

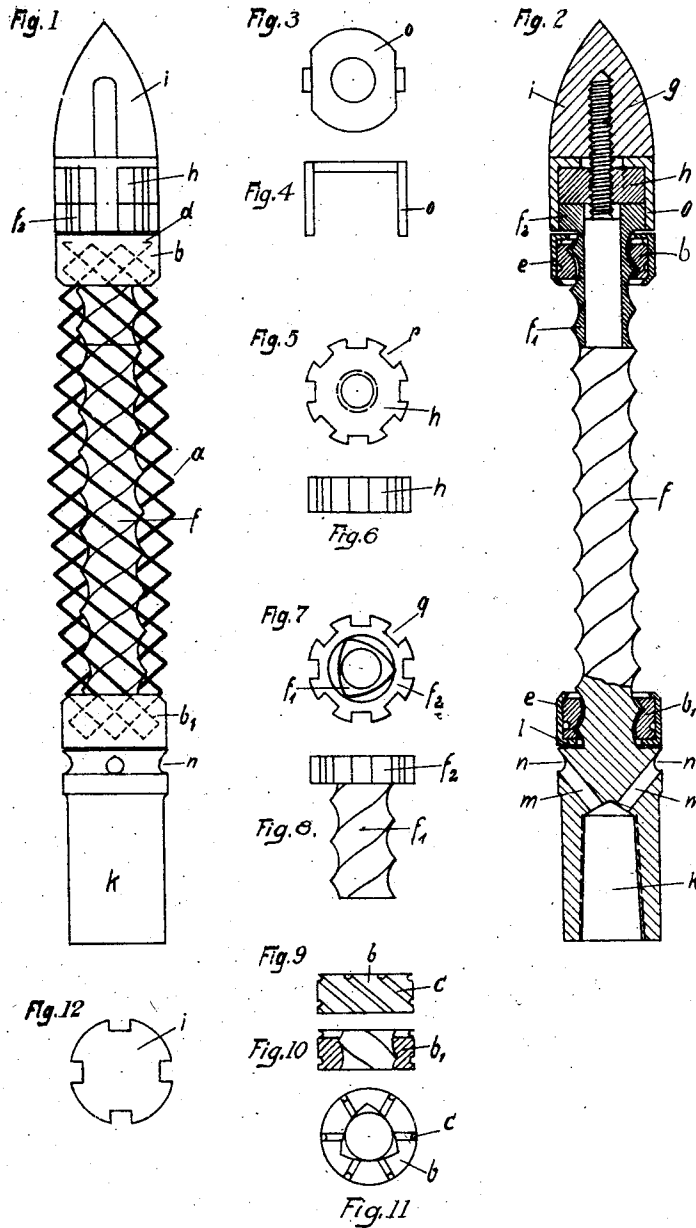
Nov. 27, 1928.

1,693,134

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DEVICE FOR CLEANING TUBES OR THE LIKE

Filed April 8, 1926



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DEVICE FOR CLEANING TUBES OR THE LIKE

Application filed April 8, 1926, Serial No. 100,517, and in Germany July 27, 1925.

This invention relates to a device for cleaning tubes, particularly condenser tubes. In contradistinction to known tube cleaners with adjustable helical springs for scraping the inner walls of the tubes according to the invention the ends of the helical springs are slidably guided by means of nuts, on a spindle provided with one or more threads, so that when pushed through the tube to be cleaned, they are subjected to torsion whereby the diameter of the springs diminishes as the resistance increases, and vice versa. Since, therefore, the diameter adjusts itself automatically to the resistance encountered, particularly effective cleaning action of the device is obtained because it exerts a smoothening and polishing action on the inside of the tubes, and thereby lessens the risk of corrosion.

A tube cleaner according to the present invention is illustrated by way of example in the accompanying drawings in which

Fig. 1 shows the cleaner in longitudinal elevation,

Fig. 2 the same partially in section after the removal of the helical cage,

Figs. 3 and 4 are respectively a plan view and a side elevation of a retaining clip forming a part of the improved tube cleaner;

Figs. 5 and 6 are respectively a plan view and a side elevation of a nut adapted for cooperation with the clip shown in Figs. 3 and 4;

Figs. 7 and 8 are respectively a plan view and a side elevation of a rotatable portion of the improved screw spindle shown in Fig. 2;

Figs. 9, 10 and 11 are respectively a side elevation, a transverse section and a plan view of a nut adapted for cooperation with the rotatable member shown in Figs. 7 and 8; and

Fig. 12 is an inverted plan view of a lock nut forming a part of the improved cleaner.

The tube cleaner consists of one or more steel wire springs *a* helically wound and attached at their ends to nuts *b* and *b'* to form a cage, the diameter of which is variable. The attachment is preferably effected by inserting the ends of the springs in the helical grooves *c* (Figs. 9-11) in the nuts *b* and *b'* and by bending their extremities to form hooks *d* (Fig. 1) which are also disposed in grooves in the nuts. The ends of the springs are held firmly on the nuts *b* and *b'* by means of clips *e* (Fig. 2). In this way, the springs *a*, in combination with the terminal nuts *b* and *b'* form a spring cage capable of independent movement.

The said nuts *b* and *b'* are mounted on a spindle *f*, provided with one or more threads, preferably of steep pitch. At the forward end, the nut *b* and lock nut *i* (which also acts as a guide-head) are mounted on an extension *g* of the threaded spindle. If the tube cleaner—to the rear end *k* of which can be screwed a length of tube to serve as a handle—is pushed through a tube to be cleaned, the springs *a* scrape against the inside of the tube and exercise a cleaning action. The rear nut *b'* bears against the stop surface *l*. If the resistance increases while the cleaner is being pushed through the pipe, the forward nut *b* turns on the screw spindle *f* and moves slightly towards the rear. Since the thread of the helical springs *a* is in the opposite direction to that of the screw spindle *f*, the springs are compressed as the result of the torsion set up by the increased resistance. The translational movement of nut *b* toward the rear tends to increase the diameter of the spring cage by bulging the springs *a* outwardly, but the relation of the pitch of the threads on spindle *f* to the pitch of the helices of the springs is such that the effect of the translational movement is more than overcome by the rotation of nut *b*, which winds the springs more closely about the spindle *f* and thus reduces the diameter of the spring cage. Conversely, when the resistance decreases, the nut *b* is turned in the opposite direction so that the diameter of the spring cage increases. Hence the diameter adapts itself automatically to the resistance encountered in cleaning. The same effect is also produced when the cleaner is drawn back, the rear nut *b'* being turned and thereby causing the springs to contract to a greater or lesser degree according to the resistance encountered in cleaning.

During the cleaning operation, flushing water can be supplied through the tubular handle and the shank end *k*, said water passing through bores *m* into an annular external groove *n* (Figs. 1 and 2) and thence issuing to flush the inner walls of the tube in a uniform manner.

The automatic variation of the diameter of the springs may be assisted by hand, by imparting a slight right or left-handed twist to the tubular handle. Moreover, the diameter of the spring cage can be adjusted at the outset, by twisting the front nut *b* through a part namely, a third, quarter, etc. of a turn if the spindle *f* is provided with multiple threads, according to the number of the threads.

Since, however, this method of adjustment is complicated, it may be replaced by the following arrangement:

The forward portion f_1 of the screw spindle f is mounted for rotation on the spindle f and is provided with an exterior steep-pitch thread with which the nut b engages. The portion f_1 is further provided with an enlarged head f_2 against which abuts the nut h which is threaded on the reduced portion g of the spindle, the members h and f_2 being provided with openings p and q respectively (Figs. 5 and 7) for the reception of a tool or key for turning them either independently or together. It will be understood that by rotating the member f_2 , the member f_1 , which is integral with f_2 , will also be rotated and, owing to the steep-pitch thread connection of said member f_1 with the nut b , the latter will be moved axially along the member f_1 , thereby varying the diameter of the spring cage a . In this way, the tool can be set for cleaning tubes of widely different bore.

After turning the part f_1 of the spindle, the front nut h is screwed up against the head f_2 unless it has been turned along with f_1 . To retain the two members in their relative position, a clip o (Figs. 2 and 3) can be slipped over them, the lugs of which clip fit into the gaps p and q in such a manner as to secure the members h and f_2 in their relative position. The guide head i acts as a locking nut in this case also.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A tube-cleaning device comprising a screw spindle, a pair of nuts rotatably threaded on said spindle and spaced from each other, a cage encircling said spindle and formed of a plurality of helical scraping members each having its opposite ends secured to said nuts, the direction of the helices of said scraping members being opposite to that of the threads of the screw spindle, so that the torsion caused by pushing the device through the tube causes one of said nuts to move toward the other thereby decreasing the diameter of the cage as the resistance increases, and vice-versa.

2. A tube-cleaning device comprising a screw spindle, a pair of nuts rotatably threaded on said spindle and spaced from each other,

a cage encircling said spindle and formed of a plurality of helical scraping members secured to said nuts and extending therebetween, the helices of said scraping members extending in a direction opposite to that of the threads of the screw spindle and having a greater pitch than that of said threads, so that friction of said scraping members against the walls of the tube causes one of said nuts to move toward the other thereby decreasing the diameter of said cage.

3. A tube-cleaning device comprising a screw spindle, a pair of nuts rotatably threaded on said spindle in spaced relation, a cage encircling said spindle and formed of a plurality of helical spring members secured to said nuts and extending therebetween, the helices of said spring members being opposed to the threads of the screw spindle and having a greater pitch than that of said threads, so that friction of said spring members against the walls of the tube causes one of said nuts to move toward the other thereby decreasing the diameter of said cage, said cage and nuts being removable as a unit from said spindle to permit replacement thereof.

4. A tube-cleaning device comprising a screw spindle, a pair of nuts rotatably threaded on said spindle in spaced relation and provided with exterior grooves, a cage encircling said spindle and formed of a plurality of helical scraping members secured in said grooves and extending between said nuts, the helices of said scraping member being opposed to the threads of the screw spindle and having a greater pitch than that of said threads, so that friction of said scraping members against the walls of the tube causes one of said nuts to move toward the other thereby decreasing the diameter of said cage.

5. A tube-cleaning device as specified in claim 4, comprising in addition means associated with said spindle for conducting water to the region of said scraping members for flushing the inner walls of the tube.

6. A tube-cleaning device as specified in claim 4, comprising in addition a lock-nut at one end of said cage, said lock-nut being shaped to form a guide head.

In testimony whereof I have signed by name to this specification.

ADOLF BRENDLIN.