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METHOD AND MACHINE FOR INSERTING WEDGES IN PAINT BRUSHES

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17 Claims. (Cl. 306—2)

This invention relates to the manufacture of paint brushes and the like and is particularly concerned with a method and apparatus for inserting plugs therein.

Cheaper quality paint brushes do not contain enough hog bristles or nylon filaments to fill the ferrule and it is necessary to use a wood or cardboard plug or plugs to fill the extra space. In the larger brushes, it may take a total plug thickness of 3/16" to fill the ferrules. It has been found, however, that a plug more than 3/16" thick will leave too wide a gap or space in the brushes, even causing the bristles to separate into two groups while in use. Accordingly, where a total plug thickness of 3/16" is required, two plugs of 3/32" thickness are used. A required plug thickness of 3/32" is made up with two plugs of 3/32" thickness. The two plugs are separated by a layer of bristles so that the brush is actually divided into three groups. However, the gaps between the bristles are not large enough to cause them to separate into groups while the brush is in use.

The original method of opening a brush, prior to inserting a plug, employed a stationary knife or splitter, located so that the opening, partly assembled, brush would slide on to the knife and be opened up along the brushes' middle line. This method was subsequently adopted for inserting a pair of brush plugs in the same brush by having two splitting knives, located one just above the other, on which the moving, partly assembled, brush advanced and was opened in two places, i.e., along two parallel planes. However, while this side-splitting action was suitable for opening the brush along one plane, it has not been found suitable for opening the brush along two planes. When the latter is attempted, the sideways skewing action of the bristles is increased, particularly with regard to the bristles located between the two knives. These center bristles are so disarranged that subsequent patting and evening-up motions of the brush-making apparatus fail to return them to their proper position. As a result, the brushes must be rebuilt by hand after leaving the apparatus. The abnormal skewing of the center-brush portion results from attempting to use a sideways splitting action while splitting the brush along two planes at the same time. The present invention avoids this abnormal skewing of the bristles by eliminating both these actions and substituting therefor an endwise splitting action.

Accordingly, it is an object of this invention to provide a method of inserting one or more brush plugs in a brush without causing a sideways skewing action of the brushes.

It is a further object of this invention to provide a method of inserting one or more brush plugs in a brush by first opening up the brush bristles with a splitter means advanced endwise of the bristles.

It is also a further object of this invention to provide a method of inserting a plurality of brush plugs in a ferrule held knot of bristles by successively inserting the plugs one at a time along planes opened up in the bristles by a plurality of splitter means advanced endwise of the bristles.

It is a further object of this invention to provide an apparatus for carrying out the method in accord with this invention for inserting brush plugs in brushes.

In the drawings

FIGURE 1 is a perspective view, partly broken away, of an apparatus for splitting a ferrule held knot of brush bristles and inserting a brush plug into the ferrule in accordance with the method of this invention.

FIGURES 2, 3 and 4 are diagrammatic side views of the forward part of the apparatus of FIGURE 1, illustrating the various stages in the plug-inserting method in accordance with the invention.

Referring now to FIGURE 1, the illustrated embodiment of the apparatus in accordance with this invention is mounted on a base 10 adjacent a brush conveyor 11. As will hereinafter be explained, the apparatus is so mounted that its forward end may be vertically adjusted so as to permit the orientation of splitter device 12 with respect to the brushes 13 on conveyor device 11. By this means, brushes 13 may be split along two or more different planes preparatory to the insertion of a plurality of brush plugs. For convenience, the general term "brushes" is used in this specification in relation to knots of brush bristles held in ferrules, it being understood that this term is more properly applied to finished brushes having handles attached.

Splitter 12 consists of two knives 14 and 15 arranged at an angle to each other as to form a wedge. Actually, knife 14 is pivotally mounted between a pair of uprights 16 carried by lower knife 15. Knife 14 may be freely pivoted to upright 16 so that gravity acts to lower its sharp forward edge to mate with the forward edge of lower knife 15. Alternatively, knife 14 may be spring-biased downwardly so as to mate with knife 15 in a more positive manner. The biasing means may conveniently take the form of a pair of leaf springs 19 fixed to the top of uprights 16 and bearing upon the upper surface of knife 14, as is shown in broken lines in FIGURE 1. The forward edge of Knife 14 is formed to just slightly overlap (about 3/32" of the forward edge of knife 15) in order to expose only a single edge to the bristles as the splitter is advanced. Knife 15 is elongated and adapted to slide back and forth on base plate member 17 whereby splitter 12 may be advanced and retarded from the brush-splitting position illustrated. The manner in which this back and forth movement of the splitter is accomplished will be explained below.

Between knives 14 and 15 of splitter 12, there is a plug inserter plate 20 which is adapted to slide back and forth, as will hereinafter be explained, as to pick up a plug 21 and advance it into the ferrule 15 along the parting plane of the bristles formed by splitter 12. The sequence of operation consists of advancing a ferrule held knot of bristles, by means of conveyor 13, into position in front of splitter 12 at which point the conveyor is stopped. Splitter 12 is then advanced to split the bristles along a parting plane and plug inserter 20 is advanced to force a plug 21 into the ferrule along this parting plane.

As mentioned above, plugs 21 are picked up as plug inserter 20 is advanced. Plugs 21 are fed into position in front of the forward edge of plug inserter 20 by means of a feeding device 22. This device consists of a pair of upright guide rails 24a and 24b between which are stacked a plurality of plugs 21. When plug inserter 20 is withdrawn behind feeding device 22, the column of plugs 21 drops the lowermost plug into position in front of plug inserter 20. In order to adjust feeding device 22 to accommodate various size plugs, rail members 22a and 22b are each fixed to support bracket 23 by a pair of threaded projections 24 engaged in slots 24a so as to permit the lateral movement of the guide rails. When the length of feeding device 22 has been set to accommodate a particular size plug, the guide rails are fixed in position by means of wing-nuts 25 screwed on threaded projections 24.

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As mentioned above, the sequence of operation in accord with this invention includes the advancement of splitter 12, followed by the advancement of plug inserter 20, the withdrawal of splitter 12 and finally the withdrawal of plug inserter 20. This sequence of operation is accomplished by means of cams 30 and 31 carried by cam shaft 32. As cam 30 rotates, it causes a pivotal movement of arm 33 which in turn causes knife 15 (i.e., splitter 12) to slide back and forth. A roller 35 carried by arm 33 is held against cam 30 by means of spring 36. Arm 33 is pivotally mounted on base plate 10 through means of mounting bracket 37. Pivoted carried at the upper free end of arm 33 is a second arm 38 which, in turn, is pivotally fixed to knife 15 through mounting bracket 40. The length of arm 38 may be adjusted by turning the threaded center member 39. The means whereby the back and forth motion of plug inserter 20 is effected, is similar to that just described with relation to splitter 12, although it will be appreciated that cam 31 will take a different form to cam 30 so as to achieve movements of plug inserter 20 which are out of phase but related to the movements of splitter 12.

As mentioned above, the vertical positioning of splitter 12 may be adjusted. This adjustment is accomplished by means of screw 42 which, when turned, causes the forward portion of the apparatus to rise and fall as it pivots on its mounting position on cam shaft 32.

FIGURES 2, 3 and 4 illustrate the sequence of operation of the machine in accord with this invention. The steps illustrated all take place while the ferrule is stopped on the conveyor belt. FIGURE 2 illustrates the first step in the cycle immediately after the ferrule has been brought into position. FIGURE 3 illustrates the advancement of splitter 12 to split the bristles. FIGURE 4 illustrates the advancement of the plug inserter with the simultaneous withdrawal of splitter 12. Actually, the plug is forced partly into the ferrule before the support provided by the splitter has begun to withdraw. It will be further understood that the plug is advanced all the way into the ferrule before the plug inserter is completely withdrawn.

It will be noted that FIGURES 2-4 illustrate the insertion of only one plug which is placed in the central plane of the brush. When two plugs are to be inserted, the brush is first split along a plane which forms the bristles into a first group having approximately one third the total number of bristles and a second group having the remainder of the bristles. A plug is then inserted along this plane and the brush is advanced by the conveyor belt in position in front of a second machine which is adjusted to split the brush along a second plane in the middle of the second group of bristles. In this way, the plugs are inserted along planes dividing the bristles into three substantially equal groups.

What I claim is:

1. A method of inserting brush plugs into ferrule-held knots of brush bristles comprising the steps of holding a pair of separable knives in inclined relation to one another with the knife edges of said knives substantially abutting to form a wedge-like splitter element, advancing said splitter element into the ends of the bristle knots along planes parallel to the surface of the knots and to separate the knots into at least two portions, separating said knives, and advancing brush plugs along said planes into position within said ferrules.

2. A method of inserting a pair of brush plugs into a ferrule-held knot of bristles comprising the steps of holding a pair of separable knives in inclined relation to one another with the knife edges of said knives substantially abutting to form a wedge-like splitter element, advancing said first splitter element into the end of the bristle knot along a first plane substantially parallel to the plane of the bristle knot and the second portion of said second portion made up of approximately one-third and two-thirds of the total number of bristles respectively, separating said first pair of knives, advancing a brush plug along said first plane into a position within the ferrule, holding a second pair of separable knives in inclined relation to one another with the knife edges of said knives substantially abutting to form a second wedge-like splitter element, advancing said second splitter element into the ends of said second portion of bristles along said second plane substantially parallel to said first plane as to divide said second portion into two parts each having approximately the same number of bristles as are contained in said first portion, separating said second pair of knives and advancing a second brush plug along said second plane into a position within said ferrule.

3. A method as claimed in claim 2 in which said first splitter element and said second splitter element are located at different work stations and including the steps of advancing said ferrule-held knot of bristles from one work station to the next by conveyor means.

4. An apparatus for inserting brush plugs into the ends of knots of brush bristles held in ferrules comprising a splitter means having a pair of adjacent knives arranged at an angle to each other as to form a wedge with the knife edges of said knives forming the forward edges of said wedge but being separable freely, the passage of a brush plug therebetween, means for advancing said splitter into the end of a ferrule held knot of brush bristles to split said knot of bristles along a plane substantially parallel to the plane of said ferrule and for withdrawing said splitter from said knot of bristles and means for advancing a brush plug between said knife edges along said split plane into position within said ferrule.

5. An apparatus, as claimed in claim 4, in which one of said knife edges slightly overlaps the other of said knife edges as to give a single sharp forward edge to said wedge.

6. An apparatus, as claimed in claim 4, in which the forward edge of said wedge is horizontal, the upper knife being pivotally mounted at its end remote from the forward edge of the wedge to upright means carried by the lower knife.

7. An apparatus, as claimed in claim 6, in which the knife edge of the upper knife slightly overlaps the knife edge of the lower knife as to give a single sharp forward edge to said wedge.

8. An apparatus, as claimed in claim 6, in which the upper knife is pivoted freely, the weight of said upper knife causing it to mate with the lower knife under the influence of gravity to form said wedge.

9. An apparatus, as claimed in claim 6, in which the upper knife is spring biased into its mating relationship with the lower knife.

10. An apparatus, as claimed in claim 4, in which the forward edge of said wedge is horizontal and including a base plate member on which the lower knife is slidably mounted.

11. An apparatus, as claimed in claim 4, in which one of said knives is carried by the other of said knives and including means biasing said knives forwardly into illustrated splitting position and rotatable cam means operable on said knives to alternately withdraw said knives from said splitting position and to permit said knives to advance to said splitting position under the influence of said biasing means.

12. An apparatus, as claimed in claim 11, including a base plate member on which said other knife moves back and forth, a first link member pivotally fixed at one end to said other knife and depending rearwardly therefrom, a second link member pivotally connected to the other end of said first link member and depending therefrom at an angle thereto, means pivotally mounting the shoulder of said second link member, said cams being operative on said second link member to cause it to pivot about said mounting means.
13. An apparatus, as claimed in claim 12, in which said biasing means comprises a spring fixed to said second link member and anchored forwardly thereof as to urge said second link member to pivot forwardly about its mounting means in response to the rotation of said cam means.

14. An apparatus, as claimed in claim 13, in which said first link member includes length adjustment means.

15. An apparatus, as claimed in claim 4, in which said brush plug advancing means comprises an inserted plate mounted to move back and forth between a fully extended forward position within said split bristles and a rearmost position behind said wedge forward edge, means for so moving said inserter plate, and means for feeding brush plugs to a position in front of said inserter plate while it is in said rearmost position.

16. An apparatus, as claimed in claim 15, in which the forward edge of said wedge is horizontal, the said inserter plate being slidably mounted on said lower knife, and in which said plug feeding means comprises a pair of spaced parallel upright rail members, means to adjust the width between said rail members, and a plurality of brush plugs stacked in a column between and supported by said rail members, the lowermost plug resting on said plug inserter plate whereby said lowermost plug is dropped into position in front of said plug inserter plate when the latter is withdrawn behind said feeding means.

17. An apparatus for inserting brush plugs into knots of brush bristles held in ferrules comprising; a base, a frame partially supported on said base; a splitter carried on said frame and having a pair of knives arranged at an angle to each other as to form a wedge with the knife edges of said knives forming the forward edge of said wedge, said forward edge being horizontally disposed and having the upper knife edge slightly overlapping the lower knife edge, a pair of uprights on the lower knife, said upper knife being pivotally attached to and extending between said uprights to permit the separation of said knife edges whereby a brush plug may be passed therebetween, a plug inserter plate slidably carried on the lower knife, a first spring means biasing said lower knife and hence said splitter forwardly into a bristle knot splitting position, spring means biasing said plug inserter plate forwardly into a plug inserting position within a bristle knot, a first, length adjustable, link member pivotally attached to said lower knife and depending rearwardly therefrom, a second link member pivotally attached to the other end of said first link member and depending therefrom at an angle thereto, means pivotally mounting the other end of said second link to said base, a rotatable cam shaft partially supporting said frame, a first cam fixed to said cam shaft with the camming surface thereof in contact with an abutment member carried on said second link whereby the rotation of said first cam causes said second link to pivot about its mounting on the base to alternately permit said wedge to advance to a bristle splitting position under the bias of said first spring means and to withdraw said wedge from said bristle splitting position against the bias of said first spring means; said plug inserter plate also having first and second link members similar in all respects to the first and second link members of the lower knife, a second cam fixed to said cam shaft with the camming surface thereof in contact with an abutment member carried on the second link of the plug inserter plate whereby the rotation of the second cam causes said last named second link to pivot about its mounting on the base to alternately permit the plug inserter plate to advance to a plug inserting forward position within said bristles under the bias of said second spring means and to withdraw said plug inserter plate from said forward position against the bias of said second spring means; means for feeding brush plugs to a position in front of said plug inserter plate while it is withdrawn from its forward position comprising a pair of spaced, parallel upright rail members mounted on said frame, means to adjust the spacing between the rail members, and a plurality of brush plugs stacked in a column between and supported by said rail members, the lowermost plug normally resting on the plug inserter plate whereby said lowermost plug drops into position in front of the plug inserter plate when the latter is withdrawn behind the feeding means.

References Cited in the file of this patent

UNITED STATES PATENTS

485,670 Thompson November 8, 1892
1,509,271 Unger September 23, 1924
1,874,475 Ellingham August 30, 1932
2,609,241 First September 2, 1952