

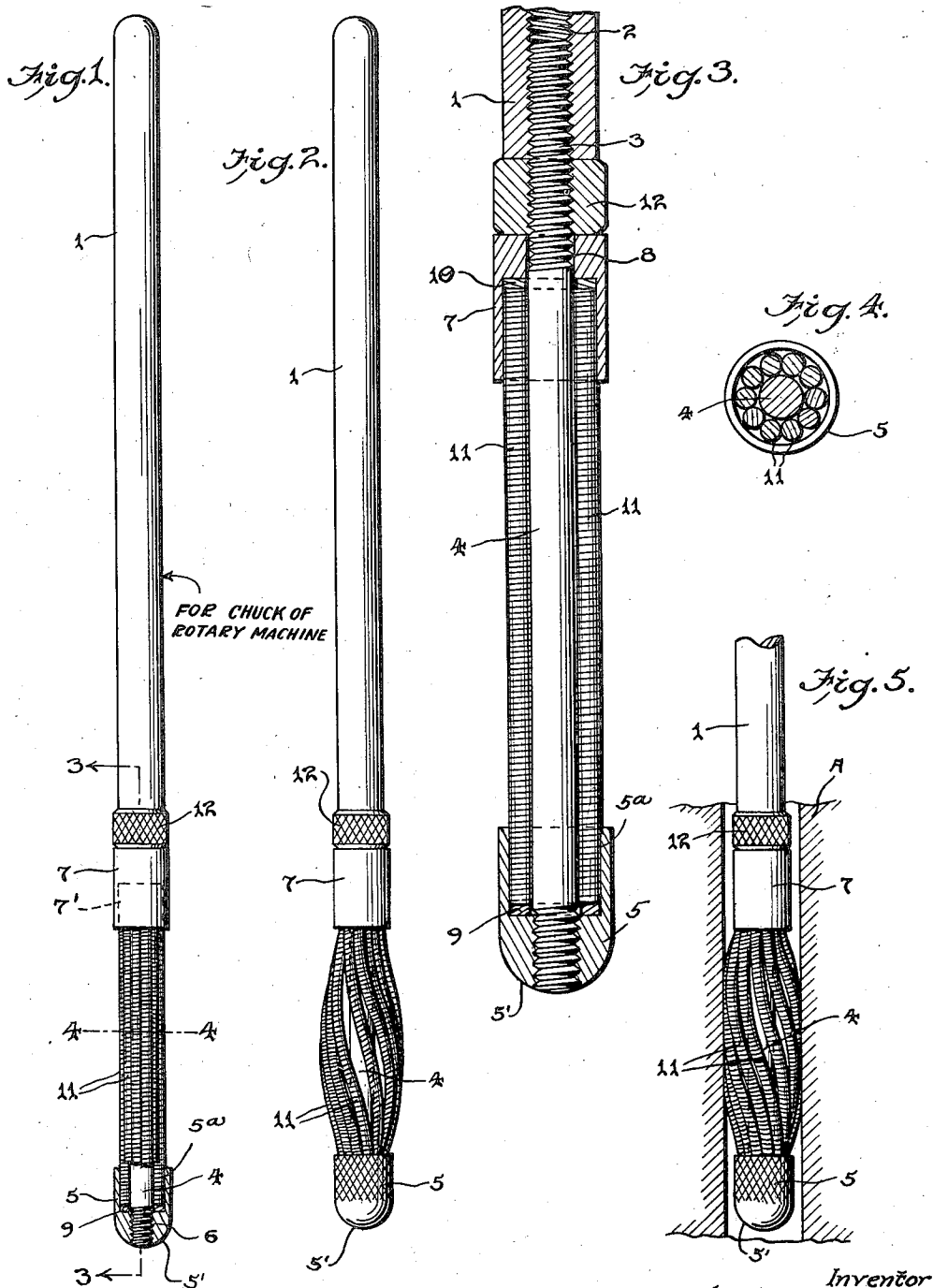
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VALVE GUIDE CLEANING DEVICE

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VALVE GUIDE CLEANING DEVICE

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4 Claims. (Cl. 15—104.01)

This invention relates to a cleaning device particularly designed for valve guide cleaning purposes.

One object of the invention is to provide a simple, inexpensive, durable and efficient device designed particularly for cleaning valve guides and in which the parts are assembled in a manner as to obviate soldering or the employment of separate securing devices for the cleaning elements and in which the cleaning elements which lie normally in alinement or in annular series around the supporting rod or stem may be readily flexed, twisted and bowed outwardly intermediate their ends, and their ends at the same time interlocked together and thereby held firmly against dislodgment from operative position.

Another object of the invention is to provide a cleaning device of the nature stated, embodying among other characteristics, resilient cleaning elements composed of fine wire closely coiled together with the coils abutting throughout the lengths of the respective elements and in which means is provided for flexing and bowing the elements intermediate their ends and at the same time effecting an interlocking connection between the respective ends of the cleaning elements.

A still further object of the invention resides in the provision of a cleaning or polishing tool embodying a plurality of resilient cleaning elements which may be readily assembled and actuated to be flexed and bowed outwardly for cleaning purposes and in which the cleaning elements may be readily removed one at a time without disturbing other cleaning elements so as to thereby provide for a refilling or replacement of cleaning elements in the event of breakage or wear.

With these and other objects in view, the invention consists in the construction and novel combination and arrangement of parts herein-after fully described, illustrated in the accompanying drawing and pointed out in the claims hereto appended, it being understood that various changes in the form, proportion and minor details of construction, within the scope of the claims, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawing:

Figure 1 is an elevation of the invention partly in section.

Fig. 2 is an elevation of the invention in its expanded condition or with the cleaning elements flexed, twisted and bowed.

Fig. 3 is a longitudinal sectional view on the line 3—3 of Figure 1.

Fig. 4 is a transverse sectional view on the line 4—4 of Figure 1.

Fig. 5 is a detail fragmentary view illustrating the manner in which the cleaning elements may be positioned with respect to the tube.

Referring now more particularly to the accompanying drawing, the reference character 1 indicates a metal or other stem of suitable length and at its inner end having a screw threaded socket 2 to receive the inner screw threaded end 3 of a rod 4 of suitable length.

The reference character 5 indicates a metal or other sleeve having a solid outer end provided with a screw threaded aperture 6 adapted to receive the screw threaded outer end of the rod 4. The exterior of the sleeve 5 is preferably exteriorly beveled at its outer end, as at 5', and the outer surface, adjacent the beveled end, is preferably knurled, as shown. The sleeve 5 has at its inner end a socket 5^a which opens inwardly of the device with an internal diameter slightly greater than the diameter of the rod 4, forming an annular space for a purpose presently explained.

A metal sleeve 7 is slidably mounted on the rod 4 and it has its inner end open and its outer end closed save for the perforation 8 which loosely embraces the rod 4 to permit slidable movement of the sleeve 7 longitudinally of the rod 4. The sleeve 7 has a socket 7' having an interior cross sectional diameter greater than the cross sectional diameter of the rod 4 to form an annular space for a purpose presently explained.

A washer 9 loosely embraces the rod 4 and is loosely disposed in the socket 5^a of the sleeve 5 while a washer 10 loosely embraces rod 4 and is disposed loosely in the socket 7' of the sleeve 7. These washers 9 and 10 serve as smooth movable bearings in the sleeves 5 and 7, respectively.

The cleaning elements 11 are preferably of small diameter and preferably composed of very fine wire coiled throughout their lengths, with the coils abutting, and each strand of coiled wire forming these cleaning elements 11 is normally straight and has its ends removably located in the respective sleeves 5 and 7.

To insert the cleaning elements 11 in the sleeves 5 and 7 the sleeve 7 may be moved a distance from the outer sleeve 5, just slightly less than the length of the cleaning elements 11. This adjustment may be effected by shifting the knurled nut 12 inwardly on the rod 4 the desired

distance and when this has been done the loose sleeve 7 may be held by hand against the knurled nut 12. With the other hand each straight strand or cleaning element has one end inserted in, say for instance, in the annular space between the sleeve 5 and the rod 4 against the washer 9 therein, and by slightly flexing the cleaning element by hand, the other end thereof may be inserted in the annular space between the rod and the sleeve 7 against the bearing washer 10 therein and released when the cutting element automatically straightens out into parallel relation with the rod 4 and thus held by the sleeves. The cleaning elements may, of course, first be inserted in the inner sleeve 7 and deflected or flexed to insert the opposite ends thereof in the sleeve 5. This operation continues until the required number of cleaning elements are thus positioned in annular series in the sleeves. This operation is effected without mutilating or distorting the normally straight, highly resilient strands forming the cleaning elements.

After all of the cleaning elements 11 have been inserted in and between the sleeves 5 and 7 as described, the nut 12 may be adjusted to insure that the opposite ends of the cleaning elements 11 bear against the respective bearing washers in the respective sleeves 5 and 7, if not so placed at time of insertion of the cutting elements in said sleeves. In any event, by a sufficient turn of nut 12 toward the outer end of the rod 4, the inner sleeve 7 is moved on rod 4 toward the outer sleeve 5, causing the cutting elements to flex and uniformly twist and bow outwardly intermediate their ends a degree according to size of tubular member A to be cleaned. In other words, as shown in Fig. 1 the cutting elements are arranged in parallelism with the opposite ends of each cutting element in alignment and abutting the respective ends of adjacent cutting elements. As the cutting elements are flexed and bowed the ends of the same move in opposite directions out of alignment to position shown, for instance in Figs. 2 and 5. The ends of the cutting elements bear tightly against the aforesaid washers 9 and 10 in the respective sleeves 5 and 7 when the cutting elements are bulged or bowed. Before bulging or bowing the cutting elements, the ends of the latter may slide or be caused to slide over the respective washers 9 and 10. When the cutting elements are bulged or bowed between the sleeves 5 and 7 the ends of the cutting elements bear firmly on the respective washers 9 and 10 and as the washers 9 and 10 are free to rotate in the respective sleeves 5 and 7, a uniform twisting and adjustment of the cutting elements is effected and the respective end portions of the cutting elements are maintained in close contacting engagement with one another, it being understood that the cutting elements 11 are arranged in annular series around the rod 4 with their ends in said sleeves 5 and 7. By virtue of the substantially transversely disposed ribs and grooves resulting from the coiling of the cutting elements, an interlocking connection is effected between adjacent end portions of the cutting elements. In other words, a substantially transverse rib of a coiled cutting element may fit in the substantially transverse groove between substantially transverse ribs of an adjacent cutting element and this connection between the ends of the cutting elements is such as to prevent any longitudinal movement of an end portion of one cutting element with relation to the end portion of an adjacent cutting

element. It will thus be understood that the end portions of the cutting elements 11, at opposite ends thereof, are maintained tightly together or in interlocking relation and have rotative or circumferential movement in the respective sleeves 5 or 7 either on or with the respective washers 9 and 10 as the cutting elements are bulged or bowed and that by reason of the roughness of the end portions of the cutting elements, incident to the coils thereof, the end portions are not permitted to slide longitudinally on one another. As the bulging or bowing of the cutting elements takes place one end of each cutting element moves out of alignment with the opposite end thereof, as for instance, from the position of Fig. 1, to the position of Fig. 3 or Fig. 5. In other words, the opposite ends of each cutting element are maintained adjacent respective ends of adjacent cutting elements when loose in the sleeves 5 and 7, as in Fig. 1, and under the influence of the bulging of the cutting elements the ends of each cutting element move in opposite directions out of alignment and in tight binding or interlocking relation with the respective ends of adjacent cutting elements such as to maintain the ends of the bulged or bowed cutting elements bound tightly together and movable on or with the respective rotatable washers 9 and 10. The ends of the cutting elements will operate effectively without the use of these rotatable washers 9 and 10, but under certain conditions, these washers facilitate the movement of the ends of the cutting elements and it is preferred to use the washers under certain conditions as the smooth movable washers overcome any tendency for the ends of the cutting elements to bind against possible rough bottoms of the sockets in the sleeves 5 and 7 as the cutting elements are twisted incident to their ends moving out of alignment when the cutting elements are bulged or bowed. The outer sleeve being knurled and screw threaded on the rod 4, it may be turned to flex, twist and bow the cutting elements or to reduce the twisted, bowed condition thereof or both sleeves may be operated simultaneously for such purposes.

As the cutting elements 11 are expanded and twisted there is effected a simultaneous interlocking connection between the respective ends of the cutting elements in the sockets of the respective sleeves and these interlocking connections are due to the aforesaid ribs and grooves of the cutting elements. The ends of each cleaning element being over the respective loose bearing washers in the sleeves they move together under the twisting and flexing action and the coils of each cleaning element having alternate ribs and grooves and being resilient there is a consequent effectual interlocking connection between the tightly bound ends of these elements within the sleeve preventing longitudinal movement of one cleaning element with relation to the other and obviating the necessity of solder or other fastening means and yet permitting removal of one or more cleaning elements when desired for refilling or replacement purposes.

The stem 1 may be connected up with the chuck of any type of machine, electric or otherwise (not shown) for rotating purposes to clean valve stem guides of motors or engines or to clean tubular devices of various kinds of a diameter of a cross section calculated to receive the tool for cleaning purposes. Of course, the tool is adapted for polishing as well as for cleaning purposes.

The peculiarly formed strands, forming the

present cutting elements, are such as to provide for resiliency longitudinally of the strands as well as transversely thereof incident to the resiliency of the coils of the strands. By reason of the alternate arrangement of shallow grooves and ribs formed as the result of the coiling of the material of which the cutting elements are composed and the sensitive yieldability of the expanded or bowed strands rough surfaces are provided on the tool at the peak of expansion or bow which are calculated to effect a smooth and effective cleaning or polishing action under rotating influence of the tool in action as well as providing for the aforesaid interlocking connections between the ends of the cleaning elements.

What is claimed is:

1. A tool of the character described comprising a rod having threaded portions, a sleeve on the rod engaging one of said threaded portions, a sleeve embracing the rod intermediate its ends and slidable on said rod, said sleeves having facing, annular recesses, a series of elongated, straight resilient cleaning elements, each composed of a coiled wire, removably supported around the rod with the coiled ends thereof grouped annularly of, and circumferentially movable in, the recesses of the sleeves, and a nut on the other screw threaded portion of the rod adjacent said slidable sleeve and operable to exert pressure against the slidable sleeve and against the adjacent ends of the resilient cleaning elements to circumferentially flex the cleaning elements and bow the latter outwardly intermediate their ends and to thus interlock the coils of the cleaning elements in the recesses of the sleeves.

2. A tool of the character described comprising a rod, spaced sleeves arranged on the rod having opposing annular recesses around the rod, means for securing one of the sleeves to the rod, the other sleeve being slidable and rotatable on the rod, an annular series of initially straight resilient cleaning elements arranged around the rod with their ends removably interfitting said recesses of the sleeves, each cleaning element consisting of a helically coiled wire, the volute end

portions of the cleaning elements being arranged side by side in contact with one another in the sleeve recesses, and means for rotating and moving the slidable sleeve along the rod toward the other sleeve, to circumferentially flex the cleaning elements and bow the same outwardly intermediate their ends and to thus interlock the coils of their end portions with one another in the sleeves.

3. A tool of the character described, comprising a rod, sleeves spaced apart on the rod and having their bores enlarged at their adjacent ends to provide annular recesses around the rod facing one another, means to anchor one of said sleeves on the rod, a plurality of elongated, resilient, normally straight cleaning elements around the rod in annular series, having transversely ridged ends extending into, and abutting one another within, the recesses of the sleeves, and means for moving the other sleeve toward, and twisting the same with respect to, the anchored sleeve, to circumferentially flex the cleaning elements and thus interlock the ridges of their said abutting ends with one another in the sleeve recesses.

4. A tool of the character described, comprising a rod, spaced sleeves on the rod having facing annular recesses around the rod, means for fixing one of said sleeves in definite position on the rod, a series of elongated, resilient, normally straight cleaning elements grouped in closely contiguous relation around the rod, said elements being formed of wires helically coiled throughout their lengths with their end portions projecting loosely into, and abutting one another in an annular series within, the sleeve recesses, and normally independently rotatable therein, and withdrawable therefrom, by manual flexure of the elements between the sleeves, and means for moving the other sleeve toward, and rotating the same with respect to, the fixed sleeve to circumferentially flex the members and thus interlock the coiled ends with one another in the sleeve recesses to secure the elements as a series, when thus flexed, against removal from the sleeves.

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