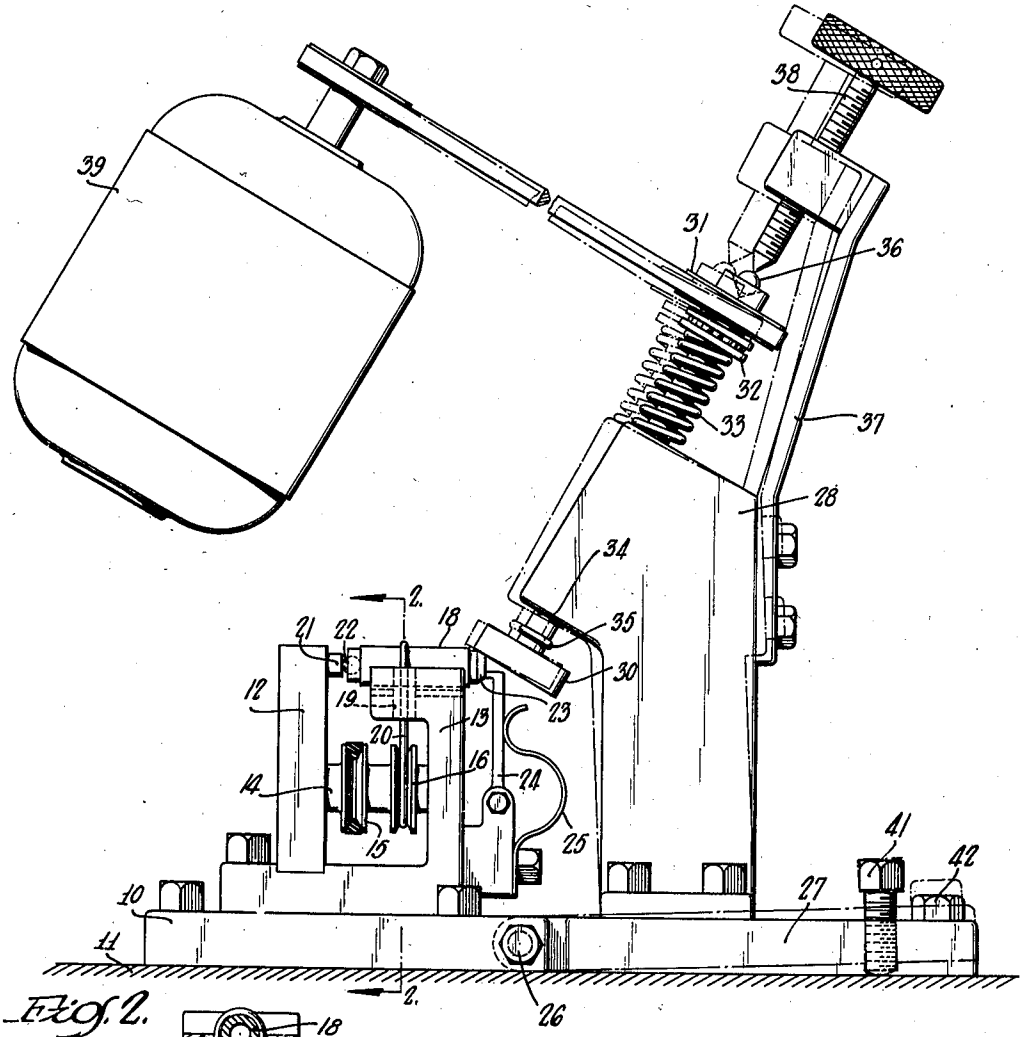
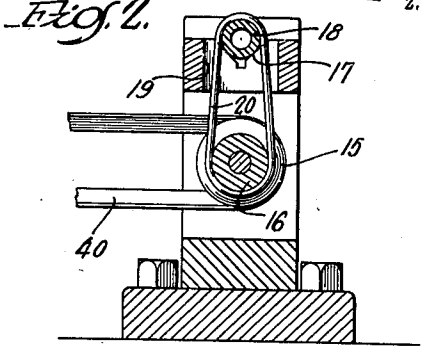


Fig. 2.



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LAPPING MACHINE

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2 Claims. (Cl. 51—129)

This invention relates to lapping machines and, more particularly, to a means for lapping the conical or frusto-conical faces of articles which have cylindrical body portions as, for example, the valve elements of the fuel injection nozzles of solid fuel injection apparatus for internal combustion engines.

Many such articles include both a cylindrical portion which must be kept within very close tolerances and an angular face or seat-engaging element which must be as accurately surfaced due to the extremely high pressures at which the finished product must seal against the fluids with which it is employed.

An important object of this invention is the provision of an apparatus for lapping the angular faces of such articles without damage to the cylindrical surface and which at the same time employs a lapping element the angle of which may be very rapidly and accurately adjusted.

Another object of the invention is the provision of apparatus of this character in which the insertion and removal of the articles to be lapped is facilitated, and in which the type of drive employed is such that the article itself becomes an element therein.

These and other objects I attain by the construction shown in the accompanying drawing wherein, for the purpose of illustration, I have shown a preferred embodiment of my invention and wherein:

Fig. 1 is a side elevation of lapping apparatus constructed in accordance with my invention, the dotted lines indicating an adjustment of the lapping tool; and

Fig. 2 is a section on line 2—2 of Fig. 1.

Referring now more particularly to the drawing, the numeral 10 indicates a base adapted to be rigidly secured to a structure 11 which is preferably smooth-surfaced throughout. Arising from the base 10 is a support comprising a pair of spaced standards 12 and 13 between which a rotatable unit 14 is mounted and is at present shown as including a pair of pulleys 15 and 16. One of the standards, at present shown as the standard 13, has its upper end formed with an upwardly opening V groove 17 of sufficient length to adequately support the cylindrical portion 18 of the article to be lapped. In alignment with the pulley 16 the upper portion of the standard 13 is slotted as at 19 to permit a belt 20 to be passed about pulley 16 and the cylindrical portion 18 of the article. This belt can be, and preferably is, resilient and may constitute simply a rubber band in the case of light articles such as the valve stems hereinbefore specifically referred to. The other of the standards, 12, has a seat 21 against which engages a bearing 22 which, in turn, engages against the end of the article to be lapped opposite that at which the conical face 23, which is to be the actual subject of the lapping operation, is disposed. The standard 13 preferably mounts a pivoted arm 24 which, through a spring 25 engages the article and constantly maintains engagement between bearing 22 and the seat 21.

Pivoted to the base 10 as at 26 is a leaf 27 having a bearing support 28. This bearing support guides a rotatable shaft 29 the lower end of which mounts the lapping element 30. Secured to the upper end of shaft 29 is a pulley 31 the lower surface of which is abutted by a thrust bearing 32. A spring 33 surrounds the shaft between thrust bearing 32 and the upper surface of standard 28 and serves to urge the shaft upwardly and to tend to move lapping element 30 toward the shoulder 34 on the under surface of the bearing support. This movement is limited in any suitable manner, as by means of a ring 35 secured to the shaft. The upper end of the shaft mounts a ball 36, and projecting upwardly from the bearing support is an arm 37 the upper end of which has directed therethrough a screw 38 which is in axial alignment with the ball and the inner end of which engages the ball. Shaft 29 is rotated through the pulley 31 in any suitable manner, as by means of motor 39, while the unit 14 is driven through its pulley 15 as indicated by belt 40.

In use of the apparatus the article is disposed in the V notch with its cylindrical portion engaging therein, and its surface 23 which is to be ground in opposition to the surface of lapping element 30 which at that time will be withdrawn through retraction of the shaft by spring 33. The belt 20 is placed in position together with bearing 22 and the pressure-applying arm 24. Shaft 29 is then adjusted downwardly through screw 38 until the lapping device 30 comes into proper engagement with the surface 23. When, due to service, the lapping device becomes worn, or when, for any reason, it is desirable to change the angle of the working surface of the lapping device to that of the axis of the cylindrical portion 18 of the article being lapped, this may be readily accomplished by means of adjusting screw 41 extending through the free end of leaf 27 and engaging the supporting surface 11. After the adjustment has been perfected, it may be secured

by a clamping hold-down bolt generally designated at 42.

It will be obvious that by polishing the surfaces of the V groove the rotation of the article being lapped may be obtained by exerting but slight pressure thereon, and that, accordingly, a freely stretchable driving belt 20 may be employed as, for example, a rubber band, which is of course, readily replaceable.

It will also be obvious that the articles may be very readily removed and replaced and that a very accurate adjustment of the lapping may be had while at the same time employing an extremely simple and durable apparatus.

Since the construction is capable of considerable modification without departing from the spirit of my invention, I do not wish to be understood as limiting myself thereto except as hereinafter claimed.

I claim:

1. Means for lapping the conical faces of valve members having cylindrical shanks, comprising a rest having a V-shaped notch for the reception of the cylindrical shank of the member, a bearing to engage the end of the shank, a shaft paralleling the notch, a standard pivoted to the rest in opposition to the conical end of a supported valve element, means to adjust the standard about the pivot thereof, a second shaft rotatably and longitudinally adjustably mounted in the standard and bearing a lapping tool to engage said conical end, a spring to shift the second shaft in a direction withdrawing the lapping tool from the conical member, an adjustable stop engaging the shaft to determine the operative position thereof, means to rotate said shafts and a frictional driving connection between the first-named shaft and the cylindrical portion of the valve member.

2. Means for lapping the conical faces of valve members having cylindrical shanks, comprising a rest having a V-shaped notch for the reception of the cylindrical shank of the member, a bearing to engage the end of the shank, a shaft paralleling the notch, a standard pivoted to the rest in opposition to the conical end of a supported valve element, means to adjust the standard about the pivot thereof, a second shaft rotatably and longitudinally adjustably mounted in the standard and bearing a lapping tool to engage said conical end, a spring to shift the second shaft in a direction withdrawing the lapping tool from the conical member, an adjustable stop engaging the shaft to determine the operative position thereof, means to rotate said shafts and a frictional driving connection between the first-named shaft and the cylindrical portion of the valve member, said driving connection including an elastic member under tension whereby to maintain the cylindrical portion of the member in position within the notch.

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