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BIT FOR ROTARY TUBE CLEANERS

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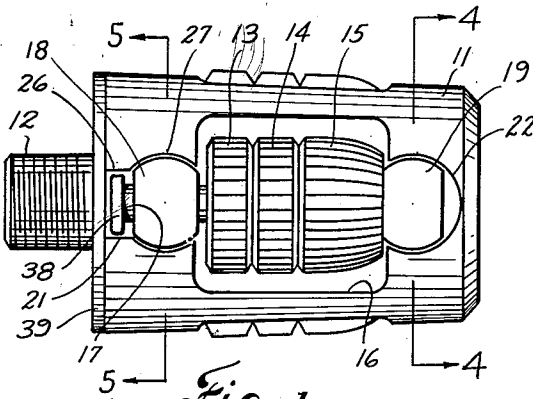


Fig. 1

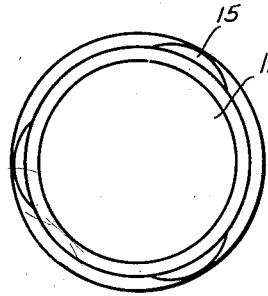


Fig. 2

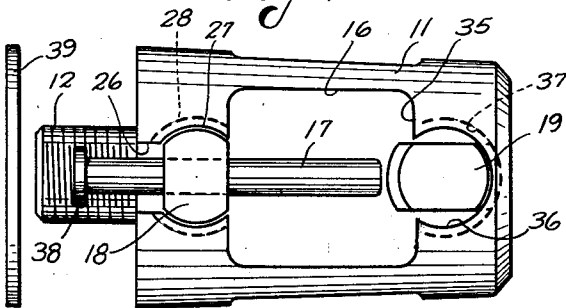


Fig. 3

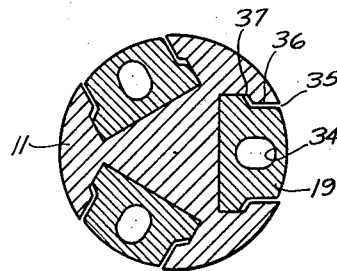


Fig. 4

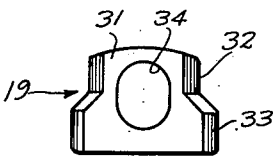


Fig. 6

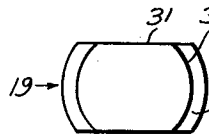


Fig. 7

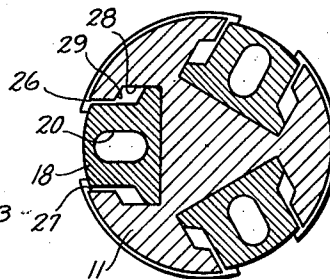


Fig. 5

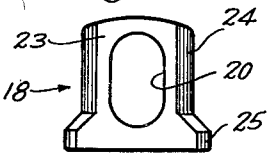


Fig. 8

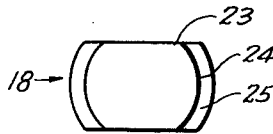


Fig. 9

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UNITED STATES PATENT OFFICE

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BIT FOR ROTARY TUBE CLEANERS

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7 Claims. (Cl. 15—104.13)

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This invention relates to tube cleaner bits of the kind which are motor driven through tubes to remove scale and encrustations from the inner tube wall. Such bits ordinarily comprise a rotatable body, and a plurality of sets of cutter elements carried by the head for radial movement outward under the influence of centrifugal force.

The instant invention contemplates a reorganization and design of the mounting for the cutter elements.

Thus, the object of the invention is to simplify the construction as well as the means and mode of operation of tube cleaner bits as disclosed herein, whereby such bits may not only be economically manufactured, but will be more efficient and satisfactory in use, adaptable for use in tubes of various diameters (within certain limits), having relatively few parts and be unlikely to get out of repair.

A further object is to allow a greater than usual radial movement of the cutter elements to enable the bit to deal more effectively with heavy encrustations and to make it applicable to openings of varying diameter.

Another object of the invention is to simplify assembly of the bit and to improve its operational characteristics by providing for independent support in the body of cutter pin mounting blocks.

A further object of the invention is to define longitudinal as well as radial limits of motion for the blocks.

A further object of the invention is to provide a machine possessing the advantageous structural features, the inherent meritorious characteristics and the mode of operation herein mentioned.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof, and the mode of operation, as hereinafter described or illustrated in the accompanying drawing, or their equivalents.

Referring to the accompanying drawing, wherein is found the preferred but obviously not necessarily the only form of embodiment of the invention,

Fig. 1 is a view in side elevation of a tube cleaner bit in accordance with the present invention;

Fig. 2 is a front end view of the bit of Fig. 1;

Fig. 3 is a view similar to Fig. 1 with the cutters removed and showing the manner of assem-

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bly and mode of installation of the mounting blocks;

Fig. 4 is a view in cross section taken substantially along the line 4—4 of Fig. 1;

Fig. 5 is a view in cross section taken substantially along the line 5—5 of Fig. 1;

Figs. 6 and 7 are detail views of the mounting block in the forward end of the bit; and

Figs. 8 and 9 the detail views of the mounting block in the rearward end of the bit.

Like parts are indicated by similar characters of reference throughout the several views.

Referring to the drawing, in the illustrative embodiment of the invention a tube cleaner bit comprises an integral body 11 of cast or machined construction having an axially extending threaded extension 12 used to secure the bit to a motor shaft.

The bit is provided with three sets of cutter elements so disposed as to move outward under the influence of centrifugal force when the bit is rotated, the outward motion of the cutter elements being limited by the internal wall of the tube being cleaned or by stops incorporated in their mounting. Each set of cutter elements being identical in its construction and mounting, only one will be described.

A set of cutter elements is made up of a pair of disc cutters 13 and 14 and a cone cutter 15, the latter being in advance of the others with respect to the front or working end of the bit. The cutter assembly is recessed in a chamber 16 in the body 11 and projects a greater or lesser distance beyond the periphery of the body in accordance with the speed of rotation of the bit and the extent of radial movement permitted within the tube. Centrally disposed openings in the cutters permit passage of a pin 17 therethrough, the opposite ends of the pin 17 being received in mounting blocks 18 and 19 which are in turn installed in recesses 21 and 22 formed in the body 11, respectively rearwardly of and in advance of the chamber 16.

The block 18, shown in detail in Figs. 8 and 9, is generally rectangular in shape, the broad sides 23 thereof being flat. The narrow sides 24 thereof are arcuate and at the bases of the sides 24 are arcuate flanges 25. Extending transversely through the broad sides of the block is an elongated opening 20 to receive one end of the pin 17.

The recess 21 receiving the block 18 is produced by a longitudinally milled slot 26, a radial bore 27 opening through the front end of the slot 26 and a counterbore 28 at the rear of slot 26. The counterbore 28 is formed by a milling

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operation after formation of the slot 26 and bore 27.

There is a complementary relation between the flat sides 23 of block 18 and slot 26, which is utilized in inserting the block in recess 21 and a complementary relation of arcuate sides 24 and flanges 25 of the block to bore 27 and counterbore 28 of the recess, utilized to restrict longitudinal motion of the block. It is first inserted in recess 21 with the flat sides 23 parallel to the slides of slot 26. Then it is turned a distance of about ninety degrees to move arcuate sides 24 into bore 27 and flanges 25 into counterbore 28. At the same time opening 20 is brought into position overlying or in registry with the forward recess 22.

In connection with the configuration of block 18 and recess 21 it is to be noted that the thickness of flanges 25 with respect to the depth of counterbore 28 is such as to permit a substantial amount of radial movement of the block. The limit of such motion is defined by a shoulder 29 formed at the juncture of bore 27 and counterbore 28 and engageable by flanges 25. Further, the transverse cutter pin opening 20 in block 18 is elongated in a radial direction. Pin 20 thus is permitted a substantial radial movement relatively to the block.

The construction of forward block 19 and the formation of its recess 22 are the same as those of block 18 and recess 21 except that a greater restriction is imposed upon radial movements of the block 19 and the adjacent end of its cutter pin. As shown in Figs. 6 and 7, the block 19 has opposed flat sides 31, opposed arcuate surfaces 32, flanges 33 and a slightly elongated opening 34. Recess 22 has a slot 35, bore 36 and counterbore 37, the various formations of the recess and block cooperating in the same manner described in connection with block 18 and recess 21. In this instance, however, flanges 33 are relatively broad or thick and counterbore 37 is relatively shallow so that the extent of radial motion permitted block 19 is materially less than that permitted block 18. Further, opening 34 in block 19 is nearly cylindrical so that the end of pin 17 received in the block has less freedom of radial motion than the opposite end received in block 18.

The described construction and arrangement of the cutter mounting, with reference to the relative radial motion permitted the blocks and the cutter pin, is such as to accentuate the relationship between the cone cutter 15 and the disc cutters 13 and 14. Thus, the front end of the cutter assembly is relatively confined and tends to bore into the crust on the tube wall, while the rearward end expands toward contact with the tube wall and cuts away the crust.

In the assembly of the parts, the blocks 18 and 19 are first installed in their respective recesses 21 and 22 where they are suspended against axial dislodgment by reason of their complementary fit in respective bores 27 and 36. Cutters 13, 14 and 15 are stacked between the blocks, and pin 17 is then inserted into opening 20 in block 18 and allowed to drop through the registering openings in the cutters and into opening 34 in block 19. A head 38 on pin 17 limits inward motion of the pin and facilitates withdrawal thereof.

The slot 26 opens through the inner or rearward end of the body 11 for simplified assembly of parts. A disc 39 overlies the slot 26 and prevents inadvertent withdrawal of the pin 17, it being contemplated that the disc 39 should be

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held in place by a nut screwed down over the projection 12.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise but one of several modes of putting the invention into effect.

Having thus described my invention, I claim:

1. A tube cleaner bit, including a body, longitudinally spaced openings in said body to receive cutter mounting blocks, each of said openings comprising a longitudinal slot, a radial bore opening at its outer end through the top of said slot and an arcuate counterbore at the bottom of said slot, substantially rectangular blocks received in said openings, said blocks including flanges on their inner ends and on opposite sides thereof to lie in said counterbores, longitudinal openings in said blocks, a pin extending between said blocks and having its ends received in said openings therein, and cutter means on said pin.

2. A tube cleaner bit according to claim 1, characterized in that the counterbore in one of the openings in said body is radially elongated with respect to the other.

3. A tube cleaner bit according to claim 1, characterized in that the opening in one block is radially elongated with respect to the corresponding opening in the other block.

4. A tube cleaner bit, including a body, longitudinally spaced openings in said body to receive cutter mounting blocks, each said openings comprising a rectangular slot, a radial bore opening at its outer end through the front of said slot and a counterbore at the rear of said slot, a substantially rectangular block to be received in each said openings with a loose fit, said block having opposed arcuate sides complementary to the shape of said bore for restricted longitudinal movement of the block, and flanges at the bases of said arcuate sides complementary to the shape of said counterbore, the distance radially of the body of said counterbore exceeding the thickness of said flanges to permit limited radial movement of the block, and cutter means supported between said blocks.

5. A tube cleaner bit according to claim 4, characterized in that the other opposed sides of each said blocks are flat and spaced apart a distance not greater than the width of the slot at corresponding points, the blocks being inserted in said openings with said flat sides parallel to the sides of said slot and then turned through an arc of about ninety degrees to bring said flat sides at right angles to the sides of the slot.

6. A tube cleaner bit wherein cutter means is supported on a body between mounting blocks having limited radial movement relative to the body, characterized by longitudinally spaced openings in the body to receive said blocks, each of said openings comprising a longitudinal slot, a radial bore opening through the radially outward end of said slot and a counterbore at the

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radially inward end of said slot, said blocks having portions complementary to said bore and said counterbore but undersize with respect thereto whereby to be supported in the openings and to have limited radial movement therein.

7. A tube cleaner bit, including a rotatable body, a pair of generally rectangular blocks presenting opposed flat sides, opposed arcuate sides and arcuate flanges at the bases of said arcuate sides, longitudinally spaced recesses for said blocks in said body, each of said recesses including a rectangular slot having a width slightly greater than the distance between the flat sides of said blocks, a bore and a counterbore transversely formed in said slot, said slot having a complementary relation to the flat sides of a block for insertion of the block into the recess, said bore and counterbore achieving a complementary relation to the arcuate sides and the flanges on said blocks respectively in response to

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a ninety degree turn of the block after insertion into the recess, and cutter means supported between said blocks.

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