April 12, 1932. J. A. L. MÖLLER 1,853,569

EQUALIZER ROD

Filed April 6, 1929

Fig. 1.

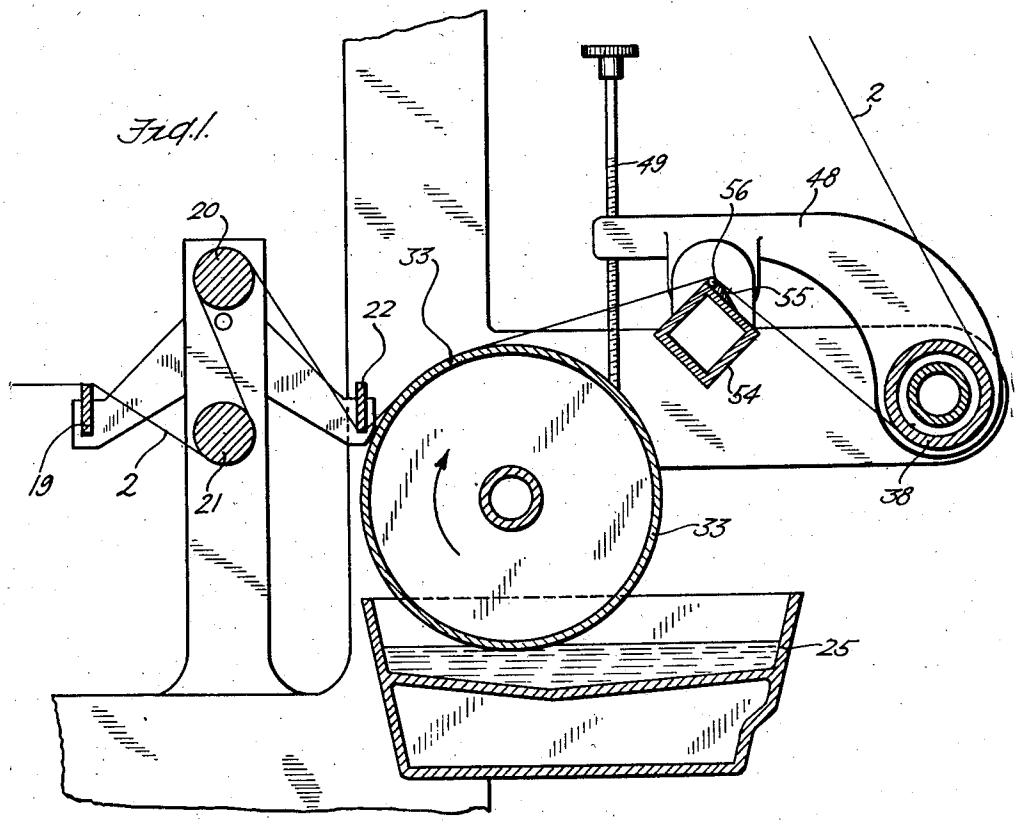


Fig. 2

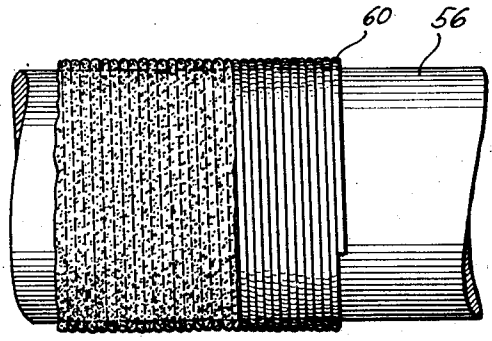
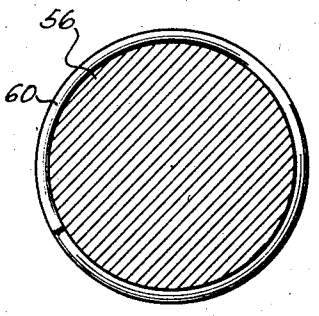


Fig. 3.



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Patented Apr. 12, 1932

1,853,569

UNITED STATES PATENT OFFICE

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EQUALIZER ROD

Application filed April 6, 1929. Serial No. 353,225.

This invention relates to machines for applying a coating of material to paper or other sheets of material and is particularly adapted for use in manufacturing carbon paper, waxed paper and similar products.

Machines have been developed for this purpose which apply the coating material to paper by passing the paper under tension over a roller which applies the coating material to one side of the paper after which the coated face of the paper is passed over a rod or bar, termed an equalizer rod, for spreading the material over the surface of the paper and removing excess material therefrom. One type of machine employed for this purpose is illustrated and described in the patent to Mayer, No. 1,043,021, dated October 29, 1912.

The equalizer rod shown and described in that patent is in the form of a long rod having convolutions on its face. These convolutions are formed by applying closely wound wire of small diameter thereto or by cutting very fine threads in the surface of the rod. The paper being coated passes over the equalizer rod so that the active or bearing portion of the wire or threads are soon worn down. This causes the equalizer rod to scrape off more of the "dope" or coating material with the result that the layer of coating material applied to the paper becomes thinner as the wire or threads are worn down to a greater degree. As a result of this wearing away of the convolutions or the equalizer rod the coating becomes relatively thinner and consequently the product obtained from the machine is not uniform.

The principal object of the present invention is to produce a product coated more uniformly than heretofore has been thought possible.

A further object of the invention is to improve the construction of equalizer rods employed for the purpose described and to increase the life and service obtained therefrom.

These and other important objects and features of the invention will more fully appear from the following description of the preferred form of the invention illustrated in the drawings.

In the drawings—

Figure 1 is a diagrammatic view of a portion of a machine embodying the present invention;

Figure 2 illustrates a portion of the equalizer rod employed in the construction shown in Figure 1; and

Figure 3 is a sectional view of the form of equalizer rod illustrated in Figure 2.

The form of the invention illustrated in the drawings is applied to a machine such as is shown in said patent to Mayer, No. 1,043,021, and for convenience of reference the same characters are used herein as are used in the patent.

The material 2 to which the coating is to be applied is passed over smoothing and tensioning members 19, 20, 21 and 22. The members 19 and 22 are provided with square edges which smooth out any wrinkles which may be in the paper before it passes over the coating roller 33. The coating roller is partially immersed in the coating material contained in the vessel 25. The coating material is carried on the surface of the roller 33 as it rotates in the direction of the arrow and is thus applied to the under surface of the paper. The coating material applied to the paper adheres thereto and is smoothed out by the equalizer rod 56 over which the paper passes immediately after the coating material has been applied thereto. The coated paper then passes under the roller 38 and on through other parts of the machine, not shown, to be dried or otherwise treated and finished.

The equalizer rod is held in position by the bar 55 which forms a right angle groove or notch with the rear face of the square tube 54.

If desired, the rod may be moved with reference to the paper and box during operation as suggested in the patent to Mayer referred to above.

The equalizer rod ordinarily used is about three-sixteenths inch in diameter and is provided with an engaging or active surface having convolutions formed by a very fine thread or by tightly wound wire of very small diameter. The diameter of the wire or the size of the threads determines the thickness of the layer of coating material remaining on the paper as it passes from the equalizer rod. In making one type of carbon paper the diameter of the wire is about four thousandths of an inch, but if the diameter of the wire is smaller the thickness of the layer of coating material will be less; and if larger, the thickness of the coating will be greater.

It is of the utmost importance that the bearing surface of the equalizer rod should not be worn down since any variation in depth of the spaces between turns of the wire or thread will result in variations in the thickness of the layer of coating. When such wearing down of the convolutions occurs the thickness of the coating is decreased. In practice it is found that the portions of the material coated in the early stages is thicker than that which is applied when the rod is worn down.

Ordinarily, the wire used to form the convolutions is made of iron or steel and is soon worn down not only by the passage of the paper over the wire but also by reason of friction between the rod and the trough formed by the square box 54 and the bar 55, in which the rod is supported. The small spaces between the convolutions of wire then become comparatively shallow so that the layer of coating becomes thinner as the operation continues.

In practice this variation is so pronounced that the equalizer rod has to be removed after running about 200 to 250 reams of paper. The worn rod may be used for producing coated products having a thinner layer of coating material but a new rod must be substituted in order to continue to produce paper coated to the same thickness as that already run.

In the present invention this difficulty is overcome and a product produced having a layer of substantially uniform thickness throughout the length of the material.

This is accomplished by providing the equalizer rod with a coating of hard wear-resisting material. This is preferably effected by depositing a coating of chromium upon the wire or over the threads of the rod, by electro-plating. The chromium plating is particularly effective when applied to a completed wire-wound rod, that is, after the wire has been applied thereto and while held tightly in place. Figure 2 of the drawings illustrates an enlarged portion of such a rod showing the rod 56 to which the wire 60 is applied, the wire being provided with a coating 62 of chromium.

The plated chromium surface is the only portion of the rod which is engaged by the paper. The hard bearing surface thus provided prevents wearing away of the fine wire or threads so that the product produced by the use of the present invention is of uniform quality over long periods of operation. It has been found possible with the present invention to produce sheets of carbon paper for periods of weeks or even months without changing or rewinding the equalizer rod and the resulting product is more evenly and uinformly coated than has heretofore been possible with equalizer rods which were uncoated or unprotected against wear.

Plating of the equalizer bar insures an even wearing surface and the interstices between adjacent turns of the wire are partially filled with the plating material so as to provide a bond between the same, thus increasing the strength and wearing characteristics of the rod. Furthermore, the plating seems to be deposited most heavily on the outermost part of the wires or threads, with the result that the coating material is spread by the rod thicker and more evenly than by a similar unplated rod when a wire winding is used, the spaces between the turns of the wire or at the base of the threads are rounded out by the plating material.

The invention is not limited to its use in connection with machines such as that described above but may be used with other coating machines or mechanism for applying an even coating of material to webs or sheets of material. Therefore it is not intended to limit the invention to the particular combination of parts shown and described except as defined by the claims.

I have used in the accompanying claims the word "helical" to describe a thread running around the surface of the rod always at an oblique angle to a plane normal to the axis of the rod. It is to be understood that the use of the word "helical" is in no sense intended to limit the shape of the rod to that of a geometrical cylinder, and it also is to be understood that the threads may with somewhat less advantage lie in planes normal to the axis of the rod.

What is claimed as new is:

1. An equalizer rod for use in coating machines, which is provided about its circumference with fine convolutions; formed of fine wire closely and tightly wound, characterized by the fact that the rod has a coating of chromium over said wire winding which is continuous in a direction longitudinal of the rod.

2. An equalizer rod for use in coating machines which comprises a rod wound with a

nne wire, the convolutions of which are substantially touching one another and having a coating of an abrasion-resisting metal continuous longitudinally of the rod.

3. A method of making an equalizer rod for use in coating machines which comprises winding a fine wire over the surface of a rod and thereafter coating the rod, thus formed with a material resistant to corrosion and abrasion.

Signed at New York, New York, this 29th day of March, 1929.

JACOB A. L. MÖLLER.