May 12, 1953 H. R. BILLETER 2,637,953

CYLINDER SURFACING TOOL

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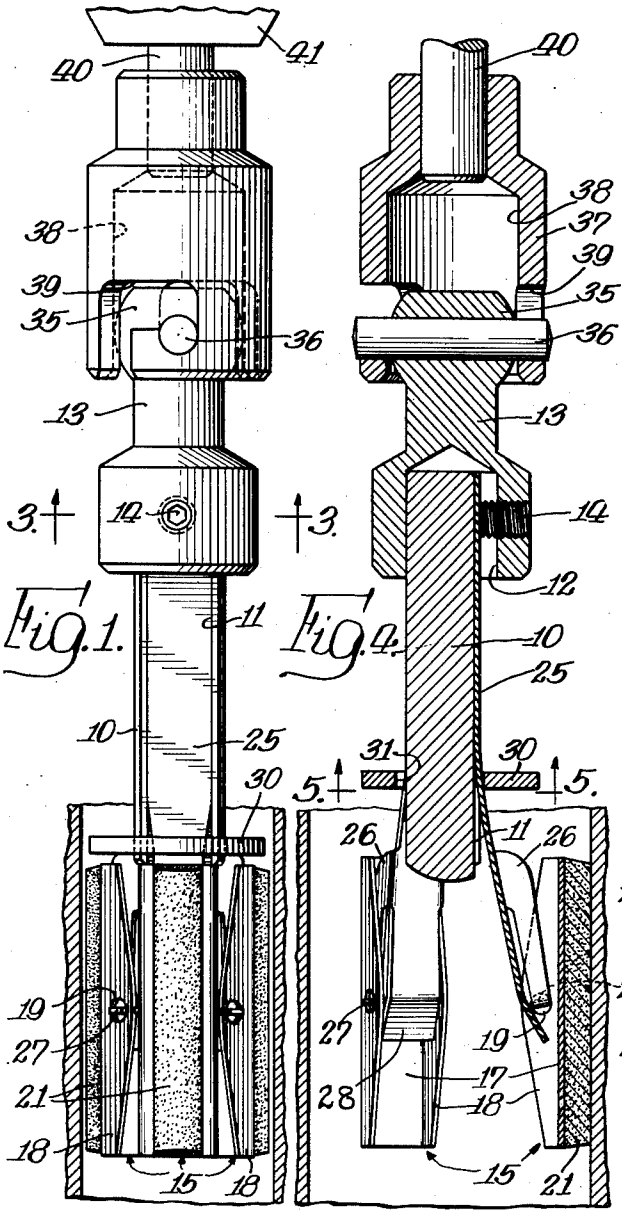


Fig. 1.

Fig. 4.

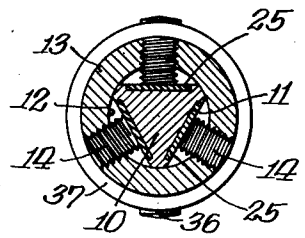


Fig. 3.

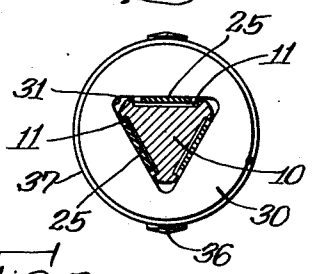


Fig. 5.

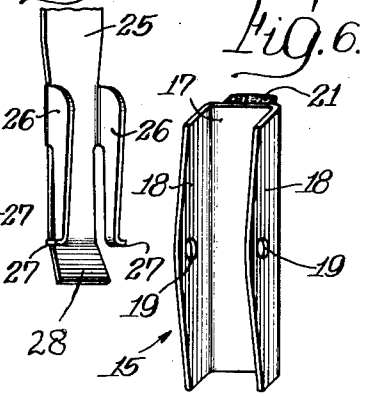


Fig. 7.

Fig. 6.

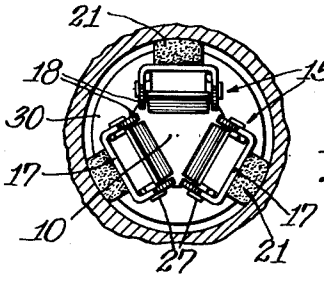


Fig. 2.

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CYLINDER SURFACING TOOL

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9 Claims. (Cl. 51—184.2)

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This invention relates to cylinder surfacing tools and has to do more particularly with a tool of this character especially well adapted for surfacing cylinders of relatively small size. While the present invention is especially well adapted to cylinder surfacing tools of small sizes for small cylinders, the invention is not thus limited and tools of larger sizes may be constructed following the teachings of the invention.

An object of the invention is to provide a cylinder surfacing tool which may be made small and compact for use in surfacing relatively small cylinders such, for example, as automotive brake cylinders, and which at the same time is sufficiently strong and rugged to resist breakage even though subjected to relatively rough usage.

Another object is to provide a cylinder surfacing tool of the type embodying a plurality of cylinder surfacing units, including abrasive stones or other surfacing elements, yieldably supported for self-acting expansion into contact with the wall of the cylinder, in which tool the surfacing elements are adapted to be clamped in contracted position to facilitate insertion of the corresponding portion of the tool into the cylinder.

Still another object of the invention is to provide a cylinder surfacing tool of the type including a plurality of cylinder surfacing units, in which tool the units may be quickly and easily removed by a simple manual manipulation to permit replacement when the units become worn or in the event that they should be damaged.

A further object of the invention is to provide a tool of the foregoing character which is simple and inexpensive to manufacture but which, at the same time, is effective to accomplish the desired results and is sturdy and durable.

Still another object of the invention is to provide a cylinder surfacing tool of the type wherein a plurality of surfacing units are carried by supporting members for expansion in a generally radially outward direction into engagement with the cylinder wall, in which tool each surfacing element is rockable on its supporting member about a single axis extending transversely thereof to permit self-adjusting movement of the surfacing element, whereby during operation the element contacts the cylinder wall substantially throughout its length, but such rocking movement being positively limited to facilitate insertion of the tool in the bore of the cylinder, the surfacing units at the same time being positively prevented from rocking or tilting on their respective supports except about the aforesaid axes.

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Another object of the invention is to provide a cylinder surfacing tool of the type wherein a plurality of surfacing units are supported for radially outward expansion against the wall of the cylinder and are contractible to permit insertion of the thus supported units into a relatively small bore cylinder, in which tool the units are so supported that they may be contracted into a relatively small compass but the units and their supporting means nevertheless are of sufficient size to provide the desired strength and rigidity of the structure.

Another object is to provide a cylinder surfacing tool which is light but sturdy and at the same time is automatically self-centering, is well balanced, and is relatively free from vibration or chattering.

Other objects and advantages of the invention will appear from the following description taken in connection with the appended drawings, in which:

Figure 1 is a side elevational view of one embodiment of the invention, the tool being shown as inserted in a cylinder of such size that the tool is contracted substantially to the minimum diameter;

Fig. 2 is a bottom view of the structure of Fig. 1;

Fig. 3 is a transverse sectional view taken along line 3—3 of Fig. 1;

Fig. 4 is a longitudinal sectional view through the device and showing it in its condition when inserted in a cylinder of larger diameter than that shown in Fig. 1, with the surfacing units expanded somewhat;

Fig. 5 is a transverse sectional view taken along line 5—5 of Fig. 4;

Fig. 6 is a perspective view of one of the surfacing units; and

Fig. 7 is a fragmentary perspective view of the free end portion of one of the spring supports for the surfacing units.

The tool of the present invention includes a rigid elongated body 10 of a cross section providing a plurality of relatively flat faces which are provided with rectangular grooves 11 respectively, and preferably it is of triangular cross section, for reasons which will appear hereinafter, thereby providing three such grooved faces. One end of the body is received in a recess or socket 12 formed in the end of a head or socket member 13 and is removably secured therein by set screws 14 threaded into the head 13 and corresponding in number to the number of faces of the body 10 and cooperating respectively there-

with in a manner described more in detail hereinafter.

The tool includes a plurality of, and preferably three, surfacing units 15 adapted to be mounted in circumferentially spaced relation for expansion in a generally radially outward direction into contact with the wall of the cylinder, so that when the tool is rotated and reciprocated within the cylinder in the manner customarily employed in the use of cylinder surfacing tools of this general character, the cylinder engaging portions of the cylinder surfacing units bear against the wall of the cylinder and effect the desired action on the wall. Each surfacing unit includes a carrier (see especially Fig. 6) which preferably takes the form of a channel member having a web 17 and spaced flanges 18 extending from the sides thereof. The flanges 18 preferably are of greater heights at their central portion than at their ends and are provided with aligned openings 19 substantially midway along their lengths. Suitably secured to the outer face of the web 17, as by an adhesive, is a surfacing element which preferably takes the form of an abrasive stone or pad of the desired degree of fineness to impart to the surface of the cylinder the desired surface characteristics.

The surfacing units 15 are connected to the body 10 in such manner that they are normally yieldingly urged radially outwardly but may be contracted for the purpose of inserting them in the bore of the cylinder to be surfaced. At the same time the surfacing units are so carried by the body 10 that when the latter is rotated and reciprocated, or both, the units are correspondingly driven to pass over the surface of the cylinder wall in contact therewith. To this end each surfacing unit is attached to the body 10 by a support 25 which preferably takes the form of an elongated leaf spring having its inner end disposed in one of the grooves 11 and within the socket 12 and secured therein by the corresponding set screw 14. The support 25 is normally bowed or bent, and preferably the former, so that the portion thereof which extends out of the socket 12 normally extends away from the body 10. The support 25, however, is so positioned that when its outer end is moved in the direction of the body 10 the support progressively enters the groove 11 and the corresponding portion of the support seats against the bottom wall of the groove.

Each of the surfacing units 15 is secured to one of the supports adjacent the free end thereof in such manner that the unit is free to rock to a limited extent about a single axis transversely of the support but is restrained against rocking or tilting movement in any other direction with respect to the support. To this end the support is provided adjacent its outer end with a pair of upstanding ears 26 preferably formed integrally with the support. Each ear 26 joins the support at its base and extends therefrom along but spaced from the support toward the free end of the latter, and is provided with an out-turned end 27 adapted to enter one of the openings 19 of the carrier 16, whereby the two ends 27 serve as trunnions for rockably mounting the carrier and its attached surfacing element. The free end 28 of the support 25 is bent outwardly from the plane of the support, as illustrated particularly in Figs. 4 and 7, and serves to take the side thrust of the unit 15 during operation and aids in preventing the unit from twisting on its support. Rocking movement of the surfacing unit on the support is limited in one direction by the web 17 striking against the outer edges of the ears 26, and in the opposite direction by the web 17 striking against the free end 28 of the support 25.

The surfacing units may be contracted into a relatively small compass to enable them to be inserted in a relatively small bore. At the same time the several members of the tool are of sufficient size to provide the necessary size and rigidity. I accomplish these desirable results, at least in part, by employing three surfacing units and a body of triangular cross-sectional shape. This arrangement of units also insures that the tool will be self-centering and that the pressures exerted by the several units against the cylinder wall will be equal.

The supports 25, and the surfacing units 15 carried thereby, may be clamped in their innermost contracted position, or in any position intermediate their innermost contracted and outermost expanded positions, by a clamp member 30 which preferably takes the form of a ring or washer having an opening 31 therethrough of generally triangular shape, and so shaped and dimensioned that the edges of the opening substantially conform to the over-all external dimension of the body 10 and the supports 25 when in the grooves 11, as illustrated particularly in Fig. 5. It will be seen that upon contracting the surfacing units manually and then advancing the clamp member to an appropriate position on the body 10, the supports may be held in any desired contracted position between their most contracted and most expanded positions. The clamp member 30 preferably is of slightly smaller diameter than the minimum diameter of the units when in contracted condition so that there is no likelihood of the member 30 contacting the cylinder wall during insertion of the tool into the cylinder or removal therefrom, or during the surfacing operation.

In the use of the tool it is both rotated and reciprocated in a manner similar to that in which other cylinder surfacing tools are operated. To this end the socket member is provided with a knob 35 of generally spherical form and having studs projecting diametrically oppositely therefrom, transversely to the axis of the tool, which studs may be provided conveniently by securing a pin 36 in the head. The head 13 is adapted to be connected to a drive member 37 having a socket 38 adapted to receive the knob 35, and a pair of diametrically opposed bayonet slots 39 adapted to receive the studs 36, the knob 35 having a shank 40 by which the tool may be driven. The shank may be inserted in a chuck, such as the chuck 41, of an electric hand drill or other suitable driving mechanism for rotating the tool. The arrangement of the socket member 37 and the knob 35 is such that there is a universal driving action between the socket member and the knob, thereby accommodating for normal disalignment between the drive mechanism and the tool.

When the device is to be used the surfacing units are contracted manually and the clamp member moved to its most advanced position to thereby clamp the surfacing units in their most contracted condition. The tool is then inserted in the cylinder and the clamp member moved back to its position against the end of the head 13, thereby allowing the surfacing units to expand and the faces of the surfacing elements to engage the walls of the cylinder under the desired pressure, which is established by the resiliency of the supporting members 25. In certain

cases it may be found desirable to limit the expansion of the units, which can be done by leaving the clamp member in an intermediate position. The drive shank 40 is then secured in the chuck of an electric hand drill or other driving mechanism and the latter operated to rotate the tool and, at the same time, reciprocated to move the tool back and forth throughout the length of the cylinder.

When the operation has been completed, the driving mechanism is halted and the clamp member is slid to the outer end of the body, to thereby contract the surfacing units and permit the tool to be removed from the cylinder without damage to the surfaces thereof.

The surfacing units may be readily removed from their respective supports when they become worn, or if they are damaged, by merely grasping the unit in one hand and pinching the ears of the support together to disengage the ends 27 from the openings 19. A replacement unit may then be attached by pinching the ears and inserting them between the flanges of the carrier and guiding the ends of the ears into the corresponding openings.

The supports 25 may be readily removed and replaced, should they become broken, by removing the corresponding set screw 14 and sliding the supports out of the socket 12. After replacement of the support 25 the set screw is again tightened to clamp the support in place.

From the foregoing it will be seen that the present invention provides a simple cylinder surfacing tool which may be made relatively inexpensively but which at the same time is rugged and durable. The tool has a minimum number of parts and those parts which may become worn, such as the surfacing units, or which may be broken, such as the supporting springs, may be readily removed and replaced.

The leaf springs provide both means for mounting the surfacing units and for automatically urging them radially outwardly against the cylinder walls so that the surfacing elements bear against the walls with the desired pressure. The springs are sufficiently rigid and are so locked to the body, by their disposition in the grooves and the locking set screws, that they cannot twist, turn or become displaced during operation.

The tool is capable of a wide variety of uses, as will appear from the foregoing. It has been found to be especially suitable for use in surfacing automotive brake cylinders which are customarily of small diameter. The tool is useful in removing gum and corrosion such as often found to be present on the wall of such cylinders, as well as providing a surface having the desired character.

I claim:

1. A cylinder surfacing tool comprising an elongate rigid body, at least three flat elongate spring members extending along and generally in the direction of the longitudinal axis of the body, means securing said spring members, independently of each other, at one end to said body in substantially equally spaced arrangement thereabout, the remaining portions of the spring members being disconnected from said body and from each other and being thereby movable independently of each other, a plurality of surfacing units each having a rigid, elongate body and an abrasive surface which is straight in a longitudinal direction and arcuate in a transverse direction, and means pivotally connecting said surfacing units each to one of said spring members adjacent the end of the latter for pivotal rocking movement about an axis transversely of said spring member and the corresponding surfacing unit and approximately at the longitudinal midpoints of the latter.

2. A small bore cylinder surfacing tool comprising an elongate body, a head having a socket receiving an end of said body, a plurality of cylinder surfacing units, an elongate resilient supporting member for each of said units having its one end disposed in said socket and its principal portion projecting therefrom in a direction generally longitudinally of the body and having a portion normally extending away from said body, the supporting members being in position to be moved into contact substantially throughout their length with said body, a plurality of fastening elements removably secured in said head bearing inwardly on the outer surfaces of the supporting elements and clamping said supporting elements respectively against said body to removably secure the latter and said supporting elements in said head, and means supporting said units on said supporting members respectively adjacent the free ends thereof for rocking movement thereon about a single pivot axis transversely of the corresponding supporting member and approximately midway of the surfacing unit in a direction longitudinally thereof.

3. A cylinder surfacing tool comprising an elongate body, a plurality of cylinder surfacing units each including a generally channel-shaped carrier, having aligned openings in the flanges thereof approximately at the longitudinal midpoints respectively, an elongate leaf spring member for each of said units secured adjacent one end to said body with its flat side abutting the body and extending generally longitudinally of the body with a portion thereof normally extending away from said body, the leaf spring members being in position to be moved into contact substantially throughout their length with said body, and means supporting said units on said springs respectively adjacent the free ends thereof for rocking movement thereon about a single pivot axis transversely of the corresponding spring and approximately midway of the surfacing unit in a direction longitudinally thereof, said last means including paired flexible ears upstanding from said springs respectively adjacent the free ends thereof, movable toward and from each other and having lateral projections mounted in the openings in the flanges respectively of the corresponding carrier, said springs having portions extending into the respective carriers in position for receiving side thrust from said flanges.

4. A cylinder surfacing tool comprising an elongate body, a plurality of cylinder surfacing units each including a generally channel-shaped carrier, an elongate leaf spring for each of said units secured adjacent one end to said body and normally extending away from said body in position to be moved into contact substantially throughout its length with said body, and means supporting said units on said springs respectively adjacent the free ends thereof for limited rocking movement about a single pivot axis transversely of the corresponding spring and approximately midway of the surfacing unit in a direction longitudinally thereof, said last means including ears upstanding integrally from said springs respectively adjacent the free ends thereof and received between and pivotally engaging the flanges of the corresponding carrier, said

ears being positioned for engagement by one end of the respective surfacing units for limiting rocking movement of the units in one direction.

5. A cylinder surfacing tool comprising an elongated body of generally triangular cross-sectional shape and having grooved side walls, three elongate leaf springs, each secured adjacent one end to a wall of said body respectively and normally curving away from said wall in position to be collapsed substantially throughout its length into the groove in such wall, three cylinder surfacing units, and means attaching said units to said springs adjacent the free ends thereof respectively for limited rocking movement thereon about a single pivot axis transversely of the corresponding spring and approximately midway longitudinally of the unit, said units being supported solely by said springs.

6. A cylinder surfacing tool comprising an elongate body, a plurality of cylinder surfacing units each including a generally channel-shaped carrier, an elongate leaf spring for each of said units secured adjacent one end to said body and normally extending away from said body in position to be moved into contact substantially throughout its length with said body, and means supporting said units on said springs respectively adjacent the free ends thereof for limited rocking movement about a single pivot axis transversely of the corresponding spring and approximately midway of the surfacing unit in a direction longitudinally thereof, said last means being respectively adjacent but spaced from the free ends of the springs, the free ends of said springs being engageable by one end of the respective surfacing units for limiting rocking movement of the units in one direction.

7. A cylinder surfacing tool comprising an elongate body having side walls with grooves extending substantially throughout its length, a plurality of cylinder surfacing units, elongate supporting members of spring material for said units extending longitudinally of the body and each having one end fitted in a groove and secured to the body therein, the remaining portions of the supporting members normally being self-biased outwardly and being adapted to be moved into the grooves throughout the length of the latter, the supporting members being free to move independently of each other, and means attaching said units to said supporting members, respectively, adjacent the free end thereof for rocking movement thereon each about a single pivot axis transversely of the corresponding supporting member and approximately midway longitudinally of the unit.

8. A cylinder surfacing tool comprising an elongate body, a plurality of cylinder surfacing units each including a generally channel-shaped carrier, an elongate leaf spring for each of said units secured adjacent one end to said body and normally extending away from said body in position to be moved into contact substantially throughout its length with said body, and means supporting said units on said springs respectively adjacent the free ends thereof for limited rocking movement each about a single pivot axis transversely of the corresponding spring and approximately midway of the surfacing unit in a direction longitudinally thereof, said last means including ears upstanding integrally from said springs, respectively, adjacent the free ends thereof and received between and pivotally engaging the flanges of the corresponding carrier, said ears being positioned for engagement by one end of the respective surfacing units for limiting rocking movement of the units in one direction, and said springs having portions at their free ends extending into respective carriers in position for limiting rocking movement of the units in the other direction.

9. For use in a cylinder surfacing tool, the combination comprising a cylinder surfacing unit including a generally channel-shaped carrier having flanges extending at least a substantial portion of the length of the carrier, said flanges having aligned openings approximately at the longitudinal midpoints of the channel, an elongate leaf spring member for said unit having a securing end and a free end, and means supporting said unit on said spring member adjacent free end thereof for rocking movement thereon about a single pivot axis transversely of the spring member and approximately midway of the surfacing unit in a direction longitudinally thereof, said last means including ears upstanding integrally from said spring member adjacent to but spaced from said free end thereof, said ears having lateral projections mounted in the openings in said flanges and the ears extending into the carrier in position for receiving side thrust from said flanges and for engagement by one end of said surfacing unit for limiting rocking movement of the unit in one direction, and said spring member having a portion at its free end extending into said carrier in position for limiting rocking movement of the unit in the other direction.

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