Nov. 10, 1931. E. A. HALL 1,831,172

CYLINDER HONE

Filed Dec. 10, 1928

Fig. 1

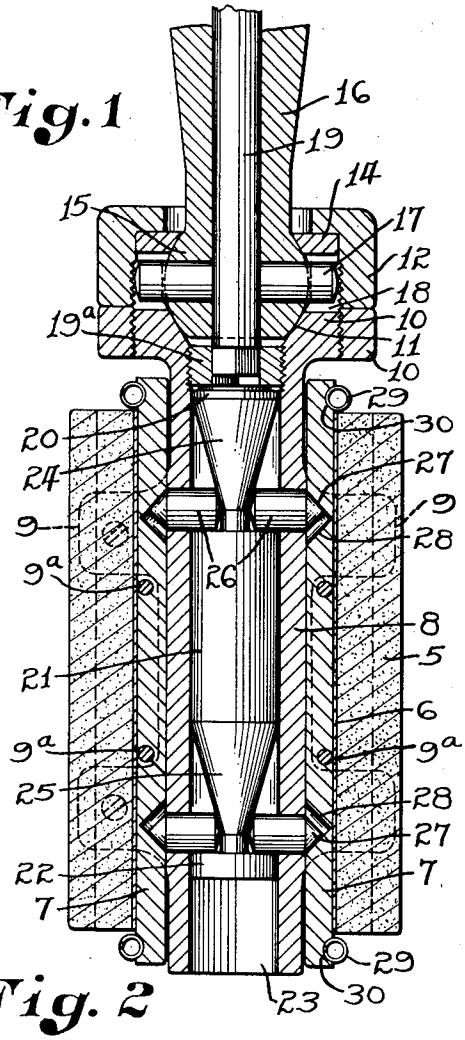


Fig. 2

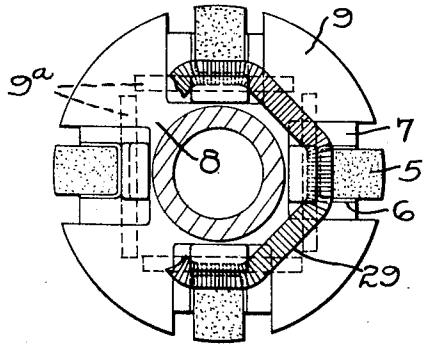
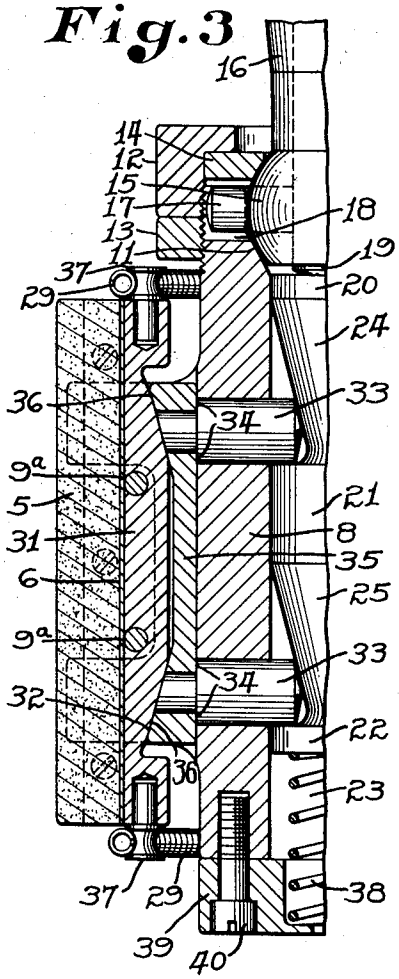


Fig. 3



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UNITED STATES PATENT OFFICE

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CYLINDER HONE

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This invention relates to a cylinder hone intended primarily for the production or the reconditioning of cylinders, and its object, generally stated, is to provide improved means for supporting and adjusting the grinding elements. One of the important features of the invention is the provision of a floating support for the respective grinding elements whereby the latter automatically adjust themselves individually to the work. Thus compensation is secured for unequal wear, independently of the position of the means by which the grinding elements are supported and guided. The body which carries the grinding elements is preferably formed in one integral piece encompassing a supporting core with radially projecting pins having opposed inclined surfaces, or supporting a member with oppositely inclined surfaces, on which the grinding elements are seated, the core being axially adjustable to vary the projection of the pins.

The characteristic features of the invention, together with its mode of operation and the advantages thereof, will be more fully described in connection with the accompanying drawings illustrating the same.

In the drawings:

Figure 1 is a central longitudinal section.

Figure 2 is a section taken on line 2—2 of Figure 1.

Figure 3 is a view similar to Figure 1, but showing a modified form of the invention.

As illustrated in Figures 1 and 2, the device comprises a number of grinding elements 5 arranged about a central axis. Each element 5 is set in a jacket 6, which is secured in a carrier 7. These carriers are supported by a body 8 which is provided with radially projecting wings 9 having opposed parallel surfaces between which the carriers 7 are guided for radial and longitudinal movement. Pins 9^a extend through the carriers 7 and have sufficient clearance on the wings to permit the carriers with the grinding elements to automatically adjust themselves to compensate for wear.

The body 8 is formed at one end with a head 10, having a concave spherical seat 11. The head 10 is externally threaded to receive a correspondingly threaded cap 12 and lock nut 13, and these together with a washer 14 co-operate with the head 10 to form a spherical socket to receive the correspondingly shaped head 15 of a drive shaft 16. This constitutes a universal connection between the shaft 16 and the tool body 8 and driving force is imparted to the latter by radial pins 17 which are mounted in the head 15 and project into slots 18 formed in the head 10. The drive shaft 16 and the means by which it is connected to the body 8 are immaterial to the present invention.

In one form of the invention, as shown in Figure 1, the shaft 16 is formed with a central longitudinal bore for receiving a spindle 19, which may be used to adjust a screw threaded plug 19^a within the body 8, and thereby exert pressure against the head 20. The head 20 is connected with the heads 21 and 22, which are slidably adjustable within a bore 23 formed in the body 8. The respective heads 20 and 21 are formed with oblique surfaces 24 and 25 facing in the same direction and preferably conical, and these surfaces, as the heads are adjusted longitudinally, have a wedge action against the inner ends of the pins 26, which are mounted for adjustment radially of the body 8. The pins 26 are formed at their outer ends with sloping surfaces 27, preferably conical, which engage corresponding recesses 28 formed at the bottom of the carriers 7. Before the tool is adjusted to the work, the carriers 7 are held in engagement with the conical ends 27 of the pins by any suitable yieldable means such as the coil springs 29 which encompass the body 8 and are seated in grooves 30 formed in the ends of the carriers 7.

By a longitudinal adjustment of the central core comprising the heads 20 and 21 with their conical surfaces 24 and 25, all of the pins 26 are adjusted equally. It will be noted, however, that the centers of pins 26 at opposite ends of the body 8 are farther apart than the centers of the corresponding surfaces of the recesses 28. This allows for a limited combined radial and longitudinal movement of each carrier 7 with respect to its support, so that the respective grinding

elements 5 have a floating support and may automatically adjust themselves individually to compensate for unequal wear. It is understood, of course, that in the normal operation of the device, the lower portions of the grinding elements come into action first and will wear off faster than the upper portions. The automatic adjustment of the grinding elements is effected without interfering in any way with the free adjusting movement of the pins 26 or of the heads 20 and 21 which control the adjustment. In other words, the compensating movement of the grinding elements may take place without causing any tendency for the pins 26 to bind. It will also be noted that the carriers 7 may be reversed end for end wherever the condition of the grinding elements makes it advisable to do so.

Figure 3 shows a modified construction for effecting substantially the same result. The elements which do not differ materially from those shown in Figure 1 are designated by the same reference characters. Each carrier 31, however, which carries the grinding element 5, has its inner face formed with oppositely inclined flat surfaces 32, instead of recesses like those shown at 28 in Figure 1. The pins 33 are formed with shoulders 34, which support a cradle 35 having oppositely inclined seats 36 on which the surfaces 32 have a floating support. Each carrier 31 has studs 37 mounted in its ends and provided with peripheral grooves which are engaged by the springs 29 to hold the carrier on its seat.

In Figure 3, the plug 19ª is omitted and suitable means will be provided to cause the end of the spindle 19 to bear against the head 20. Pressure is exerted upwardly against the head 20 by a spring 38 seated within a cap 39 secured by bolts 40, or other suitable means, to the end of the body 8.

In both forms of the invention herein described the two conical surfaces 24 and 25 taper in the same direction and there is no relative adjustment between them.

While I have illustrated and described in considerable detail two ways in which the invention may be embodied it is to be understood that this is merely for the purpose of illustration, and that many other modifications may be devised without departing from the scope of the invention as claimed.

What I claim is:

1. In a cylinder hone, a plurality of grinding stone carriers, a rotatable body having radial wings with opposed parallel faces between which the respective carriers are held for rotation with the body, seats against which the carriers rest, and means for adjusting said seats radially and maintaining them always at equal distances from the axis of the body, said carriers being independently movable on said seats longitudinally and radially with respect to the body.

2. In a cylinder hone, a plurality of grinding stone carriers, a rotatable body having radial wings with opposed parallel faces between which the respective stone carriers are held for rotation with the body, seats with oppositely inclined surfaces on which the carriers have a floating support to permit independent compensating movements thereof, and means for adjusting said seats outwardly.

3. In a cylinder hone, a body rotatable about a longitudinal axis, grinding stone carriers arranged about the body, guide means between which the respective carriers are held against circumferential displacement with respect to the body, the inner face of each of said carriers having oppositely inclined surfaces, means carried by said body having correspondingly inclined seats on which said surfaces rest, said carrier being movable longitudinally and radially with respect to said seats.

4. In a cylinder hone, a plurality of grinding stone carriers, a rotatable body having radial wings with opposed parallel surfaces between which the respective carriers are held for rotation with the body, seats carried by the body, each of said carriers and the respective seats having two oppositely inclined respectively co-engaging surfaces constituting a floating support for independent longitudinal rocking movements of the carriers, and means for adjusting said seats in unison radially and equally.

5. In a cylinder hone, a rotatable body, grinding stone carriers arranged about the body, means preventing circumferential displacement of said carriers with respect to the body, seats carried by the body, each of said carriers and the respective seats having two oppositely inclined respectively co-engaging surfaces, resilient means tending to move each end of each carrier toward the axis of the body, said carriers being otherwise free to move individually on said body and to automatically adjust themselves to compensate for wear, and means for radially adjusting said seats in unison.

6. In a cylinder hone, a body rotatable about a longitudinal axis, grinding stone carriers arranged about the body, guide members between which the respective carriers are held against circumferential displacement with respect to the body and permitted to have longitudinal radial rocking movements, means adjustable radially of the body beneath each carrier and presenting spaced bearing surfaces, each carrier having oppositely inclined surfaces which rest on said spaced bearing surfaces and constitute a floating support for the carrier, and means for radially adjusting said first means.

7. In a cylinder hone, a body rotatable about a longitudinal axis, grinding stone carriers arranged about the body, guide means having parallel surfaces between which the respective carriers are held against circum-

ferential displacement with respect to the body, a pair of radially adjustable elements projecting from the body beneath each carrier and terminating in oppositely inclined bearing surfaces, the respective carriers having similarly inclined surfaces resting on said bearing surfaces to constitute a floating support.

8. In a cylinder hone, a plurality of grinding stone carriers, a rotatable body having radial wings with opposed parallel surfaces between which the respective carriers are held for rotation with the body, radially adjustable means projecting from the body beneath each carrier and terminating in oppositely inclined bearing surfaces, the respective carriers having similarly inclined surfaces resting on said bearing surfaces, resilient means tending to move each end of each carrier toward the axis of the body, said carriers being otherwise free to move individually on said body and to automatically adjust themselves to compensate for wear.

9. In a cylinder hone, a plurality of grinding stone carriers, a rotatable body having radial wings with opposed parallel surfaces between which the respective carriers are held for rotation with the body, a seating element projecting from the body beneath each carrier and terminating in oppositely inclined bearing surfaces, means for adjusting said elements radially, the respective carriers having similarly inclined surfaces resting on said bearing surfaces to constitute a floating support, and resilient means tending to move each end of each carrier toward the axis of the body.

10. In a cylinder hone, a rotatable body, a plurality of grinding stone carriers arranged about the body, supporting members carried by said body and having oppositely inclined surfaces on which the carriers have longitudinal angular floating support, and an adjusting member within the body having similarly disposed inclined surfaces, said supporting members having portions engageable by the inclined surfaces of the adjusting member to vary the distance from the axis of the body to the inclined surfaces against which the carriers have their floating support.

11. In a cylinder hone, a rotatable body, a series of stone carriers arranged about the same, radially adjustable supports having inclined surfaces on which opposite ends of the carriers have longitudinal angular floating support, and adjusting means operable to project the radially adjustable supports equally at both ends of the carriers.

12. In a cylinder hone, a rotatable body, a series of stone carriers arranged about the same, an adjusting member disposed axially of the body and having two conical surfaces similarly tapered in the same direction, and means resting on said conical surfaces and providing a floating support for said carriers, whereby the stones carried thereby can individually adjust themselves to maintain a position parallel to the cylinder regardless of unequal wear.

13. In a cylinder hone, a hollow rotatable body having longitudinally extending surface grooves, a member longitudinally adjustable in said body and having two conical portions facing in the same direction, means for adjusting said member in the body, means coacting with the cone portions of said member and radially movable in the body by adjustment of said member, and stone carriers in said grooves and mounted on said last means for radial adjustment therewith and for longitudinal rocking adjustment relative to each other and the body.

14. In a cylinder hone, a plurality of stone carriers, a rotatable body having opposed radially disposed parallel surfaces between which the respective carriers are held for rotation with the body, means located within the body inwardly of said carriers and providing individual supports therefor on which each carrier may have longitudinal rocking movements relative to the body and to the other carriers to accommodate the working face of its stone to the surface acted on, and means interiorly of the body coacting with said first means and operable to radially adjust the carrier supports thereof in unison.

15. In a cylinder hone, a rotatable body, grinding stone carriers arranged about the body, means preventing circumferential displacement of said carriers with respect to the body, each of said carriers having an inwardly disposed inclined surface, means carried by the body having cooperating surfaces engageable by said first mentioned surfaces and constituting a floating support for each carrier to permit compensating movements thereof relative to the other carriers, means interiorly of the body operable to move said last mentioned means to radially adjust its carrier supporting surfaces, and resilient means tending to move each end of each carrier toward the axis of the body.

16. In a cylinder hone, a rotatable body, a plurality of carriers arranged about the body, an adjusting member within the body having inclined surfaces, radial elements engageable by said inclined surfaces and projectible thereby through operation of the adjusting member, said elements having inclined surfaces at their outer ends forming seats for the respective carriers, said carriers being held against circumferential displacement by the body and coacting with the inclined surfaces of the radial elements to permit and guide longitudinal angular movements of the carriers relative to the body and each other, and resilient means tending to move each end of each carrier toward the body axis.

17. In a cylinder hone, a body, a plurality of stone carriers arranged around the body and disposed lengthwise thereof, means holding the carriers to the body for yielding outward radial movements relative thereto, and radially adjustable supports on which the carriers rest for longitudinal angular movements relative to each other, the body and supports.

18. In a cylinder hone, a body, a plurality of stone carriers arranged around the body and disposed lengthwise thereof, means yieldingly holding the carriers to the body and permitting outward radial movements thereof, a cone member disposed interiorly of the body and adjustable axially thereof, and supports on which the carriers rest for longitudinal independent angular adjustment relative to each other and to the supports in radial planes substantially parallel to the body axis, said supports coacting with the cone member and being radially adjustable by axial adjustment of the cone member.

19. In a cylinder hone, a body, a plurality of stone carriers arranged around the body and disposed lengthwise thereof and guided thereby for longitudinal angular radial movements, resilient means tending to move each end of each carrier toward the body axis, adjusting means interiorly of the body, and means intermediate said adjusting means and the carriers radially adjustable by adjustment of the adjusting means and providing a plurality of seats for each carrier and permitting independent guided movements of the carriers.

In testimony whereof I have hereunto signed my name to this specification.

ERNEST A. HALL.