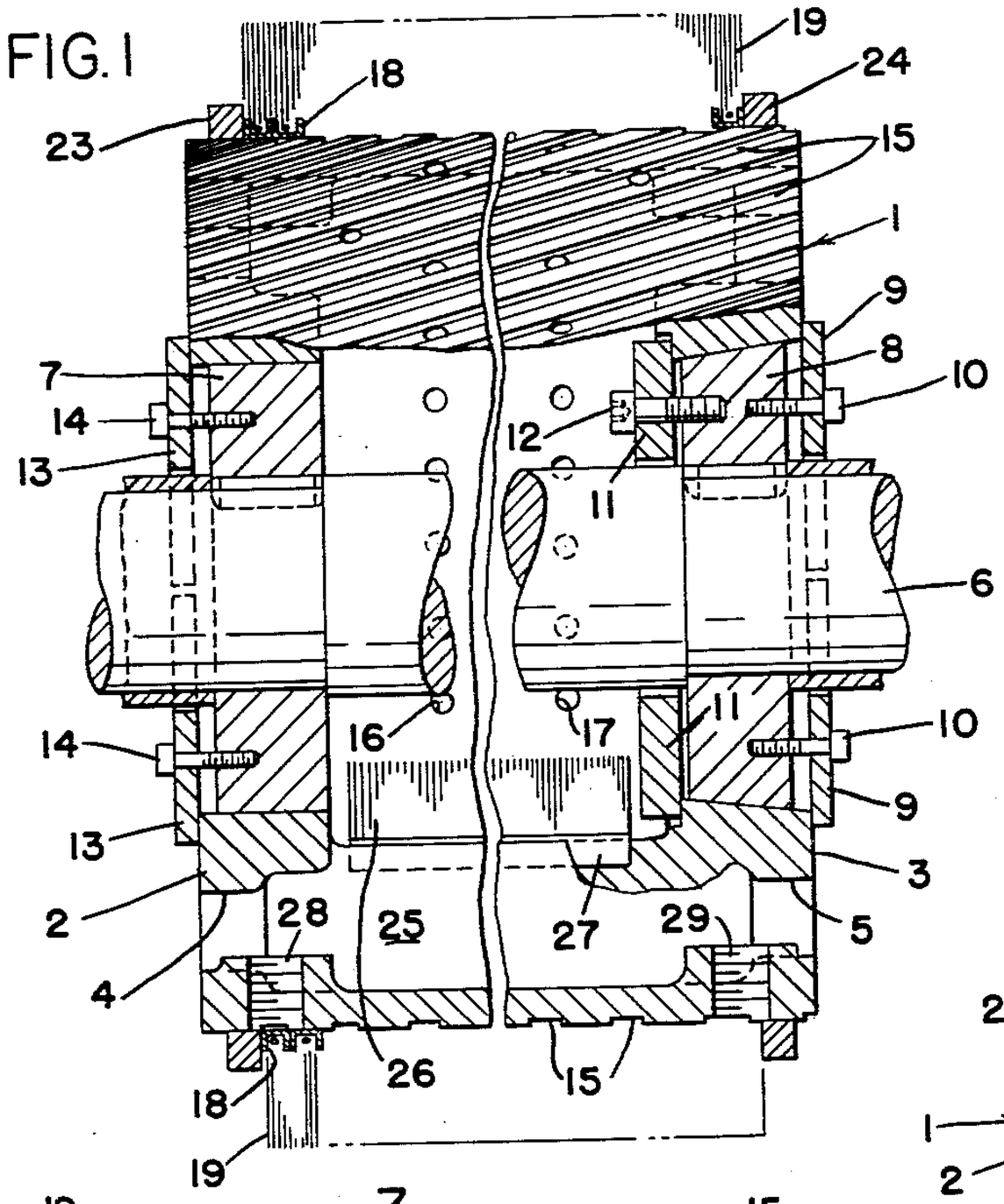
Aug. 8, 1961 J. C. BONGIOVANNI 2,994,898

SELF-COOLING ROTARY BRUSH

Filed April 28, 1958

FIG. 1



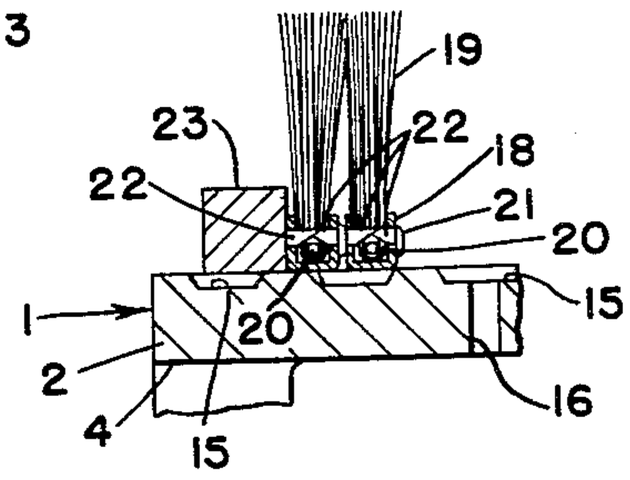


FIG. 3

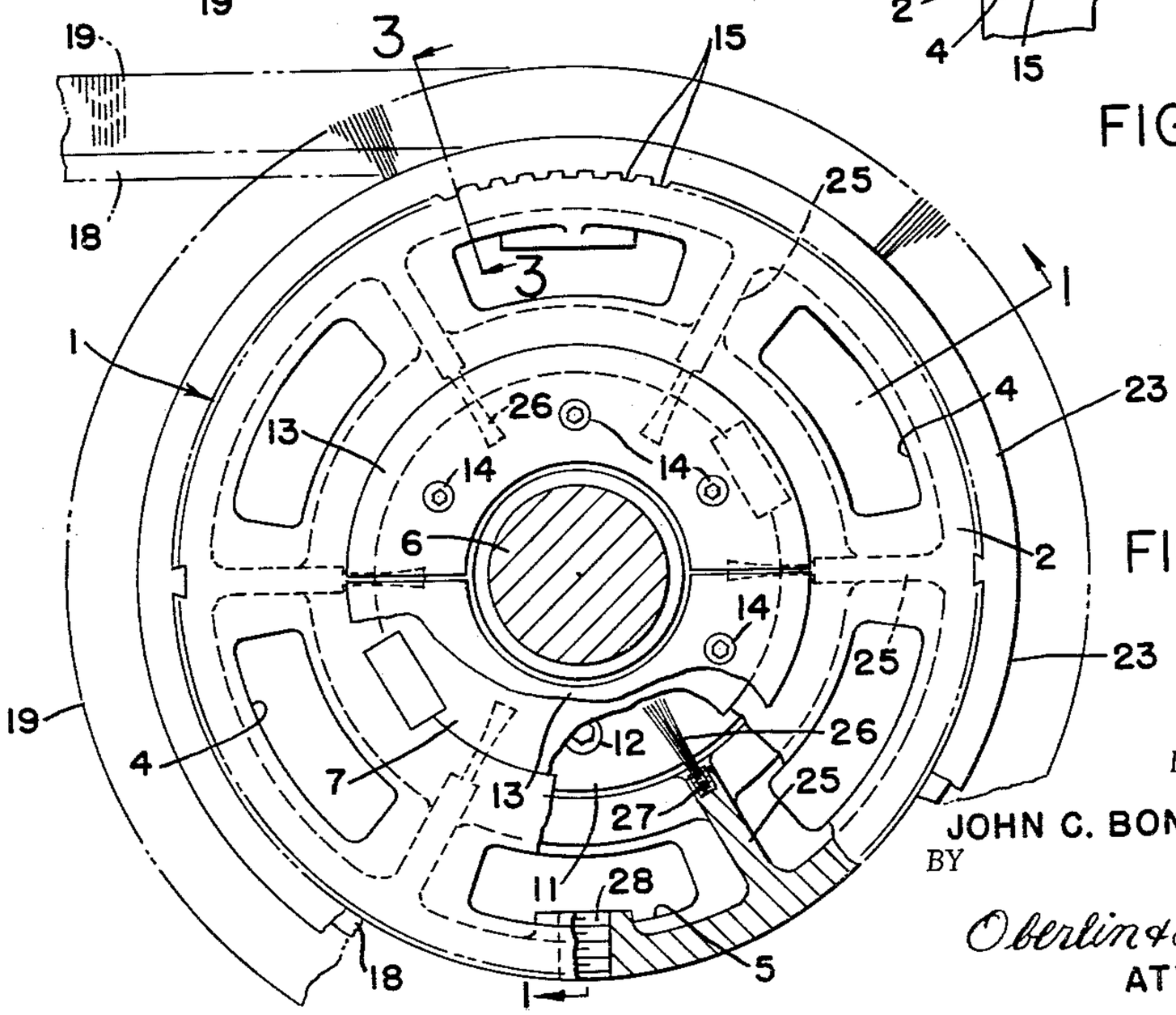


FIG. 2

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SELF-COOLING ROTARY BRUSH

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This invention relates as indicated to a self-cooling power driven rotary brush, and more particularly to a rotary brush adapted to be driven at high speed for the purpose of removing scale and otherwise surface treating hot rolled strip and the like, either ferrous or non-ferrous.

In certain respects, the brush of this invention is an improvement of the brush disclosed and claimed in my co-pending application Serial No. 525,224, now Patent No. 2,921,328, filed July 29, 1955, "Rotary Brush With Fluid Passages." When a power driven rotary brush having brush bristle material of steel wire, for example, is rotated in one direction only, the ends of the bristles tend to become rounded on the side where they engage the work in use, and it is accordingly desirable to reverse the direction of rotation at fairly frequent intervals. Such brushes may be several feet in diameter and several feet in length and on occasion may weigh as much as one-half ton. In view of the high speeds at which they are driven, there is consequently very considerable angular momentum to be overcome before such a brush can be stopped and again brought up to operating speed in the opposite direction. It is important both to reduce the power required and the shock involved in accomplishing such brush reversal in a short period of time. Moreover, the brush must ordinarily be withdrawn out of engagement with the work while being thus reversed. Accordingly, it is desirable to accomplish such reversal as quickly as possible.

The abrading action of the brush on the work is, of course, sometimes effective to generate considerable heat which is capable of damaging both the brush and the work if suitable precautions are not taken. At other times, it may be desired to use the brush to brush hot steel or aluminum, for example, and in special forms it may be employed as a "hot scalper."

It is accordingly an important object of this invention to provide a novel power driven rotary brush which will be relatively light in weight, thereby facilitating rapid reversal of the same, but which will nevertheless be of unusually strong construction.

Another object is to provide such brush with strengthening and rigidifying means which will additionally serve to enhance ventilation and cooling of the brush in use.

Still another object is to provide supplemental cooling means effective both to dissipate heat conducted from the brush face and also to serve as fan blades effective to assist in delivering cooling air to the brush face.

Other objects of the invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

FIG. 1 is a side view of a brush embodying the principles of my invention partly broken away along the line 1—1 on FIG. 2 better to disclose the internal arrangement of the same;

FIG. 2 is an end view of such new brush; and

FIG. 3 is a fragmentary detail section taken on the line 3—3 on FIG. 2 showing the manner of mounting helically wound brush strip on the hub.

Referring now more particularly to said drawing, the embodiment of my invention there illustrated comprises a cylindrical hub 1 having inwardly extending annular end portions 2 and 3 aperture to afford a plurality of ventilating openings such as 4 and 5 therethrough. The hub thus formed is mounted upon an appropriate drive shaft or brush arbor 6 by means of cylindrical hub disc 7 fitting within annular end flange 2 and tapered disc 8 fitting in the correspondingly tapered central opening of end flange 3. Such discs are each keyed to the drive shaft for rotation with the latter. A flat split ring 9 (used only when removing the brush from its support) is secured to the outer side of tapered disc 8 by means of screws 10 so that by tightening such screws the drive fit between such disc and the hub may be loosened and the brush removed therefrom. An inner ring or washer 11 is formed of three segments for insertion through the apertures such as 5 for attachment to the inner face of disc 8 by means of screws 12. By tightening such latter screws, the disc may be drawn into and maintained in tight fitting relationship with the brush hub proper. Another split ring 13 may optionally be secured to disc 7 by means of screws such as 14 so that by tightening such screws the brush may be still more firmly seated on tapered disc 8. When the brush is of considerable length, however, and the cylindrical hub is of aluminum which is ordinarily most desirable to reduce the mass of the brush, the longitudinal expansion of the aluminum hub (due to heating in use) relative to that of the steel drive shaft 6 may be quite consequential and sufficient to buckle ring 13. Under such circumstances, the segmental ring 11 will be relied upon to ensure maintenance of the desired snug fit.

The external cylindrical surface of hub or shell 1 is provided with a large number of relatively narrow grooves 15 therein extending helically of such cylindrical surface. Several rows of holes such as 16 and 17 are drilled through such shell to connect the helical grooves with the interior of the latter. Such holes are very desirable for supplemental ventilating purposes, particularly when the brush is of considerable length (e.g. three feet or more long), and such holes will generally be disposed in circumferential rows.

A variety of different types of brush strip well known in the art may be employed in accordance with my invention, but such brush strip will ordinarily comprise an elongated sheet metal channelform back 18 with brush material 19 secured therein by an elongated retaining element such as wire 20 extending longitudinally within the channel. A very satisfactory form of brush strip for employment in accordance with my invention is that disclosed in Peterson Patent 2,303,386. A superior form of brush strip for employment in accordance with my invention, however, is that disclosed and claimed in application Serial No. 452,320, now abandoned, of Brooks E. Nelson, filed August 26, 1954, for "Brush Element." Such latter form of brush strip includes provision for maintaining successive turns thereof slightly spaced to facilitate outward flow of ventilating air. Such spacing means may be in the form of a plurality of outward dimples 21 in the side of the channelform brush back (see FIG. 3). Teeth 22 may be punched in from both sides of the channel back of the brush strip to overlie the retaining wire 20 and hold the latter within the brush back. When my new brush is rotated at high speed, the effect of centrifugal force is to draw air into the helical grooves 15 for passage radially outwardly between the turns of brush strip, thereby ventilating and cooling the brush material. This effect is much accentuated by the provision of the holes 16, 17 whereby air entering the hub

through apertures 4 and 5 passes radially outwardly through such holes to grooves 15. If desired, grooves 15 may be provided of opposite hand describing helices which meet one another in a herringbone effect. Other modifications will be apparent to those skilled in the art wherein the grooves extend at angles to the axis of rotation of the hub rather than parallel thereto, but the relatively simple long lead helical form illustrated and described is preferred.

The brush strip may be wound directly upon the hub under sufficient back tension to deform the metal channel back 18 of the strip to conform to such hub as shown in FIG. 2 of the drawing. In view of the helical disposition of the grooves or channel 15, no symmetrical pattern of brush material length differentials will appear when the brush is subsequently trimmed. While portions of the brush strip back may nevertheless still be somewhat flattened where bridging grooves 15, the effect upon the work-pieces is not nearly so noticeable as when the grooves extend parallel to the axis of rotation of the tool.

Lock ring collars 23 and 24 are mounted on the cylindrical shell 1 to secure the short lead helical turns of brush strip 18 thereon in well-known manner, such collars themselves being held in place by set screws (not shown). It will be noted that such collars need not obstruct the end portions of the long lead helical grooves 15 so that such grooves remain effective to scoop in air when the brush is rotated at high speed. End clamping members of the general type shown and described in Peterson Patent 2,609,559 are also suitable for use with my new brush assembly, and the end portions of the helically wound brush strip may be held down by clamps (not shown) secured in threaded openings 28 and 29.

The brush material may be of any desired type including tampico fiber, cord, horsehair, wire, buff fabric, synthetic plastic filaments, and wire and glass fiber filaments coated with plastic. For such purposes as scale removal, however, I ordinarily prefer to employ quite hard crimped steel wire brush bristle material. Such material naturally tends to become quite heated in use and may lose its hard resilient character unless adequately cooled.

The brush hub shown in the drawing and described above is of relatively lightweight construction and will also desirably be of a light metal such as aluminum or magnesium. For the purpose of adding necessary rigidity to the shell, I provide a plurality of narrow radially inwardly projecting webs or ribs 25 extending longitudinally of the hub intermediate the ventilating windows 4 and 5. Such webs or ribs not only serve to strengthen the construction but also act as vanes, producing a certain turbulence in the air drawn in through the windows 4 and 5 and tending to direct such air outwardly through the apertures 16 and 17. Moreover, such webs act as heat radiating and dissipating surfaces for the heat which is conducted from the wire brush material 19 through the metal channel brush strip back 18 to the shell 1. Straight lengths of brush strip having wire (e.g. copper) brush material 26 and metal channelform brush backs 27 may be inset and welded or secured by other means in place in the radially inner edge portion of such ribs 25. They thus serve as extensions of such ribs to enhance the turbulence of the air passing through the hub and also act as heat dissipating means.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In a power driven rotary brush having an aluminum hub in the form of a cylindrical shell and brush strip mounted thereon, the ends of said hub having apertures therein for entrance of air within said shell and said shell having apertures therethrough, said shell also having a plurality of long lead helical grooves in its outer peripheral surface, brush strip tightly helically wound and secured in a short lead helix on the outer cylindrical surface of said shell, thereby bridging said grooves, adjacent turns of said helically wound brush strip being slightly spaced apart by lateral protuberances on the brush strip back, and reinforcing ribs extending radially inwardly from said cylindrical shell effective also to conduct heat from the latter and to render turbulent cooling fluid drawn into said shell through the ends of said hub and flowing outwardly through such apertures in said shell between said spaced turns of brush strip under the influence of centrifugal force, wherein such apertures in the ends of said hub are located intermediate the ends of said ribs, said back of said brush strip is of metal and the brush bristle material of said brush strip is metal wire, and metal brush bristle material conductively secured to said ribs and extending further radially inwardly therefrom.

2. In a power driven rotary brush having a conductive metal hub in the form of a cylindrical shell and brush strip mounted thereon, the ends of said hub having apertures therein for entrance of fluid within said shell and said shell having apertures therethrough, and brush strip tightly helically wound and secured in a short lead helix on the outer cylindrical surface of said shell; reinforcing ribs extending radially inwardly from said cylindrical shell effective also to conduct heat from the latter and to render turbulent cooling fluid drawn into said shell through the ends of said hub and flowing outwardly through such apertures in said shell between said turns of brush strip under the influence of centrifugal force, wherein such apertures in the ends of said hub are located intermediate the ends of said ribs, said back of said brush strip is of metal and the brush bristle material of said brush strip is metal wire, and metal brush bristle material conductively secured to said ribs and extending further radially inwardly therefrom.

References Cited in the file of this patent

UNITED STATES PATENTS

727,256	Atwater	May 5, 1903
1,362,822	Rude	Dec. 21, 1920
1,838,416	Lecker	Dec. 29, 1931
2,191,115	Nielsen	Feb. 20, 1940
2,409,309	Peterson	Oct. 15, 1946
2,629,121	Petre	Feb. 24, 1953
2,739,429	Peterson	Mar. 27, 1956
2,740,148	Nelson et al.	Apr. 3, 1956
2,821,729	Van Clief	Feb. 4, 1958
2,921,328	Bongiovanni	Jan. 9, 1960