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METHOD OF MAKING WIPING BLADES

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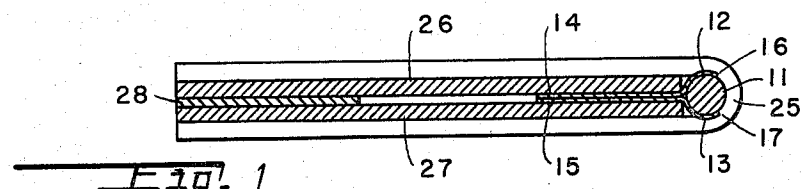


Fig. 1

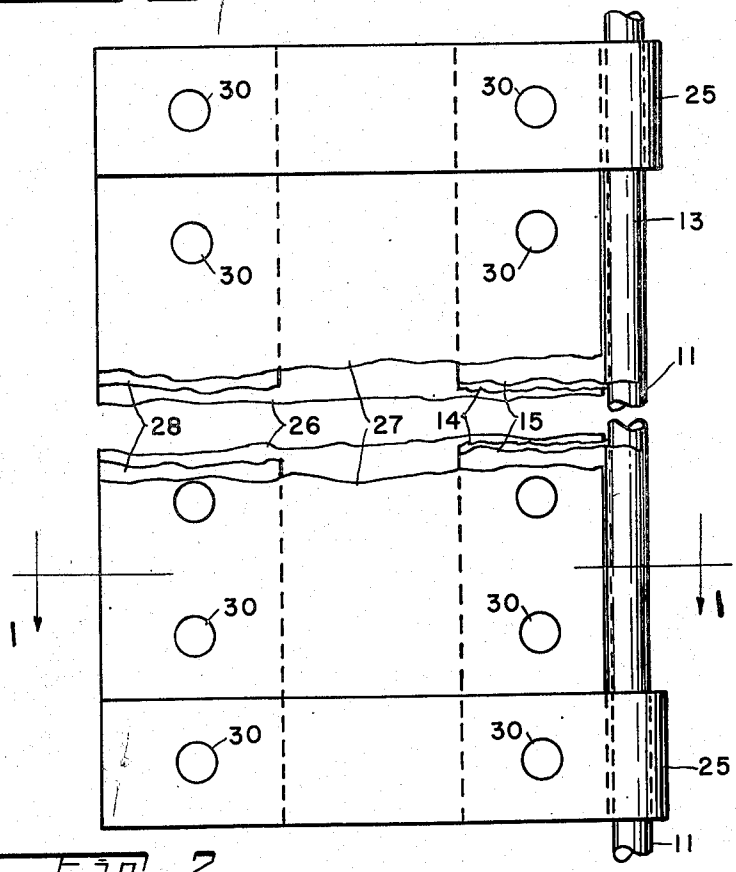


Fig. 2

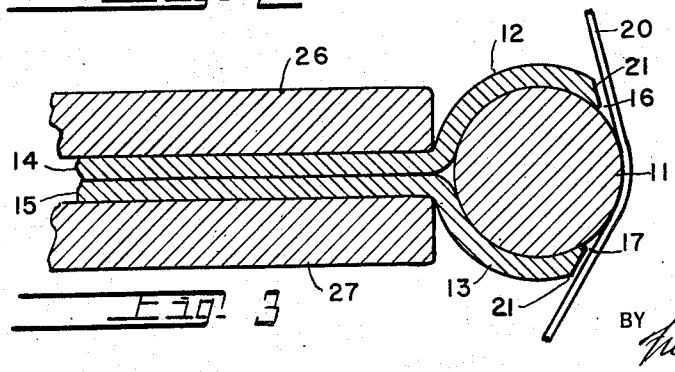


Fig. 3

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METHOD OF MAKING WIPING BLADES

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3 Claims. (Cl. 29—148)

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The present invention relates to wiping blades such as are sometimes used in coating machines, and has particular reference to blades of the type in which the wiping edge is formed of a rotating rod.

The object of the invention is to provide an improved structure for blades of this type, a structure which will make it possible to hold the rotating rod accurately and firmly in position at all points throughout its working length, regardless of whether or not the material on which said blade operates is in contact therewith; a structure in which the rods can be positively held straight or bowed as desired, in which the rod can be constrained to rotate without wobble or eccentricity in a position which may be fixed at all points throughout its working length; in which, in spite of this constraint, the rod can be freely rotated without sticking and without chatter; in which rods down to one-eighth inch or even less in diameter can be held as described; and a structure which can be easily and cheaply manufactured so that, if desired, the entire blade structure can be thrown away and economically replaced when the rod becomes worn or damaged in use. Another object is to provide a structure of the type described which can be easily, quickly, accurately, and cheaply produced and assembled from parts of ready availability. A further object is to provide a simple, quick, and accurate method of making a blade structure of the aforesaid type. Other objects and advantages of the invention will be apparent from the following description.

The structure in which I have found it possible to attain these objects and secure these advantages comprises a rotating rod and a bearing therefor which is continuous throughout the working length of the rod. This bearing is formed of two strips of metal which are in contact with each other throughout a substantial part of their width, but are spaced apart near one edge and shaped to hold the rod between them and form a bearing therefor in a manner to hold the rod definitely in a fixed position. The terminal edges of these strips lie parallel to the axis of the rod and are separated by a distance sufficient to expose as much of the surface of the rod as is required to perform the wiping, doctoring, or other operation for which the rod is to be used, but materially less than half of the surface of the rod, so that the rod cannot escape laterally from the bearing without a substantial flexure of the strips. A fixed cap is provided at each end of the bearing to positively prevent the starting of any such lateral removal

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which might otherwise take place progressively along its length by a mere local bending of the strips. The terminal edges of these strips are also in close contact with the surface of the rod. In order to make this condition more durable, the original shaping of the strips is advantageously such as to necessitate a slight bending back of these terminal edges to make room for the rod, so that these edges are then held against the surface of the rod by a live springing action in the metal of the strips. These edges thus continuously wipe the rod as it rotates and, if the rod is smooth, prevent the entrance of any coating material or other foreign matter into the bearing. The body of the blade structure is formed of two metal bars between which the flat portions of the two strips are rigidly held by riveting, spot welding, or equivalent. These two bars are preferably disposed in parallel relationship, so that the outer surfaces of the blade structure are parallel and the blade can be more readily and firmly held in the desired position. The bars are of approximately the same length as the strips which form the bearing for the rod, and should be somewhat longer than the maximum intended working length of the rod. The rod itself normally extends somewhat beyond one or both ends of the other parts of the structure so that suitable driving and longitudinal locating devices may be applied. Since such devices are well known and form no part of the present invention, they will not be further described.

The method of the invention involves first welding together the two metal bars and the spacer between them, at one edge thereof; drawing two metal strips, each about half the thickness of said spacer, through a die to shape the metal near one edge of each to form a half bearing for the cylindrical rod; placing said two strips face together with the unshaped portions in contact with each other and the shaped portions in contact with the opposite sides of the cylindrical rod; holding these three parts firmly in that position and inserting the unshaped portions of the two strips between the unwelded edges of said metal bars, up to the shaped portions of the strips; holding the parts firmly in that position and spot welding the strips and bars together at intervals throughout their length.

The construction will be better understood by reference to the accompanying drawing in which: Fig. 1 is a cross sectional view of the structure taken on line 1—1 of Fig. 2. Fig. 2 is a side view of the structure with part broken away. Fig. 3 is

a fragmentary sectional view, to a larger scale, of a portion of Fig. 1, with slight modifications.

Referring to the drawing, a round rod 11 constitutes the working edge of the blade. This rod may be smooth, wire wound, or threaded, as desired, and the terms "rod," "round rod," and "cylindrical rod" as used herein are to be understood to refer to rods of circular cross section whether smooth surfaced or not, as the herein described construction is equally applicable to all, the qualification "round" or "cylindrical" being used to distinguish from rods of polygonal cross section. In use this rod is rotated either intermittently to any desired degree at any desired intervals, or continuously at any desired speed, usually slow, by means which form no part of the present invention and will not be further described.

The rod 11 is held in position by suitably shaped portions 12 and 13 of metal strips 14 and 15 respectively. These portions of the strips are shaped to form a bearing in which the rod 11 can be rotated. Care should be taken that the terminal edges 16 and 17 of the strips 14 and 15 are in close contact with the surface of the rod 11. This contact is, in general, more easily assured and maintained if the initial shaping of portions 12 and 13 has been such that the terminal edges 16 and 17 have to be sprung slightly outward to admit the rod 11. The edges 16 and 17 are then held in contact with the surface of rod 11 by a live springing action in the metal of the strips, and barring abuse, will maintain the desired close contact throughout the life of the structure.

The terminal edges 16 and 17 should be so spaced as to expose an area of the surface of rod 11 sufficient to perform the wiping, doctoring, or other action for which the blade is to be used. The width of area required to be exposed depends on the diameter of rod 11, and on the form and type of surface against which it is to operate. If it is to operate against a relatively rigid cylindrical surface of moderate or small radius, a minimum of space will be required between edges 16 and 17. If the diameter of the cylindrical surface is larger or the material is soft and is indented by the blade, the space must be wider. If the doctor is operating on a flexible web 20, as of paper or fabric, which wraps the rod as indicated in Fig. 3, the edges 16 and 17 must have sufficient angular spacing to clear the surface of the web. It is frequently of advantage, for this purpose, to bevel the corners of the edges 16 and 17 as indicated at 21. The portion of the surface of rod 11 exposed between edges 16 and 17 should, however, always be materially less than half of the rod surface, so that the distance between edges 16 and 17 is materially less than the diameter of the rod, in order to hold the rod positively in place without depending on pressure of the web 20 or other work to hold it in place against its support.

The metal strips used are, in many cases, sufficiently flexible to permit the rod 11 to be removed laterally, between edges 16 and 17, by springing of the metal of the strips. If this removal is started at one end and is carried progressively along the length of the rod, it requires only local flexure of the formed strips 12 and 13. In order to prevent this possibility, I prefer to provide at each end of the structure, means for positively holding the rod 11 against lateral removal. These means may be of any form desired but I find the type shown in Figs. 1 and 2 to be convenient. As illustrated, each consists of a

U-shaped band 25 which holds rod 11 against any tendency to lift out of the bearing provided by formed strip portions 12 and 13. The bands 25 as shown extend across the full width of the blade structure, but if desired may be much shorter, as they need only be long enough to be firmly attached to the structure, as hereinafter more particularly described. It is to be noted that these are placed only at the ends, safely beyond the extremities of the working length of the rod. When the ends of rod 11 are thus held in place, any tendency which may remain for the intermediate portion of the rod to escape is readily resisted by the stiffness of the formed strips 12 and 13.

The blade structure is held together and given its stiffness by metal bars 26 and 27. These hold the flat portions of strips 14 and 15, which are in contact with each other, in place between them. In case these flat portions 14 and 15 are, as illustrated in the drawing, of less width than the bars 26 and 27, it is desirable to have these bars separated at their other edges by a spacer 28 or a multiplicity of spacers, or one or more projections formed on one or both of the bars 26 and 27, in order that the outer surfaces of bars 26 and 27 may be parallel to facilitate the holding of the blade in position for use. The strips, bars, and spacers, if used, are held rigidly together by any suitable fastening means such as rivets or spot welds 30, to form a unitary blade structure which firmly supports and accurately holds the rod 11 in place throughout its length, but permits it to be freely rotated as required in use.

The metal strips which hold rod 11 may be given the form shown in Figs. 1 and 3 by any suitable means, and can be conveniently formed by drawing flat strips through suitable dies. The shaped portions may be the same length in each, as shown in Fig. 1, or one may be shorter than the other, as shown in Fig. 3, in cases where the angles of approach to and departure from the blade by the surface on which the blade operates, are not equal. The straight portions of the strips 14 and 15 may be as wide as the bars 26 and 27, in which case no spacer 28 or equivalent is necessary, or they may be only wide enough for the necessary rivets or spot welds. They should be thick enough and stiff enough to hold the rod 11 accurately centered against all forces which may be expected in normal operation. I have found metal of "half-hard" temper, so-called, to be suitable in many cases. Though the flat portions of these strips are preferably in contact with each other, they may if desired for any reason, be separated by a spacer, if it is not too thick with reference to the diameter of rod 11. I have ordinarily found it more convenient to use two separate strips 14 and 15 though they may, if desired, be made of a single double width strip formed and doubled on itself in the middle, though this method requires somewhat more careful workmanship than that already described.

The bars 26 and 27 may be of any width and thickness required to give the structure the required rigidity, when the required length of the blade is taken into consideration. If it is desired that the rod be bowed in use, the bars 26 and 27 may be given the slight curvature required, or they may be straight and then sprung in clamping and held under strain with the desired amount of bow.

The structure is adapted to use with rods of from ⅛ inch, or even less, in diameter up to any size which requires lateral support intermediate its ends in order to hold the required form over the required length, specifically in those cases when an enlarged diameter, or crown, in the center of the span is inadequate for this purpose.

The entire structure may be made of any metals suitable for the purpose intended. For many purposes I have found chromium plated steel suitable for rod 11. The shaped bearing strips 12 and 13 may be made of steel, but if the blade is to be used under corrosive conditions a corrosion-resistant metal such as, for example, stainless steel, is generally desirable. Metal for the other parts should be similarly chosen with regard to the requirements which it will have to meet in use. The present invention, however, is not dependent on any specific material.

The construction shown is not only successful, satisfactory, and durable in operation, it is also well adapted to ease and rapidity of construction. The strips 14, 15, the bars 26, 27, and spacer 28 are all standard pieces of metal which are available on the market rolled or drawn to the necessary dimensions. The strips 14 and 15 are then drawn through a suitable die to give them the form shown at 12 and 13. The spacer 28 is next assembled between bars 26 and 27 which are carefully aligned and the three parts spot welded in place. The strips 14 and 15 are then placed together with the bearing portions 12, 13 on opposite sides of rod 11 and slipped in between bars 26 and 27, and held firmly in place while spot welding at intervals throughout the length of the structure. One of the U-shaped retainers 25, which may be suitably bent pieces of cold rolled steel, is then slipped over the structure at each end and spot welded in place. If it is thereafter desired to remove and/or replace rod 11, it may be withdrawn and replaced by sliding endwise in the mount.

As an example, I have made blades as described, up to a length of about 20 feet, in which the rod 11 was of chromium plated tool steel $\frac{5}{32}$ inch in diameter, the strips 14 and 15 were of half-hard stainless steel 0.010 inch thick and ¾ inch wide, while bars 26 and 27 were of 0.20 carbon cold rolled steel 0.050 inch thick and 2 inches wide, the whole held together by two rows of spot welds 30 averaging about ¾ inch apart. These blades were found to fulfill all of the hereinbefore enumerated objects and to operate successfully for long periods of time, during which the rod 11 was continuously rotated, in connection with the application of aqueous coating compositions to paper.

This application is a division of application Serial No. 81,791, filed March 16, 1949, now Patent No. 2,598,733.

I claim:

1. Method of making a wiping blade in which the working edge is composed of an exposed minor portion of the surface of a rotatable cylindrical metallic rod, of predetermined diameter which comprises: preparing two strips of metal by shaping a portion of the width of each, adjacent one edge thereof, into a segment of a cylindrical surface of a radius approximately equal to that of the said cylindrical metallic rod, while the remainder of the width thereof remains substantially flat; placing said strips face to face with a rod of said predetermined diameter grasped between said shaped portions and with the flat portions extending in the same direction therefrom; and holding them firmly grasping said rod while fastening their flat portions firmly between two substantially straight and parallel metal bars.

2. The method of claim 1 wherein said two metal bars are preliminarily fastened together near one edge and so spaced apart that the projecting flat portion of said strips may be inserted between their other edges, and the bars will be substantially parallel after the flat portions of the strips are fastened firmly therebetween.

3. The method of claim 1 wherein the shaping of the strips is so carried out that the axis of the cylindrically shaped portion lies approximately in the plane of the unshaped flat portion of the strip, and wherein parallelism between the rotatable rod and one of said bars is secured by seating the shaped portion of the adjacent strip, throughout its length against the edge of said bar while their flat portions are in contact; and firmly holding the parts in this position while they are being fastened together.

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