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RIDGE REAMER FOR CYLINDERS

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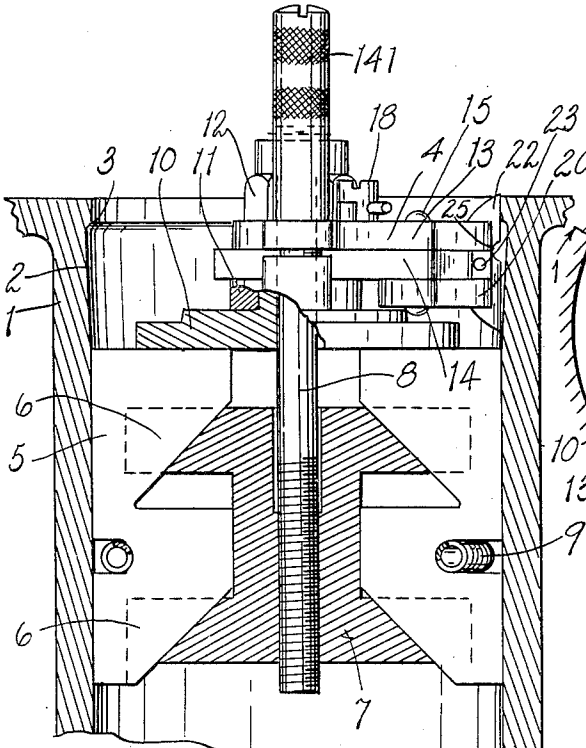


Fig. 1.

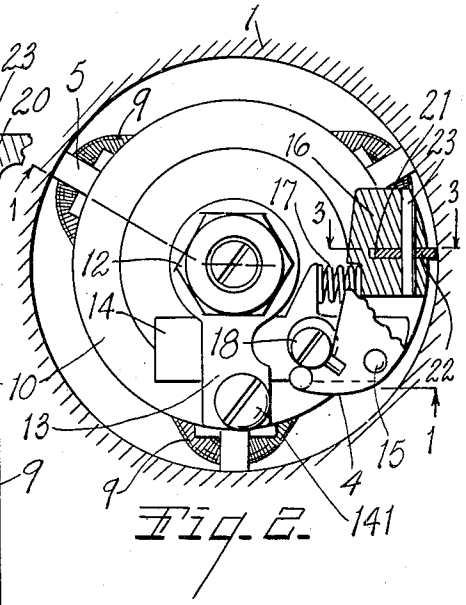


Fig. 2.

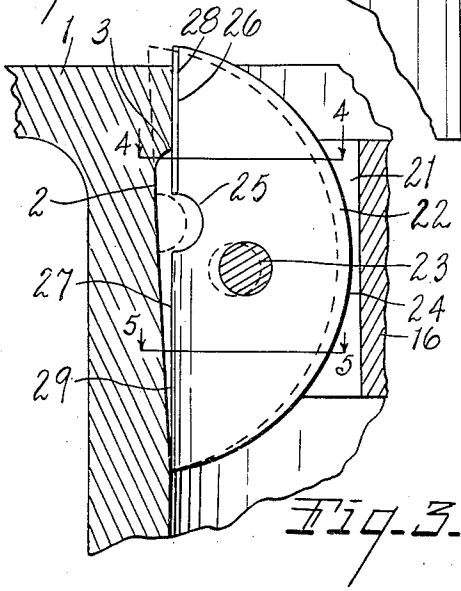


Fig. 3.

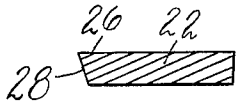


Fig. 4.



Fig. 5.

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RIDGE REAMER FOR CYLINDERS

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10 Claims. (Cl. 77—73)

The main objects of this invention are:

First, to provide an improved device for reaming cylinder bores to remove ridges therefrom caused by wear of a piston therein.

Second, to provide a device of the type described having a novel cutting element whereby likelihood of overcutting or undercutting the cylinder is prevented.

Third, to provide a device of the type described which is readily installed in a cylinder in such manner that the cutting element is exposed to view so that the cutting operation may be readily observed.

Fourth, to provide a novel cutting element for ridge reaming devices of the type under consideration, the said element having improved guiding provisions thereon and being otherwise improved whereby the sharpening thereof in manufacturing the same is facilitated.

Fifth, to provide a cutting element of the type described which is of extremely inexpensive nature and may be discarded following use, thereby avoiding the dangers which may arise due to improper resharpening of the element.

Objects relating to details and economies of the invention will appear from the description to follow. The invention is defined in the claims.

A preferred embodiment of the invention is illustrated in the accompanying drawing, wherein:

Fig. 1 is a fragmentary view in vertical section illustrating a conventional worn internal combustion engine cylinder with the reaming device of our invention operatively mounted therein, portions of the device being broken away and in vertical section on line 1—1 of Fig. 2 to illustrate details of construction thereof.

Fig. 2 is a fragmentary top plan view partially broken away and in horizontal section and illustrating still further the details of construction of the device of our invention.

Fig. 3 is an enlarged fragmentary view in section on line 3—3 of Fig. 2, illustrating more clearly the construction and operation of the improved cutting element or blade of our device.

Figs. 4 and 5 are detail views in section on lines 4—4, 5—5 respectively of Fig. 3, illustrating the outline of the blade or cutting element at different locations therein.

In the operation of a piston in an internal combustion engine cylinder, a considerable amount of wear is caused at the upper part of the cylinder bore, which results in the production of an annular shoulder or ridge immediately above the limit of travel of the topmost piston ring. When it is desired to install new rings on the piston, it is desirable to remove this shoulder or ring in order to have the new top compression ring function properly and to prevent injury or breakage, for if the shoulder or ridge is not removed the new ring will become chipped or broken or rounded from striking the shoulder and will naturally lose its efficiency as a compression seal.

There are a number of types of reamers on the market designed to remove the aforesaid shoulder or ridge; however most of them are unsatisfactory in operation due to the fact that there is either a likelihood of overcutting or undercutting the ridge, the results of which are equally objectionable, or the cutting elements thereof are apt to become inoperative or objectionably operative through improper sharpening, or the cutting structure is hidden from view when being used, or for other reasons.

It is the primary object of this invention to correct or eliminate the foregoing objections and we accomplish this by the provision of an improved cutting element or blade for a reaming device, which latter is in its general structure of a known type, the said improved element or blade completely obviating all of the objections which have hitherto characterized devices of this type.

Referring to the drawing, the reference numeral 1 indicates an internal combustion engine cylinder which has had produced therein by excessive wear an enlarged tapered portion 2 adjacent the upper part of its bore and a radially inwardly projecting annular shoulder or ridge 3 above the limit of travel of the top compression ring, to remove which ridge the device of our invention is designed.

The device is generally designated by the reference numeral 4 and consists of an expansible chuck for engaging within the cylinder bore, the chuck being indicated by the reference numeral 5 and consisting of radially acting jaws 6 which are guided and projected radially by a vertically acting cam member 7 having a pair of conical cam surfaces coacting with the jaws in an obvious manner. This cam member is actuated vertically by a stem 8 threadedly engaging the same and provided with a kerfed top extremity by which the stem is rotatably actuated, using a screw-driver or other tool. To position the device in operative position, the jaws are collapsed, inserted within the cylinder, and expanded by rotation of the stem to clamp the device in position.

A coil spring 9 encircling the jaws 6 and positioned in notches therein maintains the parts of the chuck in assembled relation and retracts the same when the cam member 7 is actuated downwardly. The reaming device has a fixed top guide or supporting plate 10 on which is rotatably mounted a tool support 11. This tool support is fixedly connected to a nut member 12 by which it is rotated on supporting plate 10, using a suitable wrench for this purpose. The support includes a clamp 13 wherein a suitable tool carrier 14 is adjustably positioned, the clamp being actuable by means of a knurled handpiece 141. This tool carrier has pivotally mounted thereon by a pin 15 a tool holder 16 which is resiliently urged outwardly relative to the carrier 14 by means of a coil spring 17 engaging the tool holder and carrier. A vernier inward adjustment of the radial position of the tool holder is made possible by an eccentric device 18 engageable with the tool holder, but which forms no part of this invention and has therefore not been illustrated in detail.

From the foregoing it is seen that the tool holder 16 is given a rotary turning movement within the cylinder bore by the engagement of a suitable actuating implement or wrench implement with a nut member 12 and that the tool to be described is resiliently urged outwardly into cutting engagement with the ridge to be reamed.

It will be observed that the tool holder 16 is provided with forked legs 20 at one end thereof to straddle the carrier 14 upon which it is pivotally mounted. At the opposite end thereof, the carrier is provided with a vertically extending radial slot 21 of substantial radial depth and the cutting element or blade 22 of our invention is swiveled in this slot by means of a pin 23 fixedly secured to the carrier and extending through the slot. The blade has a rounded back edge 24 so that it is capable of considerable vertical swiveling movement in the slot 21 in order to maintain itself in proper relation to the cylinder wall and the ridge 3 which is being cut.

The formation and outline of the blade 22 are shown in detail in Figs. 3, 4 and 5. This blade is preferably made of a relatively thin piece blanked out in a punch press from a strip of high carbon steel or other steel which may be suitably hardened following the formation of the blade. As stated, the rear edge thereof is rounded and the forward or operating edge thereof has a notch 25 formed therein and separating the same into a cutting portion or section 26 and a guide portion or section 27. These two sections are in linear alinement with one another, but the guide section is bent or rounded off at a slight angle in the intended direction of inclination of the sharpened edge preparatory to sharpening the cutting portion or section 26, so that when the latter is provided with a cutting edge by such grinding or sharpening, as on the face 28, the guide section may also be slightly ground correspondingly along the face 29, but not throughout its entire face and without producing a sharpened cutting edge for the latter. In this manner, the cutting edge 28 may be produced by a single pass of the entire blade, i. e., the portions 26, 27 thereof, over the grinding wheel, thereby greatly expediting the production thereof and minimizing the difficulty of attaining a properly ground cutting edge.

From an inspection of Fig. 3, it will be noted that the pivot pin 23 for the blade 22 is located relative to the latter so that the radially outward force exerted on the blade is applied at a point within the upper and lower extremities of the blade guide portion 27. Thus, as the blade is rocked outwardly from solid to dotted line position, as illustrated in Fig. 3, the portions 26, 27 approach coincidence with the tapered worn area 2 of the cylinder wall, but when this position of coincidence is reached, due to the positioning of the pivot pin 23 relative to the blade, there is no further force tending to rock the cutting portion 26. Hence, no tendency to apply further radial cutting force such as might tend to cause overcutting even with the portions 26, 27 in linear alinement.

It is emphasized that in use the portion 27 of the blade serves only as a guide portion which follows the worn or tapered portion 2 of the cylinder bore and guides and positions the cutting edge 28 on the uppermost portion 26. It will be apparent therefore that the rounded portion 27 serves as a stop which prevents the cutting edge from cutting into the cylinder any deeper than the original worn bore, by its linear engagement with the worn and taper portion 2. This is a feature of extreme importance since overcutting by the ridge reamer has the very objectionable result that the outermost face of the uppermost installed ring will then be exposed to radially acting pressure of the exploding gas, which in turn results in collapse of the ring rendering the same entirely inefficient. As more and more metal is cut from the wall, reducing the ridge 3, the blade 22 pivots around the pin 23 until the ridge is entirely removed, at which time the rounded guide portion 27 prevents further cutting action taking place.

It is likewise desired to stress the importance of the rounded or bent face 29 of the guide portion 27. It is an extremely difficult job to produce two surfaces in exactly parallel relation to one another, one of which must have a sharp metal cutting edge and the other having a surface which will not cut and particularly is this so when a heavy or thick material is used. In such cases, it is practically impossible to produce the necessary condition referred to; however we find that employing a rounded or bent portion 27 the grinding may be proceeded with in the obviously most practical manner, i. e., presenting the entire forward edge of the blade to be ground and that this thus facilitated grinding operation does not result in the production of a sharpened cutting edge on the guide portion 27, due to the rearward bend characterizing the same.

By utilizing a relatively thin stock for the production of the blades 22, we contemplate supplying them at only a few cents' cost so that they may be thrown away when used once and a new blade substituted. A great deal of the objection to hitherto known blades of the type under consideration has sprung from the fact that it is practically impossible to resharpen the same and produce a blade which neither overcuts nor fails to remove all of the shoulder or ridge. Both of these situations are extremely serious and cause a great many so-called piston ring failures. On the whole, the blade of our invention is much more susceptible of being successfully resharpened, but in any event the fact that it may be replaced at a negligible cost and enable perfect results to be attained, eliminates the economic

need for resharpening, and we regard this as a factor of definite advantage.

As stated, our blade will accurately follow any varying amount of taper in the worn portion 2, will accurately remove the entire shoulder and will eliminate any chance of overcutting. What is more, the cutting element is disposed so that the cutting operation is at all times visible to the operator as distinguished from hitherto known types of reamers in practically all of which the cutting edge is hidden.

We have illustrated and described our improvements in an embodiment which is very practical. We have not attempted to illustrate or describe other embodiments or adaptations as it is believed this disclosure will enable those skilled in the art to embody or adapt our improvements as may be desired.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. A reaming device for removing ridges resulting from piston ring wear in a cylinder, comprising a support adapted to be fixedly secured within the cylinder, a member rotatable on said support in concentric relation to the cylinder, a tool carrier adjustably mounted on said member, a tool holder pivotally mounted on said carrier and resiliently urged outwardly, said holder having a vertical slot therein to receive a cutting tool, and a cutting tool pivotally mounted in said slot medially of the tool for swiveling movement therein, said tool having an upper cutting portion above the pivotal point thereof and a lower guide portion extending below said pivotal point, said portions being in linear alinement, said cutting portion having an inclined ground cutting edge for cutting engagement with the cylinder wall in operative position of the device and said guide portion having a rounded cylinder engaging guide surface inclined in the direction of inclination of the cutting edge whereby the latter may be produced by passing both said portions over a grinding surface without resultant changing of the shape of the guiding portion, said guide surface when in full engagement with the cylinder wall preventing further cutting thereof by said cutting edge.

2. A reaming device for removing ridges resulting from piston ring wear in a cylinder, comprising a support adapted to be fixedly secured within the cylinder, a tool holder rotatable on said support in concentric relation to the cylinder, said holder having a vertical slot therein to receive a cutting tool, and a cutting tool pivotally mounted in said slot medially of the tool for swiveling movement therein, said tool having an upper cutting portion above the pivotal point thereof and a lower guide portion extending below said pivotal point, said portions being in linear alinement, said cutting portion having an inclined ground cutting edge for cutting engagement with the cylinder wall in operative position of the device and said guide portion having a rounded cylinder engaging guide surface inclined in the direction of inclination of the cutting edge whereby the latter may be produced by passing both said portions over a grinding surface without resultant changing of shape of the guiding portion, said guide surface when in full engagement with the cylinder wall preventing further cutting thereof by said cutting edge.

3. A reaming device for removing ridges resulting from piston ring wear in a cylinder, comprising a support adapted to be fixedly secured within the cylinder, a tool holder rotatable on said support in concentric relation to the cylinder, said holder having a vertical slot therein to receive a cutting tool, and a cutting tool pivotally mounted in said slot medially of the tool for swiveling movement therein, said tool having an upper cutting portion above the pivotal point thereof and a lower guide portion extending below said pivotal point, said cutting portion having an inclined ground cutting edge for cutting engagement with the cylinder wall in operative position of the device and said guide portion having a rounded cylinder engaging guide surface inclined in the direction of inclination of the cutting edge whereby said guide surface when in full engagement with the cylinder wall prevents further cutting thereof by said cutting edge.

4. In a device for reaming a cylinder to remove ridges therefrom, a support, a tool carrying member rotatably mounted on said support and adapted to be positioned thereby concentrically of said cylinder, and a vertically extending tool means positioned medially of the tool to pivot the same on said support and transmit radial expansive action from the support to the tool, said tool having a wall cutting edge and a guiding portion disposed, in the main, on opposite sides of the pivotal point of the tool, said guiding portion having a rounded dull surface engageable with the cylinder wall and in alinement with said cutting edge and the tool being rockable on the pivot thereof as said cutting edge removes material from the cylinder wall, said guiding portion preventing further cutting by said cutting edge when the cylinder wall is engaged thereby, the rounded surface of said guiding edge permitting grinding of the cutting edge without objectionably changing its rounded surface, the pivot point for said tool lying between the upper and lower vertical limits of said guide portion.

5. In a device for reaming a cylinder to remove ridges therefrom, a support, a tool carrying member rotatably mounted on said support and adapted to be positioned thereby concentrically of said cylinder, and a vertically extending tool means positioned medially of the tool to pivot the same on said support and transmit radial expansive action from the support to the tool, said tool having a wall cutting edge and a guiding portion, said guiding portion being engageable with the cylinder wall and the tool being rockable on the pivot thereof as said cutting edge removes material from the cylinder wall, said guiding portion preventing further cutting by said cutting edge when the cylinder wall is engaged thereby, the pivot point for said tool lying between the upper and lower vertical limits of said guide portion.

6. In an internal reaming device including a support internally engageable with the work, a tool carrier rotatable on the support and means for urging the tool carrier outwardly to engage a tool carried thereby with the cylinder wall, and an elongated vertically extending tool pivoted medially on said carrier and rockable in a vertical plane with relation thereto, said tool having an upper ground cutting edge and a lower rounded guiding portion engageable with the work to guide said cutting edge as it is advanced radially with accompanying pivotal movement of the tool on the carrier, the pivotal point for said tool being located between the upper and lower extremities of said guiding portion whereby to eliminate any tendency of the tool to rock about the guid-

ing portion after the latter has reached full engagement with the work.

7. In an internal reaming device including a support internally engageable with the work, a tool carrier rotatable on the support and means for urging the tool carrier outwardly to engage a tool carried thereby with the cylinder wall, and an elongated tool pivoted medially on said carrier and rockable with relation thereto, said tool having a cutting edge and a lower rounded guiding portion engageable with the work to guide said cutting edge as it is advanced radially with accompanying pivotal movement of the tool on the carrier.

8. In an internal reaming device including a support internally engageable with the work, a tool carrier rotatable on the support and means for urging the tool carrier outwardly to engage a tool carried thereby with the cylinder wall, and a tool pivoted medially on said carrier and rockable with relation thereto, said tool having a cutting edge and a guiding portion engageable with the work to guide said cutting edge as it is advanced radially with accompanying pivotal movement of the tool on the carrier.

9. In an internal reaming device of the class described, a support, a tool carrying member rotatably mounted on said support and adapted to be positioned thereby concentrically of the work, and a tool pivoted on said support, said tool having a cutting edge and a guiding portion, said guiding portion having a relatively dull edge engageable with the wall of the work and in alinement with said cutting edge, and the tool being rockable on the pivot thereof as said cutting edge removes material from the work, said guiding portion preventing further cutting by said cutting edge when the work is engaged thereby.

10. In an internal reaming device of the class described, a support, a tool carrying member rotatably mounted on said support and adapted to be positioned thereby concentrically of the work, a tool pivoted on said support, said tool having a cutting edge and a guiding portion, said guiding portion being engageable with the wall of the work and in alinement with said cutting edge, and the tool being rockable on the pivot thereof as said cutting edge removes material from the work, said guiding portion preventing further cutting by said cutting edge when the work is engaged thereby.

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