Sept. 21, 1943. R. R. HAUSE 2,330,184

INSIDE HONE FOR CYLINDERS

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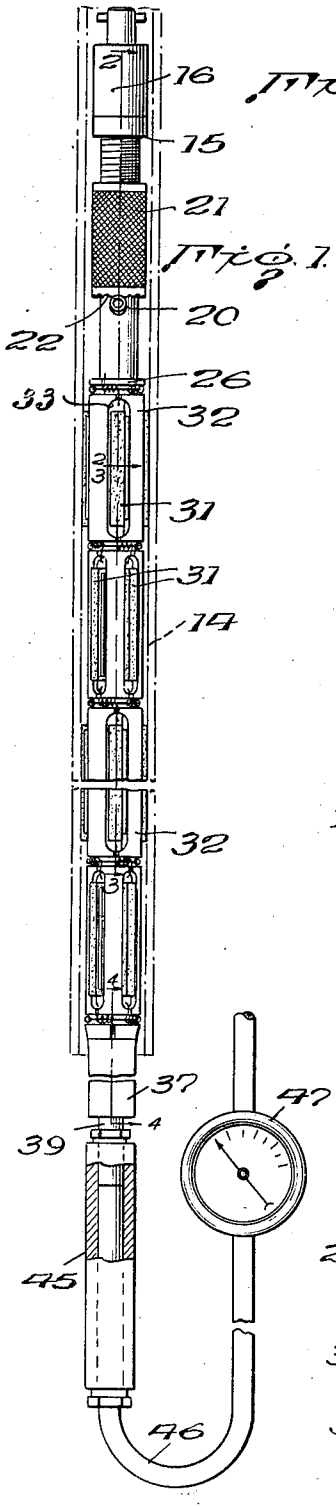


Fig. 1.

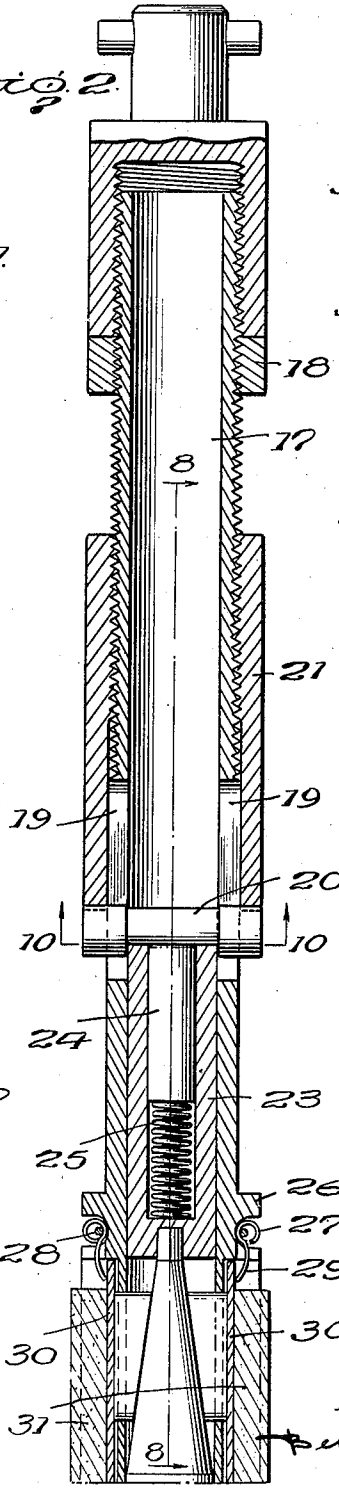


Fig. 2.

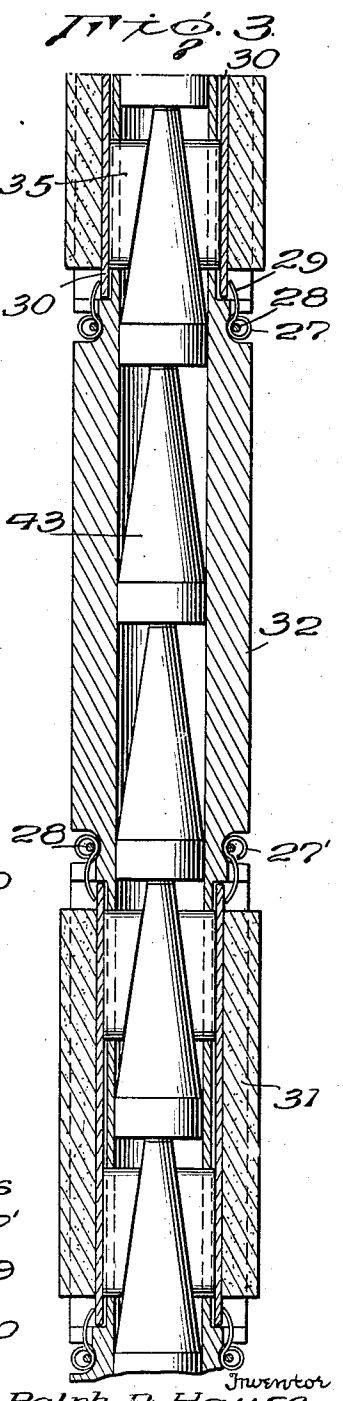


Fig. 3.

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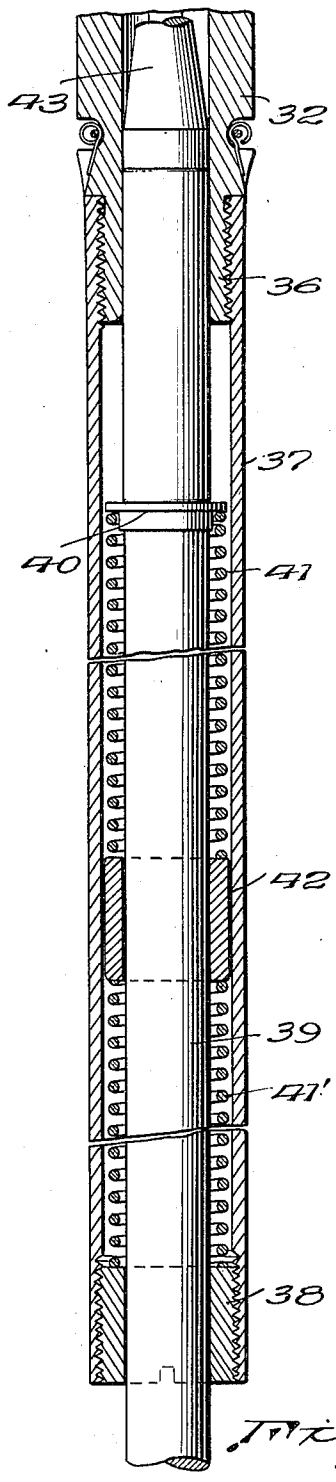


FIG. 4.

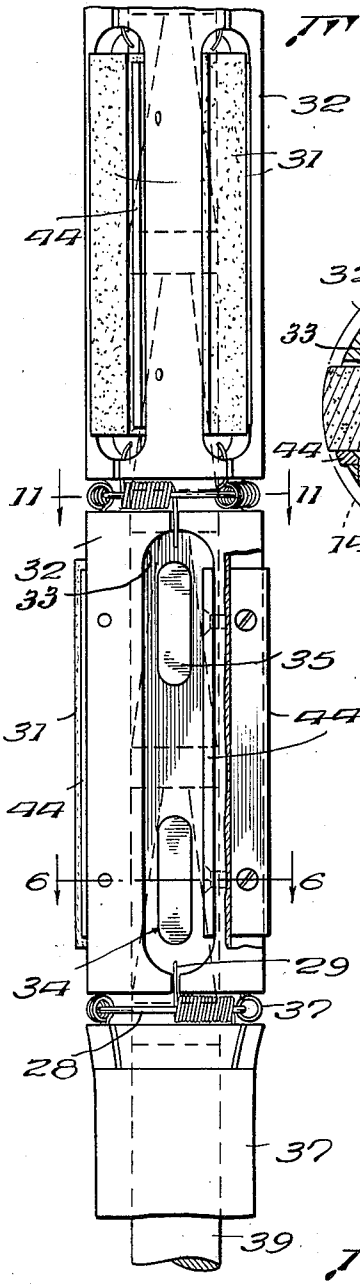


FIG. 5.

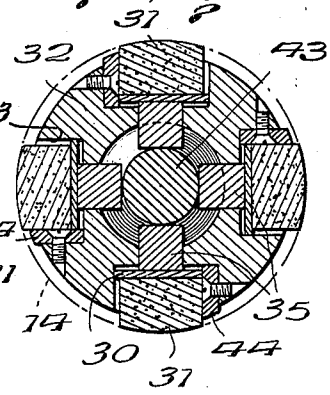


FIG. 6.

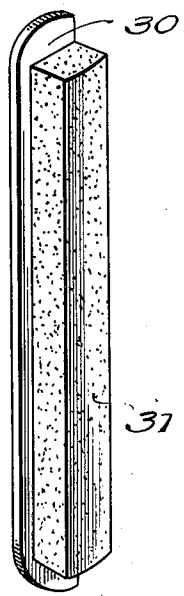


FIG. 7.

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Fig. 8.

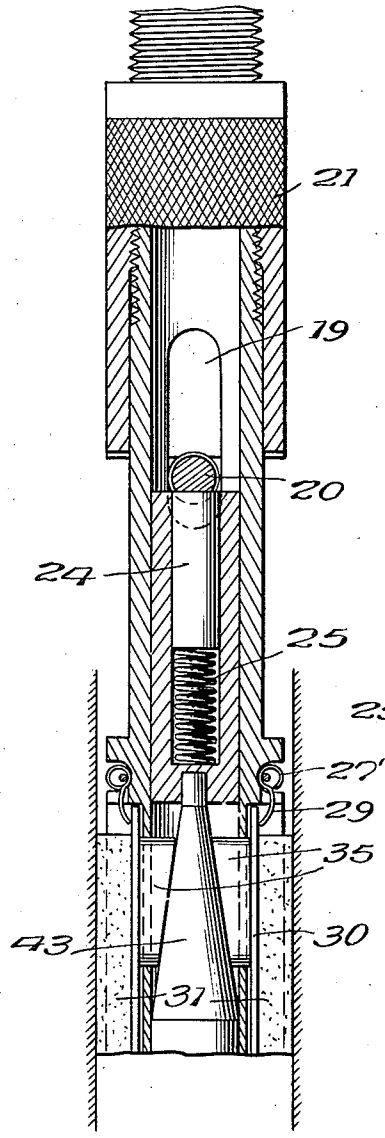
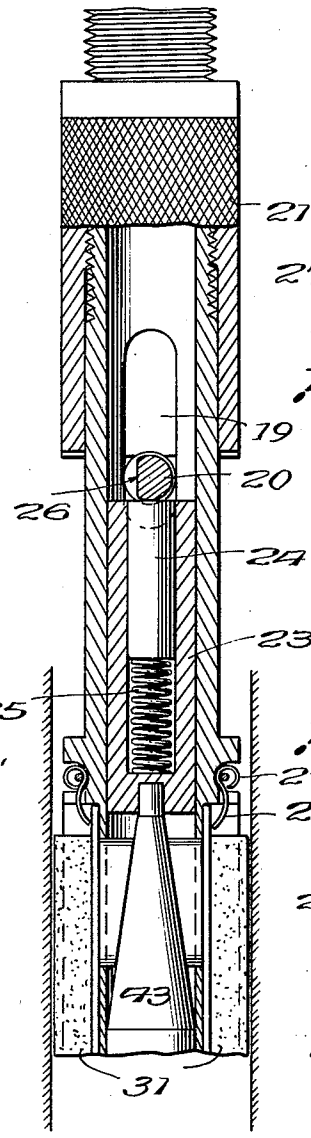


Fig. 9.



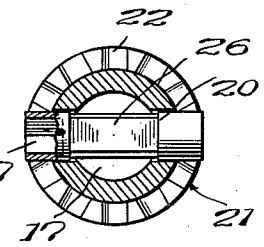


Fig. 10.

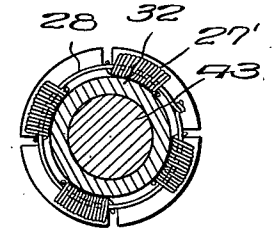


Fig. 11.

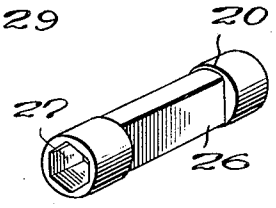


Fig. 12.



Fig. 13.

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UNITED STATES PATENT OFFICE

2,330,184

INSIDE HONE FOR CYLINDERS

Ralph R. Hause, Montpelier, Ohio, assignor to Reconstruction Finance Corporation, Cleveland, Ohio, a corporation of the United States

Application May 5, 1941, Serial No. 391,982

2 Claims. (Cl. 51—184.3)

My invention relates to inside hones for cylinders, especially cylinders as used in the manufacture of oil well pumps. Cylinder hones, in use before the advent of the present invention, have, for their main objectives, to smooth the surface or inner periphery of a cylinder after it has been prepared for honing by boring, reaming or grinding, consequently removal of quantities of metal, during the honing operation, has been unnecessary and therefore the honing tools of current manufacture are not adapted for this operation. In the conditioning of bores of elongated bodies, such as cylinders used in oil well pumps, it is essential that the honing tool be capable of producing a true bore, which frequently means the changing of a bore of varying diameter to one of uniform diameter, and this diameter must be constant throughout the length of the pump cylinder. A principal object of my invention therefore is to produce an inside hone which in addition to removing interstices and other surface inequalities, will positively function to remove substantial quantities of surface metal where necessary, the effective area of the tool being coextensive with the length of the cylinder.

Other objects of this invention are to provide a hone equipped with abrasive elements, the latter being so constructed and mounted that they may be used almost in their entireties; to provide a hone the abrasive elements of which are at all times circumferentially supported at their peripheries, the circumferential supports being replaceable; to provide yieldable means in the tool for ascertaining and controlling pressure between the abrasive elements and the work while the tool is in operation; to provide a tool so constructed that successive gangs of abrasives will travel beyond the ends of the cylinder or other work, with each stroke of the tool, positively effecting a mathematically exact bore circumference from one terminal of the cylinder to the other; to provide a tool embodying simple yet positive means for normally holding the abrasive elements in a retracted position; to provide a tool wherein the abrasive elements are circumferentially and diametrically supported in a manner allowing for the use of abrasive element holders of simple and inexpensive construction; to provide a hone of rigid construction of considerably greater length than diameter with a multiplication of abrasive elements, over standard type hones, especially adapting the hone of the present invention for use on long cylinders; and to provide a tool adapted for the removal of many times the customary amount of metal over a given period.

Additional objects of the invention will be apparent from the following description of the present preferred form of the invention, wherein

Fig. 1 is a side elevational view of an inside hone constructed in accordance with the present invention illustrating its application, a portion thereof being broken away to disclose a detail;

Fig. 2 is a detail enlarged sectional view taken on the line 2—2 of Fig. 1 looking in the direction of the arrows, showing to advantage the interior construction of the upper part of the honing tool of the present invention;

Fig. 3 is a similar view taken on the line 3—3 of Fig. 1 looking in the direction of the arrows, showing to advantage an intermediate portion of the tool;

Fig. 4 is a similar view taken on the line 4—4 of Fig. 1 looking in the direction of the arrows, showing to advantage the lower part of the honing tool, and disclosing the yieldable means employed for holding the abrasive expanding elements from dislocation when the tool is not in use;

Fig. 5 is a detail fragmentary elevational view of a honing tool constructed in accordance with the present invention, an abrasive element being removed from one of the honing units to disclose, in elevation, presser blocks for one of the abrasive elements;

Fig. 6 is a cross sectional view taken on the line 6—6 of Fig. 5 looking in the direction of the arrows, showing to advantage a gang of abrasive elements mounted in the hone body with the abrasive expanding elements engaged therewith;

Fig. 7 is a perspective view of one of the abrasive elements;

Fig. 8 is a detail enlarged sectional view taken on the line 8—8 of Fig. 2 looking in the direction of the arrows, showing the interior of a portion of the honing structure at right angles to the showing in Fig. 2, the abrasive elements being shown in an expanded position;

Fig. 9 is a similar view to that shown in Fig. 8 illustrating the abrasive elements in a contracted position;

Fig. 10 is a cross sectional view taken on the line 10—10 of Fig. 2 looking in the direction of the arrows, showing to advantage the manner of mounting a plunger engaging shaft in the hone body;

Fig. 11 is a cross sectional view taken on the line 11—11 of Fig. 5 looking in the direction of the arrows, showing to advantage the spring

means employed for normally retaining the abrasive elements in a retracted position;

Fig. 12 is a perspective view of the plunger control shaft illustrated in Fig. 10, and

Fig. 13 is a perspective view of one of the abrasive engaging wedge blocks.

In order to illustrate the application of the invention, I have in Fig. 1 shown in dotted lines a cylinder or casing 14. This work embodies a type of cylinder or casing as used in pump manufacture, the cylinder being elongated, its length being many times that of its diameter. To true inner peripheries of work of this character it is necessary correspondingly to employ a tool, the length of which is many times its diameter. This permits the tool to be simultaneously rotated and reciprocated during the axial movement of the tool throughout the entire length of the work, portions of the tool being movable even beyond the terminals of the work. The tool which I have worked out is especially adapted to the particular kind of work herein referred to and is generally illustrated in the drawings at 15 and consists of a multiplicity of parts, many of which are of standard construction. The tool comprises a connection 16 which forms the top of the tool and is adapted for operative engagement with suitable power means, in a manner well-known in the art. This connection may be of substantially standard construction, the lower end thereof being internally screw threaded, adapted for engagement with complemental external screw threads formed on the upper joint 17 of the tool. The connection 16 may be held in a predetermined position by a jam nut 18. An intermediate portion of the joint 17 is provided with parallelly arranged elongated slots 19 which are adapted for the reception of a key shaft 20, the latter extending transversely through the joint 17, the ends of the shaft protruding through the elongated slots 19 and beyond the outer peripheries of the joint. The external threads of the joint 17 are also engaged by a cylindrical nut 21, the outer face of which is knurled. The lower terminal of the nut 21 is scalloped or serrated, as indicated at 22, the scallops or serrations being adapted for engagement with the peripheries of the key shaft 20. The lower end of the joint 17 has a plug 23 slidably mounted therein, the plug housing a plunger 24, the latter being yieldably mounted on a helical spring 25. As illustrated to advantage in Fig. 2, the spring 25 is arranged in the axial recess formed in the plug 23. The spring 25 normally urges the plunger 24 upwardly into engagement with the key shaft 20, a portion of the latter being flattened, as indicated at 26, to positively prevent casual rotation of the shaft when engaged with the plunger. Rotation of said shaft 20 may be effected by a suitable key, engageable in either one of the squared terminal recesses 27 of said shaft. The lower end of the joint 17 is provided with an external annulus 26 below which is mounted a resilient band 27', the latter being sleeved on a ring 28, as shown to advantage in Fig. 2. The band 27' has fingers 29 extending upwardly and downwardly therefrom, the upwardly extending fingers being engaged with the annulus 26 while the downwardly extending fingers are engaged with the base plates 30 of abrasive elements 31, the latter forming a part of the uppermost unit 32 of the instant honing tool. The tool is composed primarily of a plurality of units similar in construction to 32 each consisting essentially of a cylinder provided with a plurality of elongated recesses 33, each of which is adapted for the reception of one of the abrasive elements 31. The inner wall of each of said recesses 33 is provided with a pair of openings 34, each of which, in the present instance, is shown to be of ovoidal configuration, each opening being adapted for the reception of a wedge shaped expanding block 35. The units 32 are, as shown, axially arranged and alternate units are provided on their opposite ends with the resilient bands, the fingers 29 of each of the intermediate units extending upwardly and downwardly into engagement with the base plates 30 of the upper and lower proximate units. It is consequently only necessary to equip every alternate unit with resilient bands, the resilient bands on the ends of one unit being all that is required to retain the gang of abrasive elements of said unit as well as the gangs of abrasive elements on the next upper and next lower unit in a retracted position.

The lowermost unit of the tool has, issuing therefrom, an externally screw threaded nipple 36 upon which is threaded the upper end of a housing 37, the housing being provided at its lower end with a bearing 38 through which a rod 39 is movably mounted. The rod 39 has a collar 40 fixedly mounted thereon, at a point remote from its upper terminal, the collar providing an abutment for the upper end of a coil spring 41, the lower end of the latter being preferably engaged with a floating band 42. The lower end of said band engages the upper end of a coil spring 41', the lower end of the latter engaging the inner terminal of the bearing 38. The springs 41 and 41' normally urge the rod 39 upwardly, the top of said rod abutting the lowermost of a series of conical expanding members 43. The cones 43 are arranged in superimposed relation in the bores of the units 32, the reduced end of each cone being nested in a corresponding recess formed in the enlarged end of an adjacent cone. The primary function of the springs 41 and 41' is to constantly urge the cones 43 upwardly to correspondingly urge wedge blocks 35 outwardly against the base plates 30 of the abrasive elements 31, thereby preventing the parts of the movable tool from being accidentally displaced when the tool is not in use.

It is of the essence of importance in the present invention that the abrasive elements be constructed to permit almost complete use of the abrasive substances and with this end in view, I herein employ abrasive elements of special construction each of which consists of a bar of abrasive material secured in any suitable manner to one face of the plate, as illustrated to advantage in Fig. 7. The abrasive elements are urged outwardly during the operation of the tool, each abrasive bar being circumferentially supported by a guard strip 44. These strips are preferably detachably engaged with the unit bodies as shown in Fig. 6. With the exception of the circumferential support 44 and radial supports for the abrasive bar, the latter is free from engagement at all points. In other words, the outer face, outer terminals and opposite sides of each abrasive bar is free, permitting engagement of the latter with the work. As is manifest, the constant expansion of the abrasive elements permits consumption of the abrasive bars practically down to the base plates 30. The guard strips 44 may be renewed at any time in an apparent manner.

For expanding the abrasive elements I prefer

to utilize hydraulic pressure. For this purpose I employ a cylinder 45 the ends of which are open, one end thereof being engaged to, and in communication with, housing 37. The other end of the cylinder is engaged with a suitable source of fluid supply by a conduit 46 the latter being equipped with a pressure gauge 47. The fluid passing into the cylinder 45 will urge the rod 39 toward the connection 16 for correspondingly and simultaneously moving the cones 43. This forces the blocks 35 outwardly. Since a pair of the blocks engages each abrasive element, in a particular manner, a uniform pressure is exerted on each abrasive bar from one extreme end of the latter to the other. The pressure is constantly checked and may be increased or diminished at the option of the operator.

With the present tool I have found that it is possible to remove several times the amount of metal from the work, which may be now removed with conventional tools, in a given period of time. This permits so-called "straightening" during the honing operation to produce a mathematically correct bore circumference from one extreme end of the work to the other. Replacement of the abrasive elements may be done in a facile and expeditious manner, by manipulation of the fingers 29.

While I have herein directed a preferred form of my invention, I am of course aware that various changes may be made therein, especially in the details of construction, proportion and arrangement of the parts within the scope of the claims hereto appended.

What is claimed is:

1. An inside hone for elongated cylindrical bodies comprising a plurality of units each embodying a gang of radially movable elements, means for normally retaining the abrasive elements in a contracted position, expanding means for said elements, means for holding the expanding means from displacement when not in use, and independent means for exerting pressure on the expanding means to force the abrasive elements outwardly against the resistance of the first said means.

2. For use in an inside hone, a unit provided with a plurality of recesses, an abrasive element engageable in each recess, the elements each including a base plate and superimposed bar, one side of the bar being flush with one edge of the plate, and a guard mounted on a wall of each recess for slidable engagement with the flush side and edge of the bar and plate respectively.

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