Sept. 10, 1957 H. B. BARRETT 2,805,528

CYLINDER HONES

Filed June 8, 1956

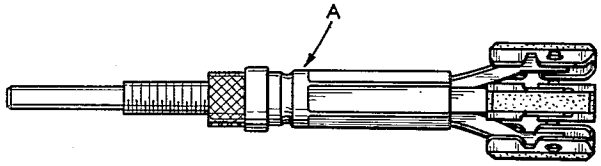

FIG. 1

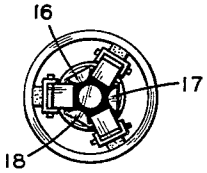

FIG. 2

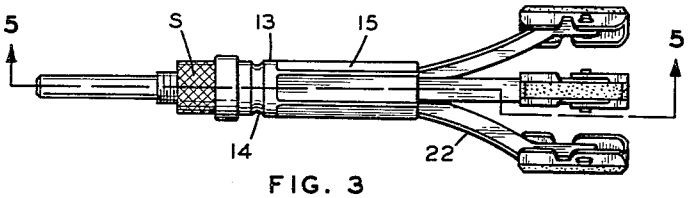

FIG. 3

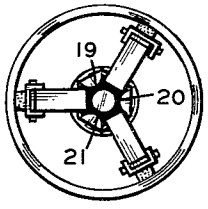

FIG. 4

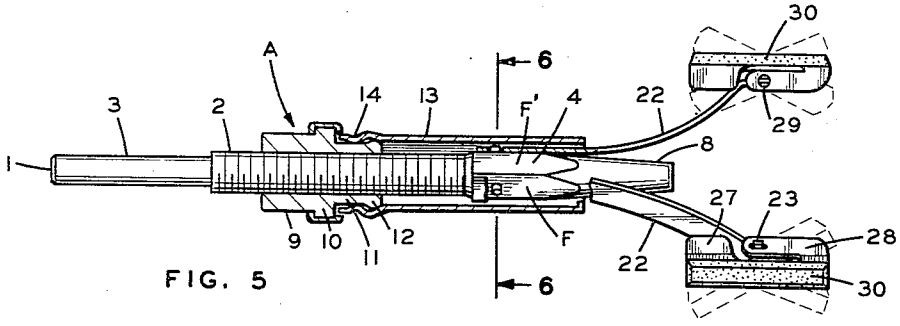

FIG. 5

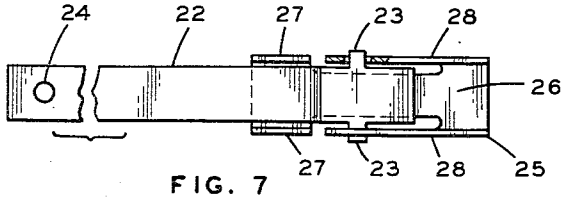

FIG. 7

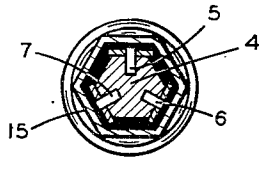

FIG. 6

INVENTOR.

HARRY B. BARRETT

BY Alfred W. Leonard

ATTORNEY

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CYLINDER HONES

Harry B. Barrett, Clayton, Mo.

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11 Claims. (Cl. 51—184.2)

This invention relates in general to certain new and useful improvements in cylinder hones and, more particularly, to honing devices adapted for use in the honing of automotive brake cylinders.

It is the primary object of this invention to provide a tool designed to finish, smooth, polish, or abrade internal cylindrical surfaces.

It is also an object of this invention to provide a cylinder hone which can be easily and conveniently adjustable to fit internal cylindrical surfaces of different diameters.

It is another object of the present invention to provide a cylinder hone which will not damage the cylinder or surrounding mechanism if the cylinder hone is rapidly or accidentally withdrawn while still in rotation.

It is an additional object of the present invention to provide an inexpensive finishing tool which can be mounted in the chuck of an electric drill or a similar hand tool.

With the above and other objects in view, my invention resides in the novel features of form, construction, arrangement, and combination of parts presently described and pointed out in the claims.

In the accompanying drawing—

Fig. 1 is an elevational view of a cylinder hone;

Fig. 2 is an end view of the cylinder home as shown in Fig. 1;

Fig. 3 is an elevational view of the cylinder hone in one adjusted position;

Fig. 4 is an end view of a cylinder hone in the adjusted position shown in Fig. 3;

Fig. 5 is a sectional view taken along line 5—5 of Fig. 3;

Fig. 6 is a transverse sectional view taken along line 6—6 of Fig. 5; and

Fig. 7 is a fragmentary plan view of a leaf spring member forming a part of the present invention.

Referring now in more detail and by reference characters to the drawing, which illustrates a preferred embodiment of the present invention, A designates a cylinder hone comprising a rod-like shaft 1 having a central externally threaded section 2 which is turned down at one end in the formation of a diametrically reduced smooth shank 3. At its other end, outwardly from the threaded section, the shaft 1 is integrally provided with an enlarged shaft-like honing-head 4 of substantially hexagonal cross-sectional shape and being provided in alternate flat faces F with short outwardly projecting radial pins 5, 6, 7. The honing-head 4 is also ground off or otherwise formed along its forward end in the provision of a blunt-pointed tapered end-section 8.

Operatively mounted on the threaded section 2 of the rod-like shaft 1 is a round nut 9 exteriorly provided with a knurled surface *s* to facilitate manual rotation, as will presently more fully appear. The nut 9 also integrally includes a diametrally enlarged annular shoulder 10 and a forwardly extending cylindrical collar 11, which is, in turn, provided at its outer end with a peripheral bead 12.

Rotatably mounted upon and carried by the collar 11 is an adjustment sleeve 13 having an annular indentation 14 which is adapted for endwise abutment against the bead 12 whereby the sleeve 13 is held in assembled relation upon the nut 9. For a substantial portion of its length forwardly of the indentation 14, the adjustment sleeve 13 is formed into a hexagonal barrel 15 which is integrally provided at its open end on alternately spaced sides with radially inwardly projecting guide ears 16, 17, 18, having inwardly presented arcuate margins 19, 20, 21, respectively adapted for sliding engagement against intermediate flat faces F′ of the honing-head 4.

Provided for removable disposition upon the honing-head 4 are three identical, spring steel honing arms 22, each being provided at its outer end with laterally projecting ears 23 and at its inner end with a circular aperture 24 adapted for loose-fitting interchangeable disposition upon the pins 5, 6, 7.

Provided for removable and replaceable disposition upon the honing arms 22 are honing-elements 25 formed of sheet metal and integrally including a flat bight 26 marginally joined to two lateral flanges 27 and two lateral spring leaves 28, the latter extending lengthwise rearwardly from the forward end of the honing-element 25 to approximately the midpoint thereof and being provided with apertures 29 for swivelling connection with the ears 23. Cemented or otherwise rigidly affixed to the outer face of the bight 26 of each honing-element 25 is a rectilinear abrasive stone 30 adapted for operative contact with the internal cylindrical surface which is to be honed.

It should be noted that the aforementioned honing arms 22 are of substantially the same width as the flat faces of the honing-head 4 so as to be more or less snugly held in place by the hexagonal barrel 15. Furthermore, the honing arms 22 are longitudinally bent and tempered so as to extend outwardly and forwardly from the honing-head 4 in a gentle S-shaped curve.

In use, the honing arms 22 are fitted upon the radially extending pins 5, 6, 7, of the honing-head 4, and the hexagonal barrel 15 shifted forwardly in relation thereto by manual rotation of the nut 9. The barrel 15 is, of course, held against rotation and caused to shift longitudinally by the sliding contact between the arcuate margins 19, 20, 21, of the guide ears 16, 17, 18, and the intermediate flat faces F′ of the honing-head 4, causing the honing-elements to operate along progressively smaller maximum diameters. In other words, the adjusted position of the hexagonal barrel 15 will determine, for such position of adjustment, the maximum diameter of the path around which the honing elements 25 can rotate when unrestrained. It will, of course, be understood that such diameter, at any given setting, is somewhat larger than the actual diameter of the cylindrical surface which is to be honed.

The shank 3 of the hone A is inserted into the chuck of a conventional electric hand drill or similar power source. Since such power source is entirely conventional, it is not specifically shown or described herein. The adjustment sleeve 13 is then shifted into some desired position and the honing-elements 25 manually pressed together so as to slip freely within the cylinder to be honed. Upon being released, the honing arms 22 will spring outwardly and hold the stones 30 resiliently against the surface being honed. Thereupon, the power source is energized and the entire cylinder hone A rotated, causing the stones 30 to slide rapidly around the cylindrical surface being honed.

In the event that the hone A, due to accident or misuse, should come out of the cylinder being honed while the power source is still energized, the stones 30 will fly outwardly only to the maximum diameter permitted by the adjustment sleeve 13. This restriction will prevent damage to the stones 30, as well as to surrounding mechanical

elements of the cylinder assembly. It is also apparent that the stones **30**, when worn out or broken, can be readily replaced at will. Finally, the hone A is substantially self-centering in the sense that it is not necessary to maintain the longitudinal axis of the shank **3** in precise alignment with the longitudinal axis of the cylinder being honed.

Another important advantage and unusual operating characteristic of hones constructed in accordance with the present invention is the ability of the hone A to maintain the stones **30** in an orbit which is co-axial with the cylinder being honed even though the shank **3** is swung into an angular or non-axial position. Inasmuch as the hone A is ordinarily driven by an electric hand drill, the mechanic cannot be expected to hold the drill in true axial alignment with the cylinder being honed and yet the failure to do so with conventional types of hones will introduce serious inaccuracies. The hone A, however, will produce an accurate cylindrical surface even if the shank **3** is wobbled. Thus, the swivel-like connections formed by the tongues **23** and apertures **29**, taken together with the resiliency of the arms **22** and the manner of their connection to the honing-head **4**, in effect constitute a universal joint, so that the stones **30** will maintain accurate axiality within the cylinder being honed.

It should be understood that changes and modifications in the form, construction, arrangement, and combination of the several parts of the cylinder hone may be made and substituted for those herein shown and described without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A cylinder hone comprising an elongated shank having an axially projecting head, a plurality of resilient arms adapted for longitudinal flexing radially of said shank and being loosely mounted upon the head, a tubular sleeve shiftably mounted upon the shank, means on the shank for shifting the tubular sleeve axially with respect to the shank to various relative positions of adjustment therealong, said sleeve being adapted, when in such shifted positions, to extend over and around end portions of the arms and bear thereagainst to limit the maximum diameter to which the outer ends of the arms can extend, and abrasive elements swivelly mounted on the outer ends of each of said arms.

2. A cylinder hone comprising an elongated shank having an axially projecting head, a plurality of resilient arms having a longitudinal arcuate contour and being loosely mounted upon the head, a tubular sleeve shiftably mounted upon the shank, means on the shank for shifting the tubular sleeve axially with respect to the shank to various relative positions of adjustment therealong, said sleeve being adapted, when in such shifted positions, to extend over and around end portions of the arms and bear thereagainst to limit the maximum diameter to which the outer ends of the arms can extend, and abrasive elements swivelly mounted on the outer ends of each of said arms.

3. A cylinder hone comprising an elongated shank having an axially projecting head, a plurality of resilient arms having a longitudinal arcuate contour and being loosely mounted upon the head, a tubular sleeve shiftably mounted upon the shank, means on the shank for shifting the tubular sleeve axially with respect to the shank to various relative positions of adjustment therealong, said sleeve being adapted, when in such shifted positions, to extend over and around end portions of the arms and bear thereagainst to limit the maximum diameter to which the outer ends of the arms can extend, and abrasive elements removably mounted on the outer ends of each of said arms.

4. A cylinder hone comprising an elongated shank having an axially projecting head, a plurality of resilient arms formed of flat resilient blades of spring material and having a longitudinal arcuate contour, said arms being loosely mounted upon the head, a tubular sleeve shiftably mounted upon the shank, means on the shank for shifting the tubular sleeve axially with respect to the shank to various relative positions of adjustment therealong, said sleeve being adapted, when in such shifted positions, to extend over and around end portions of the arms and bear thereagainst to limit the maximum diameter to which the outer ends of the arms can extend, and abrasive elements operatively mounted on the outer ends of each of said arms.

5. A cylinder hone comprising an elongated shank having an axially projecting head, a plurality of resilient arms formed of flat resilient blades of spring steel and having a longitudinal arcuate contour, said arms being loosely mounted upon the head, a tubular sleeve shiftably mounted upon the shank, means on the shank for shifting the tubular sleeve axially with respect to the shank to various relative positions of adjustment therealong, said sleeve being adapted, when in such shifted positions, to extend over and around end portions of the arms and bear thereagainst to limit the maximum diameter to which the outer ends of the arms can extend, and abrasive elements operatively mounted on the outer ends of each of said arms.

6. A cylinder hone comprising an elongated shank having an axially projecting head, a plurality of resilient arms adapted for longitudinal flexing radially of said shank and being loosely mounted upon the head at their inner ends, a tubular sleeve shiftably mounted upon the shank, means on the shank for shifting the tubular sleeve axially with respect to the shank to various relative positions of adjustment therealong, said sleeve being adapted, when in such shifted positions, to extend over and around end portions of the arms and bear thereagainst to limit the maximum diameter to which the outer ends of the arms can extend, and abrasive elements swivelly mounted on the outer ends of each of said arms.

7. A cylinder hone comprising an elongated shank having an axially projecting head, a plurality of resilient arms adapted for longitudinal flexing radially of said shank and being loosely mounted upon the head, a tubular sleeve having an axially extending non-cylindrical section shiftably mounted upon the shank, means on the shank for shifting the tubular sleeve axially with respect to the shank to various relative positions of adjustment therealong, said sleeve being adapted, when in such shifted positions, to extend over and around end portions of the arms and bear thereagainst to limit the maximum diameter to which the outer ends of the arms can extend, and abrasive elements swivelly mounted on the outer ends of each of said arms.

8. A cylinder hone comprising an elongated shank having an axially projecting head, a plurality of resilient arms adapted for longitudinal flexing radially of said shank and being loosely mounted upon the head, a tubular sleeve shiftably mounted upon the shank, a nut threadedly mounted on the shank for shifting the tubular sleeve axially with respect to the shank to various relative positions of adjustment therealong, said sleeve being adapted, when in such shifted positions, to extend over and around end portions of the arms and bear thereagainst to limit the maximum diameter to which the outer ends of the arms can extend, and abrasive elements swivelly mounted on the outer ends of each of said arms.

9. A cylinder hone comprising an elongated shank having an axially projecting head, a plurality of resilient arms loosely mounted upon the head, a tubular sleeve having an axially extending non-cylindrical section shiftably mounted upon the shank, means on the shank for shifting the tubular sleeve axially with respect to the shank to various relative positions of adjustment therealong, said non-cylindrical section being provided with radially inwardly projecting ears for sliding engagement with the head whereby to prevent rotation of the sleeve as it is shifted axially with respect to the head, said sleeve being adapted, when in such shifted positions, to extend over and around end portions of the arms and bear thereagainst to limit the maximum diameter to which the outer ends of the arms can extend, and abrasive elements

operatively mounted on the outer ends of each of said arms.

10. A honing tool comprising an elongated rod-like shaft integrally including an intermediate threaded section integrally enjoined to one end by an axial shank and at its other end by an axially projecting head having a plurality of axially extending flat faces and an outwardly projecting tapered terminal section, short radial pins mounted in and projecting outwardly from at least some of the flat faces of the head, a nut rotatably mounted upon the threaded section, a sleeve journaled at one end upon the nut and extending axially forwardly therefrom around the head for longitudinally shiftable movement around the head, a plurality of resilient arms each provided at one end with an aperture for loose-fitting disposition upon one of said pins, one of said arms being removably and loosely disposed upon each of said pins and held in substantially floating disposition thereon by the sleeve, said sleeve also being in endwise engagement with outwardly presented faces of the arms for limiting the maximum diameter of the position assumed by the outer ends of the arms, and an abrasive honing element operatively mounted on the outer end of each of said arms.

11. A honing tool comprising an elongated rod-like shaft integrally including an intermediate threaded section integrally enjoined to one end by an axial shank

and at its other end by an axially projecting head having a plurality of axially extending flat faces and an outwardly projecting tapered terminal section, short radial pins mounted in and projecting outwardly from alternate flat faces of the head, a nut rotatably mounted upon the threaded section, a sleeve journaled at one end upon the nut and extending axially forwardly therefrom around the head for longitudinally shiftable movement around the head, a plurality of resilient arms each provided at one end with an aperture for loose-fitting disposition upon one of said pins, one of said arms being removably and loosely disposed upon each of said pins and held in substantially floating disposition thereon by the sleeve, said sleeve also being in endwise engagement with outwardly presented faces of the arms for limiting the maximum diameter of the position assumed by the outer ends of the arms, and an abrasive honing element operatively mounted on the outer end of each of said arms.

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