Aug. 25, 1936. W. T. HAMILTON 2,052,174

TUBE CLEANER

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FIG 1

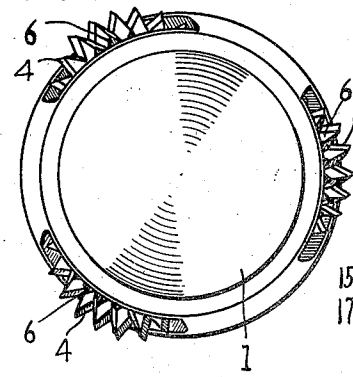


FIG 2

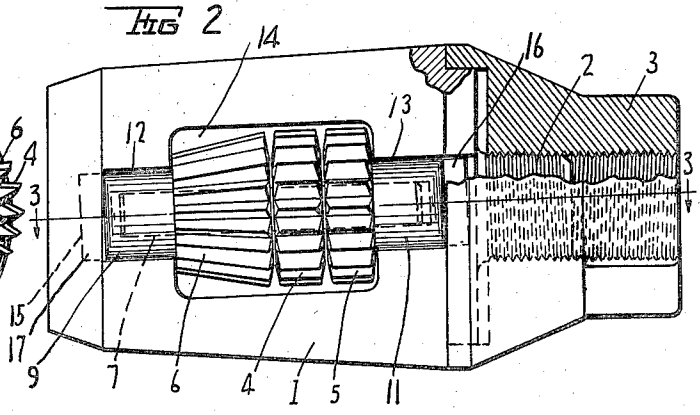


FIG 4

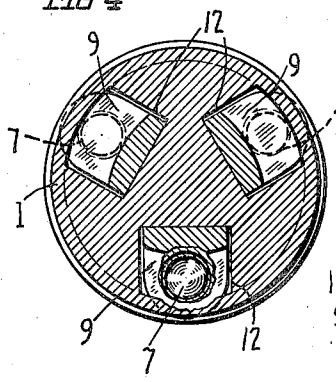


FIG 3

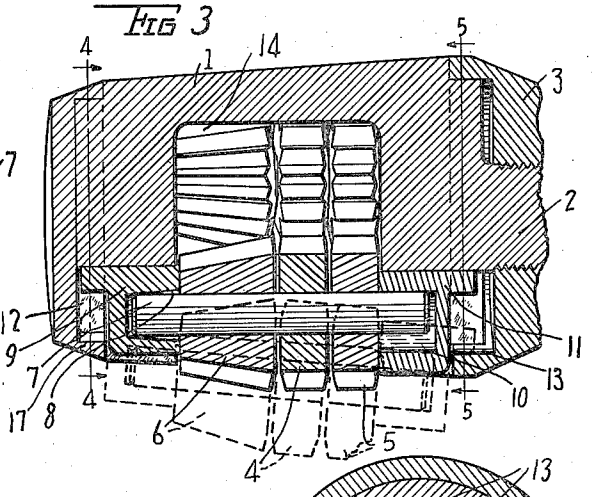


FIG 6

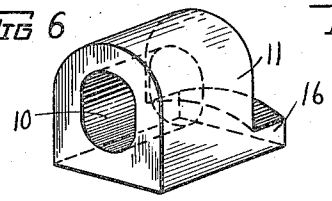


FIG 5

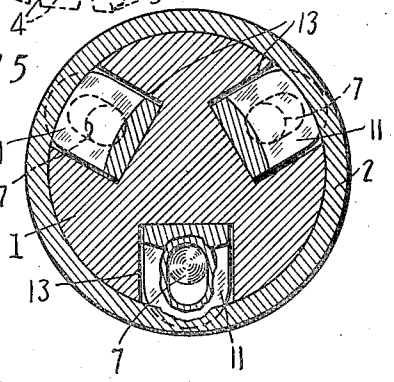
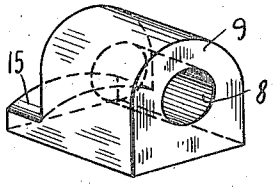


FIG 7



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TUBE CLEANER

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FIG 9

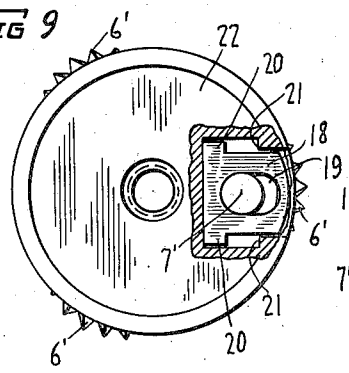


FIG 8

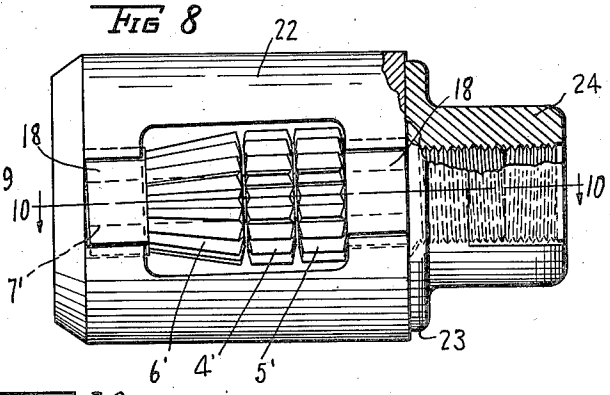


FIG 10

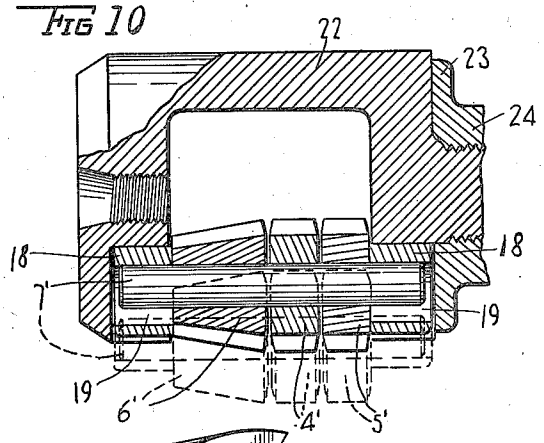


FIG 11

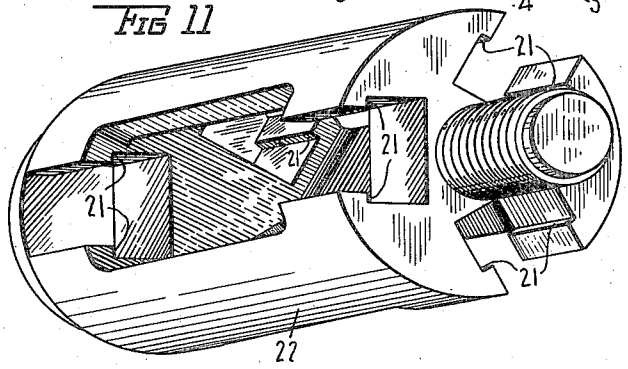
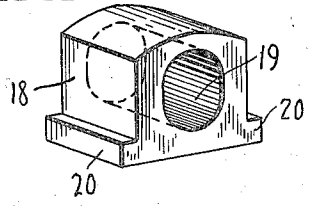


FIG 12



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Patented Aug. 25, 1936 2,052,174

UNITED STATES PATENT OFFICE

2,052,174

TUBE CLEANER

Walter T. Hamilton, Springfield, Ohio, assignor to The Airetool Manufacturing Company, Springfield, Ohio, a corporation of Ohio

Application May 9, 1935, Serial No. 20,545

4 Claims. (Cl. 15—104.13)

This invention relates to improvements in tube cleaners employed to remove scale from the internal surfaces of tubes, the invention relating to that type of tube cleaner which has cutters movable outwardly to a limited extent by centrifugal force in the manner described in my pending application Serial No. 684,708, filed August 11th, 1933.

My improved cleaner was designed particularly to clean tubes which have different diameters. It has been the practice in certain types of gasoline stills to reenforce certain portions of the tube which are subject to corrosion, generally one end thereof, by inserting in the tube a short section of tubing of such external diameter as to fit snugly within the oil still tube which results in two different diameters throughout the length of the tube. In cleaning tubes which have been thus reenforced it has been the practice to use a cleaner of small size for the smaller diameter of the tube and another cleaner of larger size for that portion of the tube having the largest diameter.

It is the object of the present invention to provide a cleaner head which is adapted to not only clean the smaller diameter of the tube but also the larger diameter.

A more specific object of the invention is to provide in a cleaner head of a given size, means for mounting the cutters such that the cutters will have a greater outward throw by centrifugal force than with known cleaner heads.

In the accompanying drawings:

Fig. 1 is an end elevation of a cleaner head constructed according to one form which the invention may take.

Fig. 2 is a view partly in side elevation and partly in longitudinal section of the same.

Fig. 3 is a horizontal section on the line 3—3 of Fig. 2.

Fig. 4 is a transverse section on the line 4—4 of Fig. 3.

Fig. 5 is a transverse section on the line 5—5 of Fig. 3.

Fig. 6 is a perspective view of a member employed in the construction, the scale being somewhat increased over the foregoing figures.

Fig. 7 is a perspective view of a similar member on the same scale.

Fig. 8 is a view partly in side elevation and partly in longitudinal section of a cleaner head in which a slightly different construction is followed.

Fig. 9 is a view, partly in end elevation and partly in transverse section of the same head.

Fig. 10 is a view partly in side elevation and partly in longitudinal section, the sectional portion being taken on the line 10—10 of Fig. 9.

Fig. 11 is a perspective view of the body of the form shown in Figs. 8, 9 and 10.

Fig. 12 is a perspective view on a slightly larger scale of a member employed in the second mentioned form.

Referring to the drawings, the form shown in Figs. 1 to 7, inclusive, will be first described. This cleaner head is composed of a body 1 having an axially extending threaded extension 2 on which a hubbed end member 3 is screwed, the threaded end 2 being extended but about halfway into the end member 3 so that the remaining open portion of the interiorly threaded bore of the end member 3 may be used to secure the head onto the motor shaft (not shown).

The head is provided in the present case with three sets of cutter elements of a well known form, and are so disposed that under the centrifugal force developed when the head is rotated by the motive power, the elements will fly out to the maximum extent allowable either by the stops provided in the head when the head is in the open or by the bore of a tube when the head is inserted in the tube. Since each set of elements is identical one set only will be mentioned, this set being the one shown in the longitudinal sectional view, Fig. 3. The cutters are of the well known form of star-cutters and comprise a pair of disk cutters 4 and 5 and a cone cutter 6 to head the group. Each cutter is provided with a central bore through which is passed a cutter pin 7. The cutter pin is carried in slidable blocks, the forward end of the pin being inserted in the opening 8 of a block 9 (Fig. 7) which is preferably tapered to permit the pin to tilt with relation to the block, while the rearward end is carried in the elongated opening 10 of a block 11 (Fig. 6).

The block 9 is a forward block and is received in an axial slot 12 cut in the outer portion of the body 1, the slot extending in depth radially toward the central portion thereof. In about the same manner, the block 11 is received in a slot 13 at the rear portion of the body. The cutters are received in a radially extending opening 14 in the central portion of the body 1, and to provide the desired range of movement, the openings 14 for each of the sets meet each other, whereby when the cutters are in their innermost positions such as is shown in full lines in the several figures, only the tips of the cutter teeth project beyond the periphery of the body.

When the head is being rotated as in operation,

the tendency for each set of cutters is to fly outwardly due to centrifugal force, and as in all cleaners of this type, advantage is taken of this tendency to allow the cutters to work on the encrustations to remove the same. Thus, the inner surface of the tube is the limiting surface whereby outward movement of the cutters is restrained, but to retain the cutters in the head when removed from a tube, stops are provided on the blocks to co-act with portions of the body. The stop on the forward block 9 is best seen at 15 (Fig. 7) and is an axial extension of that portion of the block nearest the center of the body when the block is in place as in Fig. 3. In the same way, a stop 16 is provided for the rear block 11. In the outward movement of the blocks, the blocks have a considerable distance to move before making contact with a limiting portion of the body, and this accounts for a part of the maximum possible outward movement of the cutters. In the present instance the stop 15 on the forward block makes contact with the lip 17 of the nose portion of the body, while at the rearward end the stop 16 bears against a tubular extending portion of the end member 3 which encircles the body at this end (Fig. 3).

It has been stated that for all practical purposes the interior of the tube is the stop to limit outward movement of the blocks which carry the cutters, so therefore, to clean a tube the cutters should have other possible remaining movement than that allowed by the stops on the blocks so that the pressure of the cutters on the surface tube cleaner may be maintained. To provide that the range of the throw of the cutters in cleaning a tube with two different diameters with a single head may be sufficiently great to properly clean the stepped diameters of the tube with full cutter pressure, provision is made to allow a greater outward throw of the cutters than is possible by the range of throw permitted by the stops on the blocks which carry the cutters.

This feature is obtained in the present instance by providing that in the rear block 11 the opening in the block which receives the rear end of the pin 7 is elongated in a direction which when the block is in place in the body, will be radially disposed with respect to the body. Thus the block has an outward radial movement with reference to the body and also the pin has a similar outward movement with reference to both body and block, the total movement allowing the cutters to move to the broken line position seen in Fig. 3, by which it can be seen that the rear end of the pin will move to the outer portion of the elongated slotted opening 10 of the rear block.

Obviously, the upper limit is just under the point where the pin moves completely to the outer portion of the elongated opening; otherwise, full cutter pressure would not be obtainable.

Although not shown in connection with the form here described, it is feasible to provide an elongated opening also in the forward block 9 in place of the cylindrical opening shown, but in view of the fact that a large radial movement at the forward end of the head may interfere at times with the entering of a head in certain tubes, the large radial movement is allowed at the rear end only.

In the second form shown in Figs. 8 to 12, inclusive, the construction departs but little from the previously described form, the differences being that when in the open the stops that retain the cutter groups in the body are placed on the sides of the blocks, making it possible to manufacture a shorter head for certain kinds of specialized use, and since here it is permissible to allow each end of the group to travel to the same large movement, each of the blocks has an elongated opening; in fact, the blocks are identical and a lower manufacturing cost is obtained. A block is shown at 18 in Fig. 12, the elongated opening is seen at 19, and the stops are indicated at 20 on each side. The stops make contact with the shoulders 21 in the body 22 (Fig. 11), and the groups are retained loosely in place by the flat circumferential flange 23 of the hubbed end member 24 bearing against the end of the body 22.

As before described in connection with Fig. 3, the total outward cutter movement of a set of cutters is indicated by the broken line position in Fig. 10. In the second form, the cutter pins are indicated at 7', the cone cutters at 6', and the disk cutters at 4' and 5'.

Having thus described my invention, I claim:

1. In a tube cleaner, a rotatable body, a pair of axially spaced blocks mounted therein for radial movement relatively thereto, stops to limit the movement of said blocks, a substantially axially extending cutter pin mounted in said blocks, a cutter element on said pin, said cutter pin being mounted in at least one of said blocks for outward movement under the influence of centrifugal force relatively thereto, the mounting of said pin in the other block being such as to permit such outward movement of the pin and means to limit the movement of said pin.

2. In a tube cleaner, a rotatable body having a pair of substantially axially aligned radially-extending slots, a pair of fore and aft blocks mounted in said slots for radial movement under the influence of centrifugal force, means to limit the movement of said blocks, a cutter pin mounted in said blocks, the rear block being provided with a radially-extending slot to receive said pin whereby said pin may move outwardly under the influence of centrifugal force relatively to said block, the mounting of said pin in the other block being such as to permit such outward movement of the pin and means to limit the movement of said pin.

3. In a tube cleaner, a rotatable body having a pair of substantially axially aligned radially-extending slots, a pair of blocks mounted in said slots for radial movement under the influence of centrifugal force, means to limit the movement of said blocks, each of said blocks having a radially-extending slot, a cutter pin mounted in the slots of said blocks for outward movement under the influence of centrifugal force relatively thereto, a cutter element on said pin, and means to limit the outward movement of said pin.

4. In a tube cleaner, a rotatable body having at least one radially-extending slot, a cutter supporting block mounted in said slot adapted to move outwardly by centrifugal force, means for limiting the outer movement thereof, a cutter pin carried at one end by said block, means for supporting the other end of said pin such as to permit a relative outward movement between said pin and said supporting means, said block having a radially extending slot into which said cutter pin extends so that said cutter pin may have outward movement under the influence of centrifugal force relatively to said block, and means to limit the outer movement of said cutter pin.

WALTER T. HAMILTON.