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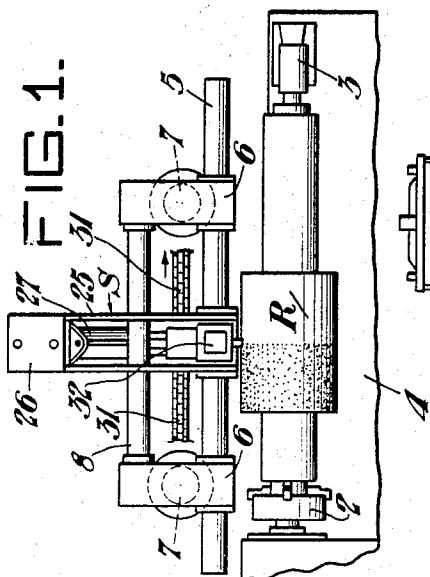
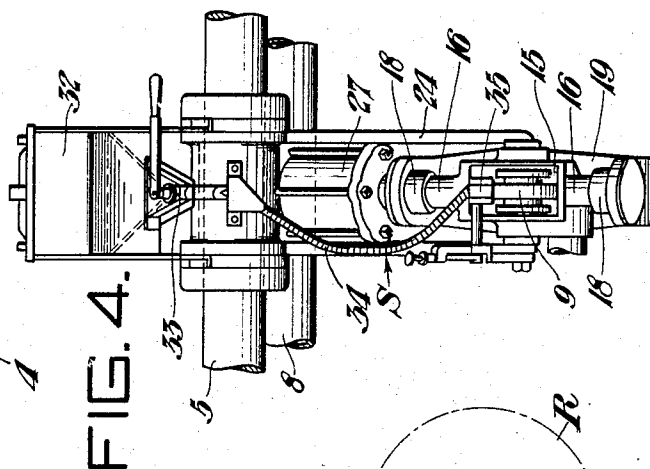
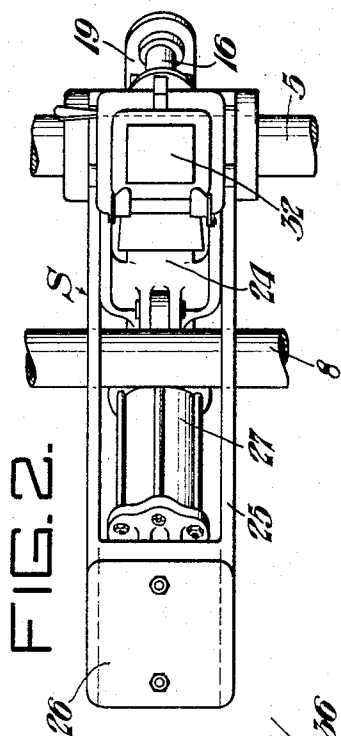
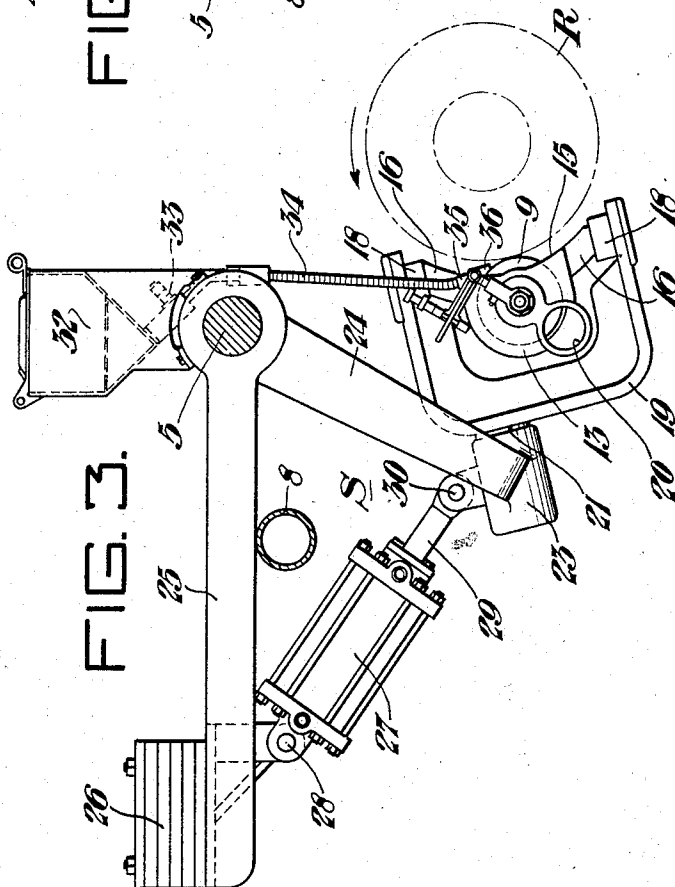
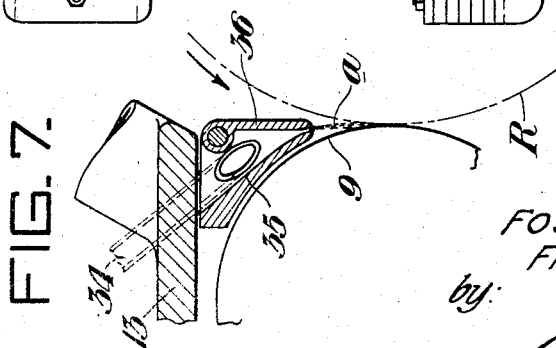
F. F. HILLIX ET AL

2,337,016

METHOD OF STIPPLING METAL ROLLS AND THE LIKE

Filed Aug. 14, 1941

2 Sheets-Sheet 1



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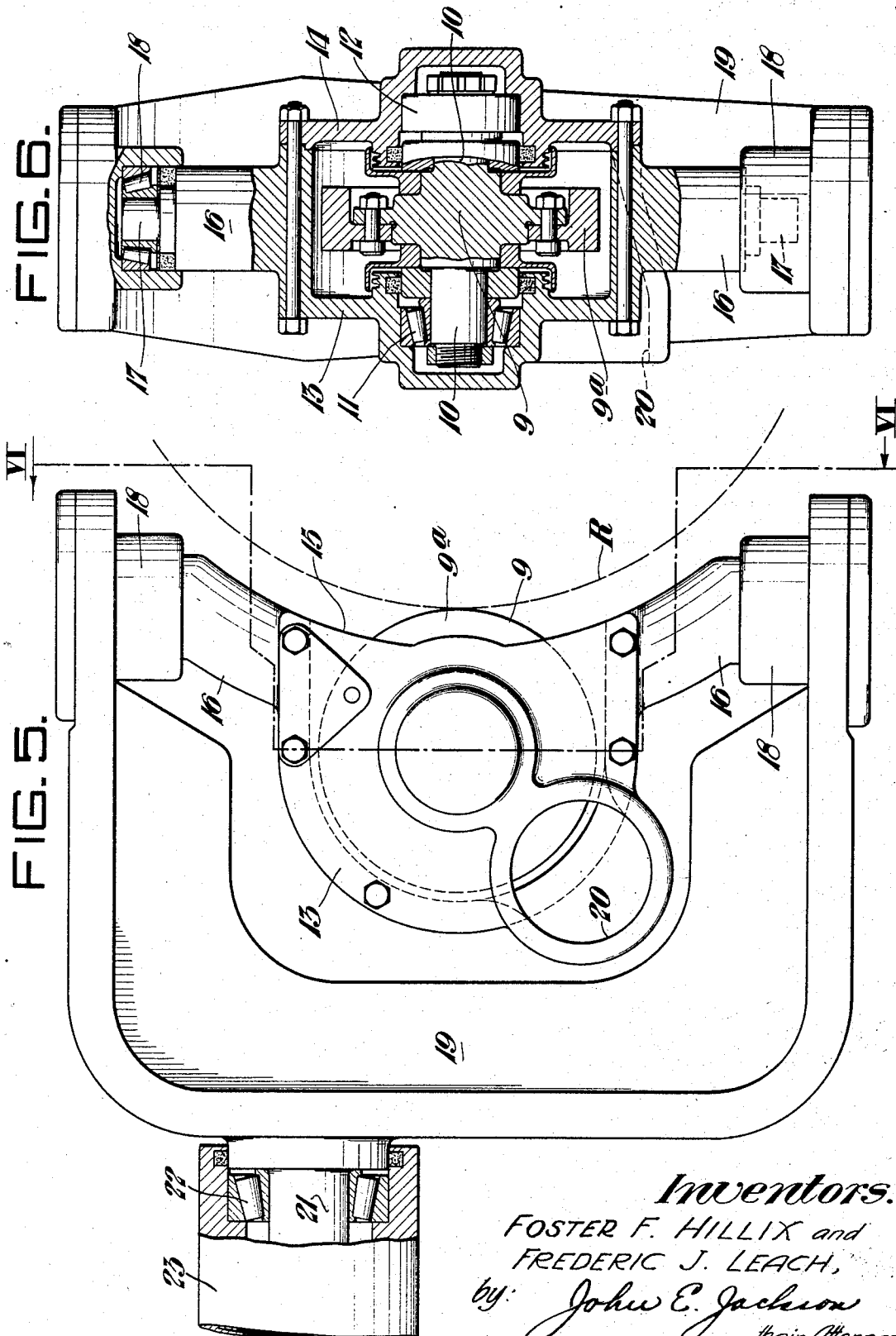
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METHOD OF STIPPLING METAL ROLLS AND THE LIKE

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,337,016

METHOD OF STIPLING METAL ROLLS
AND THE LIKE

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1 Claim. (Cl. 76—107)

Our invention relates to improvements in the method of stipple finishing cold rolling rolls of the character employed for producing stippled strip or sheet suitable for bonderizing, enameling or varnishing.

It is a prime object of our invention to provide an efficient and uniform method for stipple finishing cold rolling rolls, to produce throughout the surfaces thereof, minute sharply defined indentations and crests affording a proper "tooth" to impart the uniform pattern thereof to the metal rolled by said rolls.

We have in view to provide for maximum localization of the surface treatment in order to minimize retreatment or overlapping of the roughening of the roll surface, thereby contributing to the production and control of the desired formation of sharp indentations and crests in the resulting stippling, and also to provide for minimizing the amount of metal stock worked on and removed from the roll surface.

The invention further contemplates the use of a granular cutting medium or abrasive impressed or forced into the roll surface by a constant static direct force or pressure, enabling the employment of considerable power, limited only by the crushing strength of the granular abrasive.

Other objects are to provide an improved method readily adaptable to the use of different sized granular abrasive or cutting medium to vary the character of the resulting stippling; to provide for uniform treatment of the roll surface by following the contour thereof; to provide for the accurate and sensitive control of the applied stippling treatment; and to provide a method capable of economical and efficient operation for the stated purposes.

Additional objects and advantages will become apparent from the following description taken in connection with the accompanying drawings, wherein:

Fig. 1 is a diagrammatic plan view illustrating the method of our invention;

Fig. 2 is an enlarged plan view of the abrasive applying means of Fig. 1;

Fig. 3 is a side elevation of Fig. 2;

Fig. 4 is an end elevation of Fig. 3;

Fig. 5 is an enlarged view of a portion of Fig. 3, particularly showing the mounting of the abrasive pressure roller;

Fig. 6 is a cross section taken on the line VI—VI of Fig. 5; and

Fig. 7 is a detail view showing the abrasive feeding device.

Referring to the drawings, the roll R to be

treated in the manner of the present invention is initially finished by grinding to a high degree of smoothness with the desired crown and contour. The said roll is then placed in a lathe-like device, such as for example, the roll grinder diagrammatically illustrated in Fig. 1 including a power driven chuck or head 2 and a tail stock 3 mounted upon a suitable bed or base 4.

At one side of the grinder or lathe, we provide a movable support or traverse guide parallel with the roll axis, in the form of a shaft 5 slidably mounted in bearings 6 on suitable vertical pedestals or posts indicated at 7, said shaft preferably being located at an elevation well above the roll axis. A horizontal brace 8 preferably connects the housings of bearings 6 and is spaced from the shaft 5, thus providing a rigid assembly for mounting and supporting the stippling unit S of our invention for movement thereof in a direction axially of the roll R being treated.

The stippling unit S is designed and operable to apply a hard abrasive to the roll surface in accordance with the method of our invention, whereby the roll surface is uniformly stippled throughout in an efficient and economical manner. Our method provides for the application of the abrasive by localized static pressure in such a manner as to form sharp well defined surface indentations and intervening crests in the roll surface without elongation or scratching.

To this end, we provide an abrasive pressure member, such as a hardened steel roller 9 adapted to engage the roll surface and apply a static uniform pressure to a granular abrasive fed into the bite between roll and roller. In order that the peripheral travel of the roller and roll will be equal, we prefer to apply power to one of said members only and drive the other therefrom in the manner of an idler, sufficient pressure being supplied therebetween as to maintain said members in rolling contact without slipping.

Since the roll R may be readily driven by means of the apparatus on which it is mounted, as illustrated in Fig. 1, we have found it expedient to employ the abrasive pressure roller 9 as the idler member deriving its motion from the roll, and also have provided for the application of the desired static pressure to said roller 9.

Referring to Figs. 5 and 6, the roller 9 is provided with horizontal trunnions 10 rotatably mounted in bearings 11 and 12 respectively disposed in an enclosing housing 13 and a cover plate 14 therefor. Housing 13 is cut away and open at one side 15 thereof to expose a portion of the periphery of the roller 9, and is provided

with oppositely disposed pivot arms 16 in the plane of the roller. Arms 16 terminate in aligned trunnions 17 rotatable in bearings 18 in the spaced portions of a bifurcated yoke 19, the common axis of the trunnions 17 and their bearings being at right angles to that of the roller 9 and tangent to the periphery thereof.

For the purpose of renewing the roller 9, the same may be constructed as shown in Fig. 6, including a replaceable rim 9a of hardened material bolted to the roller proper. For example, the said rim may be made of tungsten carbide. In order to effect such replacement, the cover 14 may be removed from housing 13 and the roller bodily removed from said housing, without disturbing other portions of the apparatus. The interior of housing 13 may be connected with a suction hose or the like, as by a provided opening 20 at one side thereof, in order to remove dust and abrasive and prevent injury to the bearings 11 and 12.

A trunnion 21 is provided on the base member of the yoke 19 at an elevation slightly above the axis of the roller 9 and at right angles to the axis of the trunnions 17, said trunnion 21 being pivotally mounted by a bearing 22 in a hub 23 of a bifurcated arm or fork 24 rotatably depending from and supported by the shaft 5, as shown in Figs. 2, 3 and 4. Thus, by means of the fork 24, the roller 9 may be swung about the shaft 5 into engagement with the roll R, the trunnions 17 and 21 providing a universal mounting for the roller to enable the same to follow the contour of the surface of the roll R.

In order to advance the roller 9 into contact with the roll R and exert a suitable constant pressure on the latter by said roller, we provide a weight arm 25 pivotally mounted on the shaft 5 and having adjustable weights 26 on the free end thereof, said arm normally extending horizontally over and resting on a suitable support, as for example, the brace 8 extending between the pedestals 7.

Disposed diagonally between and connecting the arm 25 and fork 24, we provide a hydraulic piston and cylinder, the cylinder 27 being pivotally connected to the under side of arm 25 as at 28, and the piston being pivotally connected by its extending rod 29 with the hub 23 of the yoke 19, as at 30. With the arm 25 at rest upon the brace 8, the hydraulic piston and cylinder are contracted to withdraw the roller 9 and its yoke away from the roll R, as when mounting or removing said roll from the apparatus.

To apply the roller 9 to the surface of roll R, the hydraulic cylinder 27 and its piston are extended, thereby first engaging roller and roll, and then elevating the arm 25 above the support 8. With the arm 25 in the latter position, the weights 26 thereof will exert a constant static force upon the roller 9 in proportion to said weights, the hydraulic cylinder and piston forming and maintaining a connecting link between the weight arm, fork 24 and its yoke 19.

With the roller 9 so engaged with the roll R under a constant applied static pressure, a dry granular abrasive is applied to the bite between the roll and roller, as indicated at a in Fig. 7. Various types and sizes of abrasive may be employed, it being desired to use a hard material capable of withstanding considerable pressure. We have found fused alumina to be such a material, and since it is relatively inexpensive, it may be employed efficiently and economically.

By reason of the fact that the roller 9 or its

replaceable rim 9a is materially harder than the metal of the roll R, the applied force is transmitted through the abrasive to the roll surface, resulting in the abrasive cutting and forming indentations and producing intervening crests in the metal of the roll surface, thereby producing the desired stippled finish on the roll. The cold working of the metal of the roll is slight and produces an excellent "tooth" or roughness of the surface with the desired uniformity. The line contact between roll and roller effects a desirable localization of the applied pressure so as to uniformly force the abrasive particles into the roll surface as the same pass between the roll and roller, such localization serving to prevent overlapping as the treatment progresses over the roll surface.

We have found that the said stippling treatment may be accurately controlled and regulated for the desired results by applying a pressure to the roller 9 limited only by the crushing strength of the abrasive, and that the pressure range thus made available is entirely sufficient to effect an adequate cutting deformation of the roll surface. Further, by varying the size of the abrasive, the character and degree of the resulting stippling may be varied as desired, and the abrasive pressure roller of our invention may be readily employed for a large range of such sizes.

It will be seen that by applying the abrasive in a thin flat stream across the face of the roller 9, the cutting zone is limited to the width of the roller face, and by imparting the necessary traverse to the roller mounting, the entire surface of the roll may be treated. For example, chains 31 may be provided, driven by suitable means, and connected to the assembled fork 24 and weight arm 25 at the shaft 5, to traverse the roller mounting on said shaft across the surface of the roll R, as indicated by the arrow in Fig. 1.

Suitable means may be provided for feeding the abrasive to the bite between the roll and roller. For example, a hopper 32 may be mounted upon the stippling unit S, as upon the arm 25, said hopper having a feed valve 33 controlling the flow therefrom to a flexible conduit 34. Conduit 34 connects a feed nozzle 35 mounted on the housing 13 immediately above the bite of the roll and roller, said nozzle including an adjustable control gate 36, the nozzle and gate coacting to deliver a uniformly thin flat stream or layer of abrasive transversely between said roll and roller.

From the foregoing description, it will be apparent that the abrasive is applied to the roll surface and forced thereinto by the applied radial normal pressure of the roller 9, the static uniform pressure of said roller serving to effect a non-slipping travel of the roller over the roll surface, thereby producing a sharp stippling action without scratches or elongated indentations.

Various changes and modifications are contemplated within the scope of the following claim.

We claim:

The herein described method of stippling metal rolls and the like, consisting in progressively rolling the surface thereof with a narrow faced roller while maintaining a constant contact pressure therebetween, the roller having free pivotal movement to thereby equalize the pressure throughout the line contact of the roll and roller surfaces by the resultant pressure therebetween, and applying a thin layer of granular abrasive into the bite between said roll and roller.

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