March 27, 1956 R. O. PETERSON 2,739,429

ROTARY BRUSH

Filed June 14, 1954 2 Sheets-Sheet 1

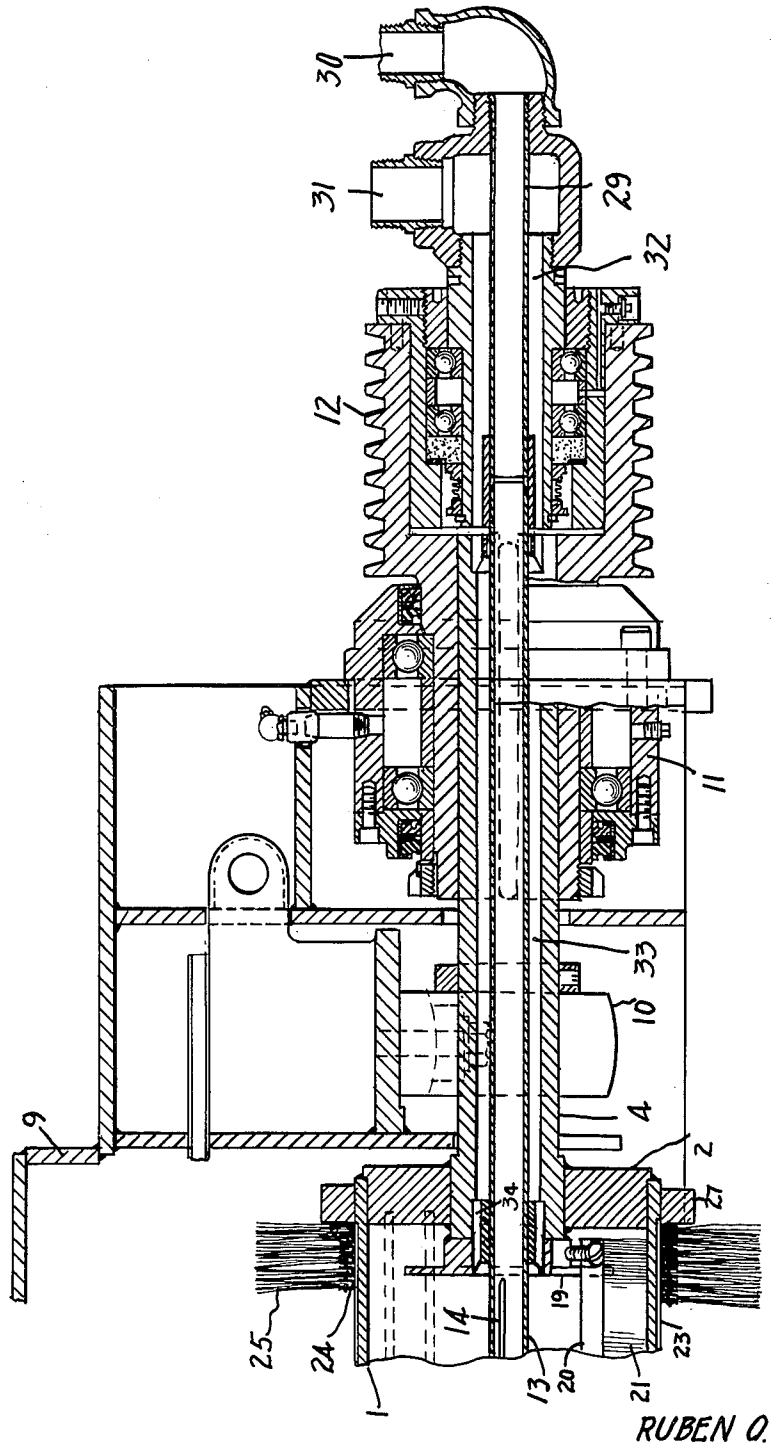


Fig. 1

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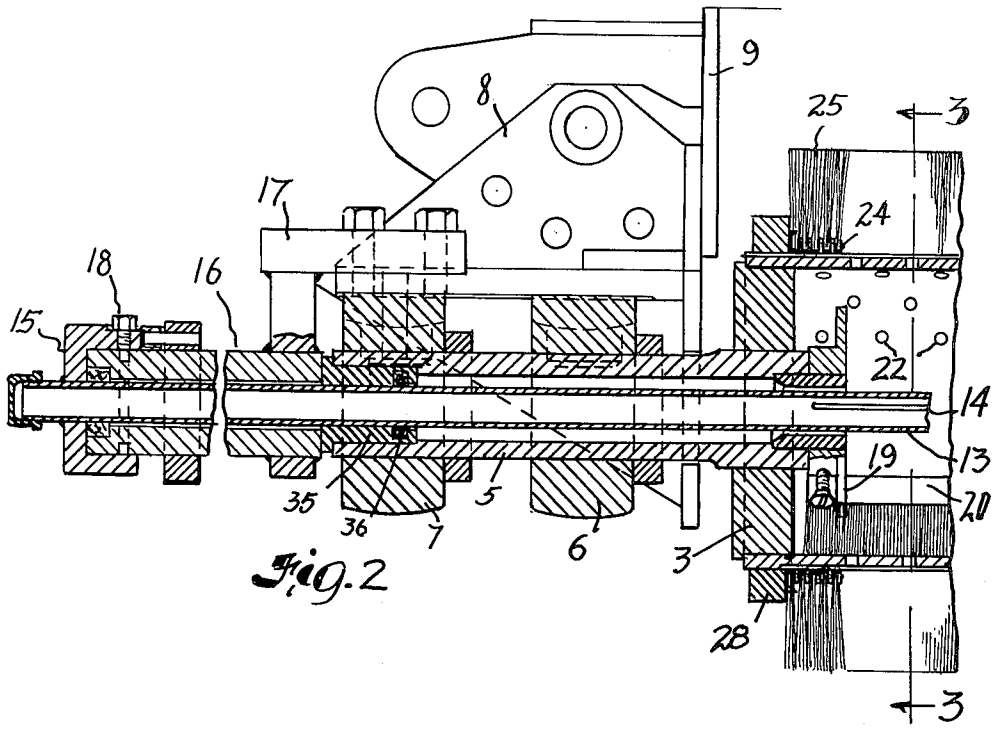


Fig. 2

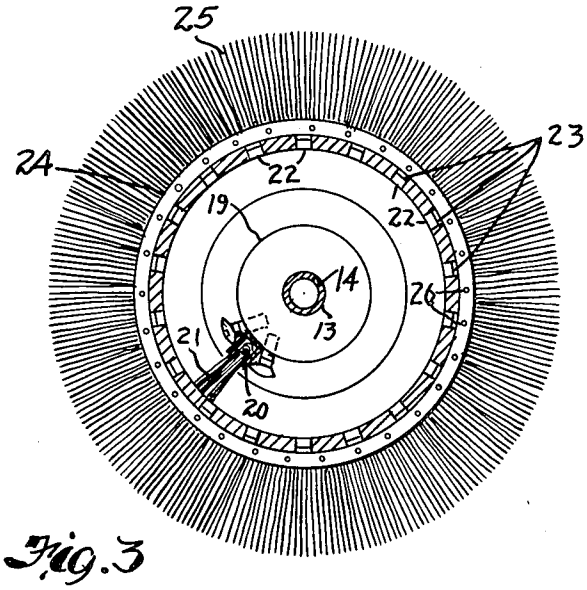


Fig. 3

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ROTARY BRUSH

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17 Claims. (Cl. 51—193)

This invention relates as indicated to a rotary brush, and more particularly to a rotary brush adapted to have abrasive-containing fluids delivered to the interior thereof for application to the surface being brushed.

Power driven rotary brushes are utilized for a great many purposes in industry, and increasing interest is being shown in the employment of the same in the surface conditioning of metal sheets, particularly steel sheets and strip for the purpose of obtaining such beneficiating effects as the removal of scale and other closely adherent coatings, cleaning and polishing the surface, and reducing the surface tension on such articles by brushing action. I have found that under some circumstances the brushing action may be advantageously supplemented by the application of auxiliary materials such as abrasive, peening pellets, cleaning and coating materials and coolants. It is an object of my invention to provide a novel rotary brush particularly adapted forcefully to impel abrasive and peening particles against the work surface in the region receiving brushing action by the brush.

It is another object of my invention to provide such rotary brush including means for controlling the direction of principal discharge of such abrasive, pellets, fluid, etc., therefrom.

A further object is to provide means for conducting abrasive and the like to the brush in a manner effectively to utilize the centrifugal action of the latter forcibly to discharge the material against the work.

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 fragmentary longitudinal section of a brush embodying my invention and showing the means for conducting fluid to the interior of such brush;

Fig. 2 is a similar longitudinal section of the other end of such brush and mounting means therefor; and

Fig. 3 is a transverse section through the brush taken on the line 3—3 on Fig. 2.

Referring now more particularly to said drawing, it will be seen that the embodiment of my invention there illustrated comprises a large tubular metal core or shell 1 mounted on hub members 2 and 3 secured to axial tubular extensions 4 and 5 respectively. Such extension 5 is journalled in spaced roller bearings or pillow blocks 6 and 7 carried by support 8 comprising part of a housing 9 which may desirably be of the type disclosed in my prior Patent 2,636,200. The other axial extension 4 is similarly journalled in a pillow block 10 and a double roller bearing assembly 11. A belt drive pulley 12 is keyed thereto to drive the brush.

Extending axially through the brush and the tubular hub extensions 4 and 5 is an inner tube 13 having a longitudinal slot 14 therein within shell 1 of the brush. The left-hand end of such tube 13 (as viewed in Fig. 2) is welded to an end cap 15 embracing a tubular extension 16 of bracket 17 on stationary housing 9. Cap 15 and thereby inner tube 13 may be secured in desired indexed position by means of screw 18. Accordingly, slot 14 in tube 13 may likewise be indexed for a purpose explained below.

Inner hubs or discs 19 may desirably be non-rotatably mounted on inner tube 13 within shell 1 with a length of brush strip 20 secured thereto and extending parallel to the axis of the brush. The brush material 21 of such brush strip will extend radially as shown in Figs. 1 and 3 to contact the inner periphery of shell 1 and brush the same as such shell rotates. Brush strip 20 may be thus secured on inner tube 13 in desired angular relationship to slot 14 to assist in controlling the further flow and distribution fluid entering the interior of the brush cavity from such slot.

Shell 1 is provided with rows of apertures 22 therethrough connected at the outer surface of such shell or cylinder 1 by longitudinally extending grooves 23. Brush strip 24 which may desirably be of the type disclosed in my prior Patent 2,303,386 is helically wound about the outer periphery of shell 1 with the brush material 25 extending radially therefrom. The brush strip will ordinarily preferably be formed with an elongated sheet metal back of U-shaped cross-section within which the brush material is retained by means of an elongated retaining element such as a wire. The sides of such brush strip back may be indented with radial grooves, or preferably a series of lateral protuberances 26 may be formed in the sides of the brush strip back slightly to space the adjacent turns on shell 1 to afford passages for the outward flow of fluid from the interior of such shell through apertures 22 and grooves 23. The helical turns may be retained on such shell by any well-known conventional means such as clamping nuts 27 and 28.

Communicating with the right-hand end of inner tube 13 (Fig. 1) is an extension 29 coupled thereto and leading to a fluid inlet port 30. A second fluid inlet port 31 leads to a co-axial outer passage 32 communicating with the space 33 between stationary tube 13 and outer tubular extension 4 which rotates with the brush drive means. The collar 34 is axially grooved to afford entrance of the fluid from annular passage 33 to the interior of the brush shell 1.

A bronze thrust bearing 35 engages bracket 17 of the housing, and a seal 36 is provided for the purpose of reducing leakage at this end.

The operation of my new rotary brush may now be understood. Inner tube 13 is preliminarily indexed to direct slot 14 in the desired direction to control the fluid discharge from the brush in conjunction with wiper brush strip 20. Fluid such as water or compressed air with entrained abrasive may be admitted through inlet 30 only for delivery to the work surface by the rapidly rotating brush, or in some cases it may be desirable to admit such fluid through inlet 31 only. Ordinarily, however, I will prefer to introduce a stream of air-borne abrasive through inlet 30 under relatively low pressure sufficient to maintain a steady controllable flow. The abrasive stream thus directed into a given quadrant of the brush cavity through slot 14 will make this quadrant richer in abrasive than the other three quadrants, an effect enhanced by the action of wiper strip 20 which, moreover, also assists in preventing clogging of any of the apertures 22 in brush shell 1.

Additional air may be simultaneously admitted through inlet 31 in considerably greater volume or under consider-

ably greater pressure for the purpose of assisting in expelling the abrasive from the interior of the brush to the work surface. This arrangement permits the obtaining of considerably greater control over the amount of abrasive thus expelled without diminution of the pressure required effectively to expel the same or the requirement of a special elaborate mixing chamber. In the brush of my invention, the interior of brush shell **1** serves as the principal mixing chamber. The orifice area of slot **14** should not exceed the cross sectional area of tube **13** and may desirably be about 75% of the same.

A variety of different abrasive materials may be thus entrained and expelled from the brush including emery powder, sand, carborundum, Aloxite, pumice, rouge, and steel mill scale. Small steel pellets may also be utilized for their peening action. The most commonly utilized fluids for thus entraining such abrasives will be compressed air and water, but other gases and liquids may be utilized in special applications, and mineral oil will sometimes constitute a desirable vehicle. Also, under some circumstances, such fluids may be utilized for their own action without the employment of any abrasive or other solid material therewith. Thus, when brushing extremely highly heated steel strip, for example, water may be forced through my new brush under relatively high pressure to prevent overheating of the brush bristle material while in contact with the work. Air may likewise be forced through the brush principally for its coolant effect.

Many different types of brush material may be employed, dependent upon the particular application for which the brush is designed, including tampico fiber, nylon coated glass fiber, and plastic coated wire, for example, but crimped wire bristle material will be most frequently used.

The precise manner of mounting the outer brush elements on the cylindrical shell may be varied, my prior Patent 2,409,309 showing an alternative method. Also, annular brush sections such as those of Whittle Patent 2,288,337 may be mounted on shell **1** but helically wound brush strip is ordinarily preferred as less likely to streak the work.

This application is a continuation-in-part of my co-pending application Serial No. 126,408 filed November 9, 1949, now Patent No. 2,680,938, which is in turn a continuation-in-part of my co-pending applications Serial No. 632,831 filed December 5, 1945, and Serial No. 668,391 filed May 9, 1946, which are in turn continuations-in-part of Serial No. 437,648 filed April 4, 1942, such applications having now become abandoned.

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 combination, a rotary brush provided with radial passages leading from the interior thereof for the discharge of flowable material by centrifugal action of said brush, a supply conduit entering the interior of said brush axially thereof and adapted to discharge such material in a definite radial direction, said conduit being rotatably adjustable about its axis to deliver such material to a selected portion of said brush, and a brush element mounted within said rotary brush and normally stationary relative thereto, said brush element engaging the inner periphery of said rotary brush and thereby serving both as a deflector to control outward flow of such material and as an anti-clogging means.

2. In combination, a rotary brush provided with radial passages leading from the interior thereof for the discharge of flowable material by centrifugal action of said brush, a normally stationary supply conduit entering the interior of said brush axially thereof and adapted to discharge material in a definite radial direction within said brush, said brush being journalled exteriorly of said conduit and said conduit being rotatably adjustable about its axis to deliver such material to a selected portion of said brush, and a deflector within said brush mounted for adjustment of position supplementally to control the flow of such material, said deflector comprising a brush element adapted to engage the inner periphery of said rotary brush to serve as an anti-clogging means.

3. In combination, a rotary brush having an inner cavity, means adapted to feed flowable material to the interior of said brush for discharge generally radially through the brush material thereof under influence of centrifugal force, and anti-clogging means comprising a relatively stationary brush element mounted within said rotary brush and engaging the periphery of such inner cavity in brushing contact.

4. In combination, a rotary brush provided with generally radial passages leading from the interior thereof for the discharge of flowable material therefrom by centrifugal action of said brush, and a supply conduit entering the interior of said brush axially thereof and having a single narrow slot longitudinally thereof extending substantially the entire axial width of said brush to discharge such material to the interior of said brush in a single radial direction, such slot having a total orifice area not exceeding the cross-sectional area of said conduit.

5. A rotary brush mounted in normally stationary bearings and comprising a generally tubular core having radial openings therethrough, brush elements mounted on said core having radially extending brush material and spaced apart to permit the radial passage of flowable material therebetween, end members closing the ends of said tubular core to form an inner chamber, a supply conduit entering such chamber axially thereof and having a single narrow slot longitudinally thereof extending substantially the entire axial width of said brush to discharge material such as water and entrained abrasive to the interior of said brush in a predetermined radial direction, said conduit being mounted for rotative adjustment independent of rotation of said brush, wiper means comprising an elongated brush element mounted on said conduit within such chamber and adapted to engage and brush the inner periphery of said tubular core as said brush rotates, seals between said conduit and said respective end members, and a passage for admitting compressed air behind one of said seals whereby such air may escape therepast into such chamber and act on said other seal to hold the same in tight sealing engagement.

6. A rotary brush mounted in normally stationary bearings and comprising a generally tubular core having radial openings therethrough, brush elements mounted on said core having radially extending brush material and spaced apart to permit the radial passage of flowable material therebetween, end members closing the ends of said tubular core to form an inner chamber, a supply conduit entering such chamber axially thereof and having a single narrow slot longitudinally thereof extending substantially the entire axial width of said brush to discharge material such as water and entrained abrasive to the interior of said brush in a predetermined radial direction, said conduit being mounted for rotative adjustment independent of rotation of said brush, wiper means comprising an elongated brush element mounted on said conduit within such chamber and adapted to engage and brush the inner periphery of said tubular core as said brush rotates, and a passage communicating with such chamber for also admitting air under pressure thereto to assist in ejecting such material radially therefrom.

7. A rotary brush mounted in normally stationary bearings and comprising a generally cylindrical core having radial passageways therein, brush elements mounted on said core and arranged to permit the radial flow of material outwardly from said core, end members closing the ends of said tubular core to form an inner chamber, a supply conduit entering said chamber adapted to deliver flowable material in a radial direction therein, wiper

means comprising a brush element mounted within such chamber and adapted to engage and brush the inner periphery of said tubular core as said brush rotates relative thereto, and a passage communicating with such chamber for also admitting air under pressure thereto.

8. A rotary brush mounted in normally stationary bearings and comprising a generally cylindrical core having radial passageways therein, brush strip helically wound about and secured on said core adapted to permit the radial flow of material outwardly from said core, the interior of said core being closed off to form an inner chamber, means adapted to deliver flowable material to such chamber, and wiper means comprising a brush element mounted within such chamber and adapted to engage and brush the inner periphery of said tubular core as said brush rotates relative thereto.

9. A rotary brush mounted in normally stationary bearings and comprising a generally cylindrical core having radial passageways therein, annular brush elements secured on said core adapted to permit the radial flow of material outwardly from said core, the interior of said core being closed off to form an inner chamber, means adapted to deliever flowable material to such chamber, and wiper means comprising a brush element mounted within such chamber and adapted to engage and brush the inner periphery of said tubular core as said brush rotates relative thereto.

10. In combination, a rotary brush provided with radial passages leading from the interior thereof for the discharge of flowable material by centrifugal action of said brush, a supply conduit positioned axially within said brush and having a single narrow slot longitudinally thereof extending substantially the entire axial width of said brush to discharge such material to the interior of said brush in a single radial direction, said conduit being rotatably adjustable about its axis to deliver such material to a selected region circumferentially of said brush, and a second separate inlet to the interior of said brush for introduction of fluid under pressure.

11. In combination, a rotary brush provided with radial passages leading from the interior thereof for the discharge of flowable material by centrifugal action of said brush, a supply conduit positioned axially within said brush and having a single narrow slot longitudinally thereof extending substantially the entire axial width of said brush to discharge such material to the interior of said brush in a single radial direction, said conduit being rotatably adjustable about its axis to deliver such material to a selected region circumferentially of said brush, and a second separate inlet co-axial with said conduit for introduction of fluid under pressure to the interior of said brush.

12. A rotary brush having a cylindrical shell with numerous apertures therethrough, grooves in the exterior surface of said shell extending generally parallel to the shell axis and interconnecting rows of such apertures, brush strip helically wound on said shell, means affording clearance between adjacent turns of said strip to permit fluid flow from the interior of said shell through such apertures and grooves and between the turns of said brush strip to the brush face, means closing the ends of said shell to provide a fluid containing cavity, and means for introducing fluid axially of said shell.

13. A rotary brush having a cylindrical shell with numerous apertures therethrough, grooves in the exterior suface of said shell extending generally parallel to the shell axis and interconnecting rows of such apertures, brush strip helically wound on said shell, means affording clearance between adjacent turns of said strip to permit fluid flow from the interior of said shell through such apertures and grooves and between the turns of said brush strip to the brush face, means closing the ends of said shell to provide a fluid containing cavity, and two co-axial conduit means for introducing fluids into such shell cavity.

14. A rotary brush having an inner cavity and generally radially extending brush material, said brush having apertures leading from such cavity to permit flow of fluid therefrom to such brush material, and two separate co-axial fluid inlets leading to such inner cavity, said inlets also being co-axial with the axis of rotation of said brush and extending one within the other.

15. In a method of brushing comprising delivering flowable non-gaseous material to the interior of a hollow power driven rotary brush adapted to discharge such material therefrom, regulating the direction in which such material is thus delivered to the brush selectively to control the general direction of discharge of the same from the brush, discharging such material from the brush against the work, and brushing the work; the step of pressurizing the entire interior of such brush with a separately introduced gas to facilitate rapid movement outwardly through the brush of such material.

16. In a rotary fluid throwing and brushing tool including a hollow core portion and at least one brush part removably mounted thereon, said brush part comprising narrow brush strip having passageways between portions thereof, said hollow core portion having passageways through the walls thereof communicating with passageways between brush part portions mounted thereon, an elongated conduit adapted to deliver a fluid within the interior of said core portion and having an orifice in the wall thereof, said orifice having less area than the smallest cross-sectional area of said conduit, and means for adjustably positioning said orifice directionally to discharge a fluid to a selected portion of the interior surface of said hollow core.

17. The tool of claim 16, wherein a second conduit leads to the interior of said core portion.

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