June 21, 1932. C. H. STUBBS 1,863,950

TUBE COATING BRUSH

Filed Sept. 16, 1929

Fig. 1.

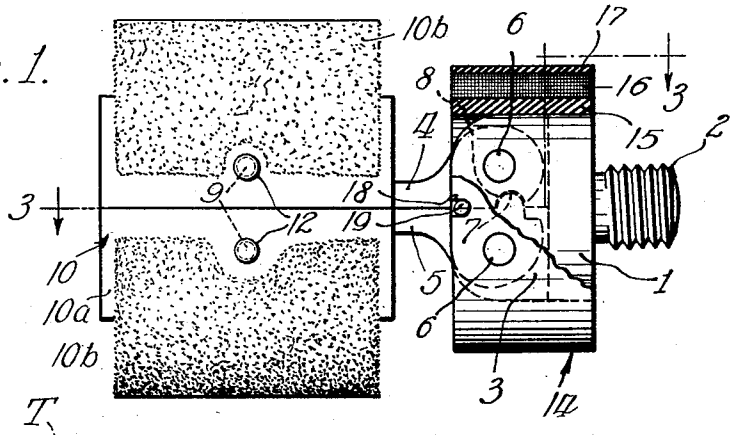


Fig. 2.

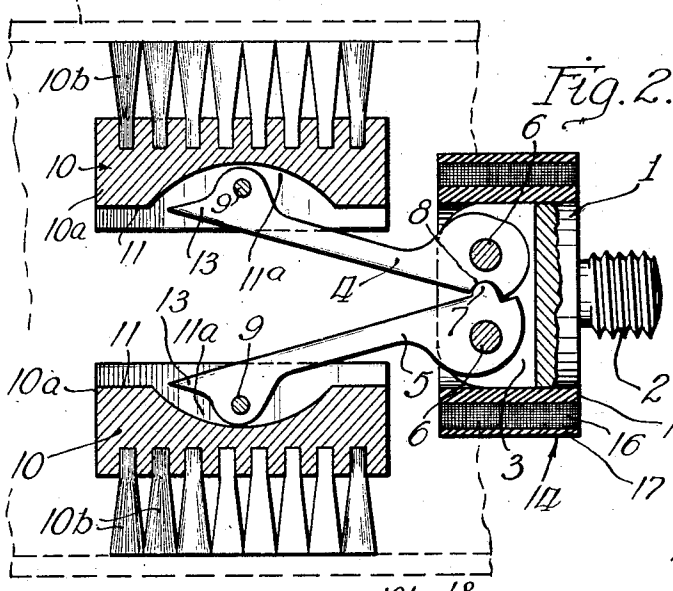


Fig. 3.

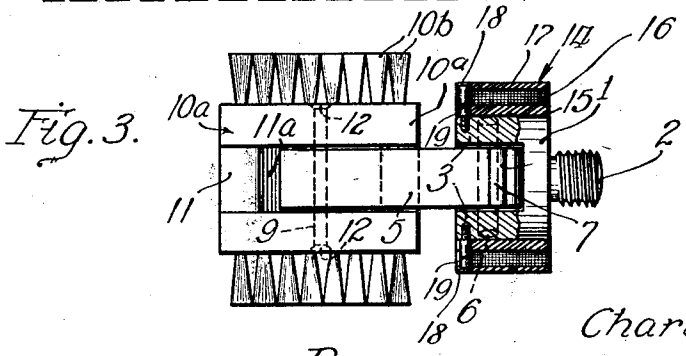
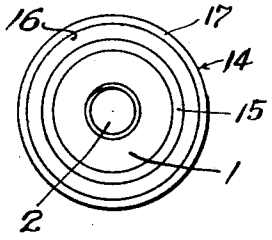


Fig. 4.



Inventor
Charles H. Stubbs

By Brown, Jackson, Boettcher & Dienner
Attys.

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UNITED STATES PATENT OFFICE

CHARLES H. STUBBS, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE DAMPNEY COMPANY OF AMERICA, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS

TUBE COATING BRUSH

Application filed September 16, 1929. Serial No. 392,837.

This invention relates to brushes, and more particularly to a brush for use in coating the interior surfaces of the tubes of water tube boilers, condensers, and like apparatus.

It is recognized that tubes in water tube boilers and other apparatus can be treated to advantage by coating the interiors thereof with a protective coat of a composition in the form of a paint, this composition serving to protect the tube against the destructive action of the liquid or fluid flowing therethrough. While the advantages of such a protective coating have been appreciated, great difficulty has been experienced, from a practical standpoint, in applying the coating to the interior of the tube in a satisfactory manner and at a sufficiently low cost to justify the application of such a coating.

In coating the interior of tubes, a suitable quantity of the coating material is injected into the tube and is then spread over the interior surface thereof by a brush which is inserted into the tube and pushed therethrough, this brush being rotated. The protective composition should, for maximum efficiency, be distributed uniformly over the entire interior surface of the tube, so as to effectively cover the same. To accomplish this, the coating brush should be disposed parallel with the tube and should bear against the inner face thereof with uniform pressure throughout the length of the brush.

One of the main objects of my invention is to provide a tube coating brush of simple construction and operation, in which the sections of the brush contact with the interior of the tube under uniform pressure and are disposed parallel to the tube. A further object is to provide a brush of this character, in which the brush sections are interconnected in such manner as to assure equal pressure thereof against the interior surface of the tube. Further objects and advantages will appear from the detailed description.

In the drawing:

Figure 1 is an elevation of a tube coating brush structure in accordance with my invention;

Figure 2 is an axial sectional view through the brush structure, parts being shown in elevation, in open or expanded condition for use in the tube;

Figure 3 is a section taken substantially on the line 3—3 of Figure 1, on a reduced scale; and

Figure 4 is an outer end view of the brush head.

The brush proper is mounted upon a cylindrical head 1 provided at one end thereof with a screw stud 2, by means of which the head is adapted to be attached to a driven member, such as an air turbine, to be rotated thereby. At its other end, the head is slotted diametrically to provide two lateral flanges 3 disposed in spaced parallel relation. Two links 4 and 5 are pivotally secured at one end, between the flanges 3, by pivot pins 6. One of these links is provided with a tooth or detent 7, which extends into a depression or recess 8 in the other link 4. This tooth or detent and the depression 8 coact to provide a gear connection between the two links, which assures equal movement thereof. Each link is pivotally secured at its other end, by means of a pivot pin 9, to a core or base member 10^a of a brush section 10, which also comprises the bristles 10^b secured in base 10^a in a known manner. Base 10^a is provided, in its inner face, with a longitudinally extending groove 11, having a relatively deep arcuate portion 11^a which receives the enlarged end portion of the link. Each brush section 10 is of substantially semi-cylindrical shape and, when the links 4 and 5 are disposed in parallel relation, the two brush sections fit together with the links disposed in the grooves, as in Figure 1. Each pin 9 is peened over or headed at each end, as at 12, so as to be held thereby against endwise movement.

In the use of this brush, after a suitable quantity of the coating material has been placed within the tube, the brush is inserted into the tube and is moved therethrough, being simultaneously rotated at a sufficiently high speed to cause the brush sections 10 to swing outwardly under the influence of centrifugal force into contact with the surrounding wall of the tube. Since the two links 4 and 5 are interconnected, so as to have equal movement in opposite directions, the

bristles 10^b of the brush sections will be urged into contact with the interior surface of the tube with equal pressure. Also, since the brush sections are pivoted to the links on axes parallel to the pivotal connection between these links and the head and transverse to the axis of rotation of the head, the brush sections are free to swing about the pivot pins 9 into parallelism with the tube. This means that, if the bristles of either of the brush sections should contact with the interior of the tube at either end of such section, when the brush is first expanded by rotation thereof with the head, continued outward movement of the brush section would result in rocking of the same upon the pivot pin 9 until the section has been moved into parallelism with the tube with the bristles throughout the entire length of such section in contact with the inner face of the tube. The pivoting of the links to the head on axes transverse to the axis of rotation of the head and on opposite sides of such axis, and the pivoting of the brush sections to the links on axes parallel to the axes of the pivotal connections between the links and the head, cooperate to assure proper movement of the brush sections into contact with the surrounding wall of the tube and also assure that such contact will extend throughout the length of the bristles of each brush section.

This greatly facilitates the application of the coating of protective material to the interior of the tube. The interconnection between the two links assures that the pressure of the bristles of the respective brush sections against the interior of the tube is equal, thus assuring uniform distribution of the coating material upon the inner face of the tube.

In its broader aspects, my invention comprehends the provision of a rotatable head and of brush sections, in conjunction with the links or equivalent means pivotally secured at one end to the head on axes extending transversely of the axis of rotation of said head and disposed at opposite sides thereof, the brush sections being suitably connected to the links at the other end thereof in such manner as to be capable of movement relative to the links into substantial parallelism to the axis of rotation of the head. More specifically, I prefer to dispose the pivot pin 9 at the longitudinal center of base 10^a of the brush section 10, as illustrated in Figures 2 and 3. If the brush sections are evenly balanced throughout, such sections will naturally tend to assume positions parallel to the axis of rotation of head 1 during rotation thereof. The brush sections will then be held in contact with the inner face of the tube, during rotation of the head, throughout the entire length of each brush section and under equal and uniform pressure. This will be clear from Figure 2, in which the tube is indicated in dotted lines and is designated by the reference character T.

By thus mounting the brush sections relative to the links, and connecting the links for equal movement, the brush structure as a whole assures uniform distribution of the coating composition upon the inner face of the tube throughout an area of appreciable extent during each complete rotation of the brush structure. As a result, with the brush rotated at moderate speed, the structure as a whole can be inserted through and withdrawn from the tube at relatively high speed and yet, during such rapid insertion and withdrawal, assures proper coating of the entire interior of the tube. By constructing the brush structure in the manner illustrated and described, I thus obtain more uniform coating of the interior of the tube than has heretofore been possible and permit of this being done more rapidly than is possible by the use of coating brushes commonly employed for this purpose, thus effecting a material saving in time, which is an essential consideration in this art.

The links 4 and 5 are preferably provided with extensions 13 which constitute stop elements. These elements cooperate with the walls of recesses 11^a to limit turning movement of the brush sections about pins 9 toward extensions 13, under certain conditions.

A protector 14 of suitable type is preferably disposed about head 1, as illustrated. This protector comprises an inner layer 15 of rubber, an intermediate layer 16 of fabric, and an outer layer 17 of rubber.

The protector has a snug fit about head 1 and is provided, in its inner end, with two notches 18 which snugly receive pins 19 screwed or otherwise suitably secured in the head. In this manner the protector is effectively secured on the head and, in the use of the brush, provides a cushioning guard which effectively prevents contact of the head 1 and associated parts with the tube. It will thus be seen that possibility of contact of the metallic parts of the brush with the tube, and possible resulting damage to either the brush or the tube, is eliminated.

What I claim is:

In a tube coating brush structure, a rotatable head, links pivoted at one end to the head on axes transverse to and at opposite sides of the axis of rotation thereof for movement toward and away from each other, opposed brush sections pivotally secured intermediate their ends to the links on axes transverse to the axis of rotation of the head, and a cushion guard extending about the head.

In witness whereof, I hereunto subscribe my name this fourth day of June, 1929.

CHARLES H. STUBBS.