July 19, 1966 D. S. MACKAY ETAL 3,261,449

BRUSH ASSEMBLY MACHINE

Filed June 19, 1964 2 Sheets-Sheet 1

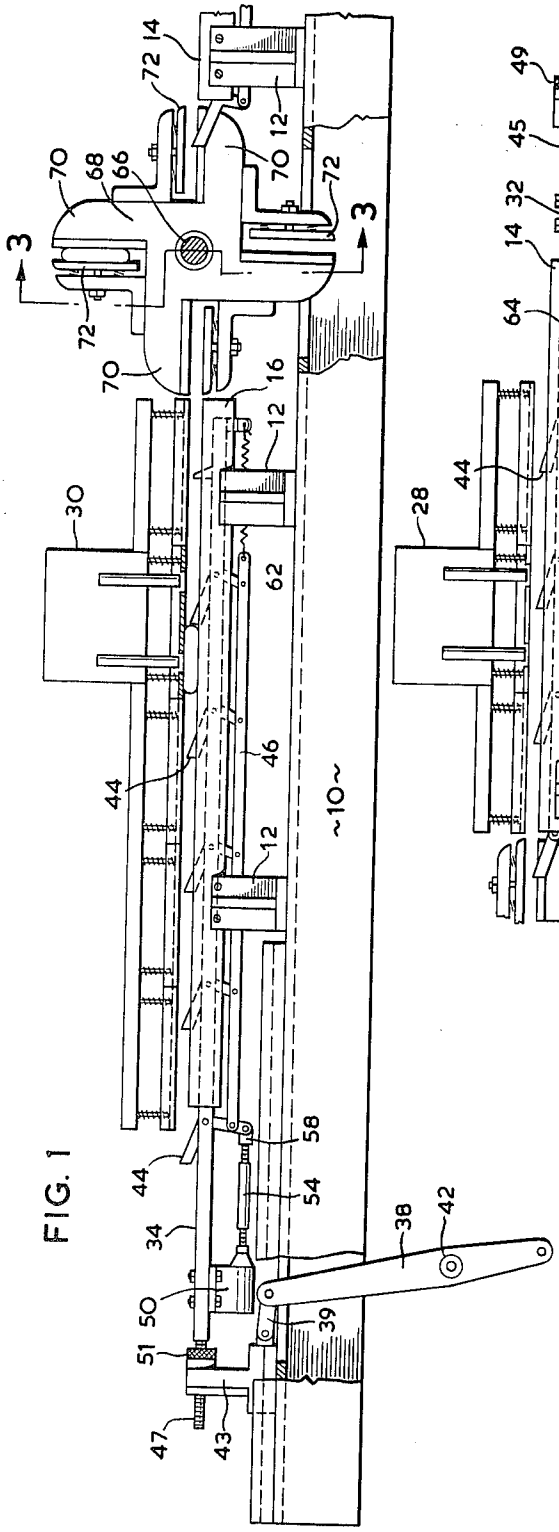



FIG. 1

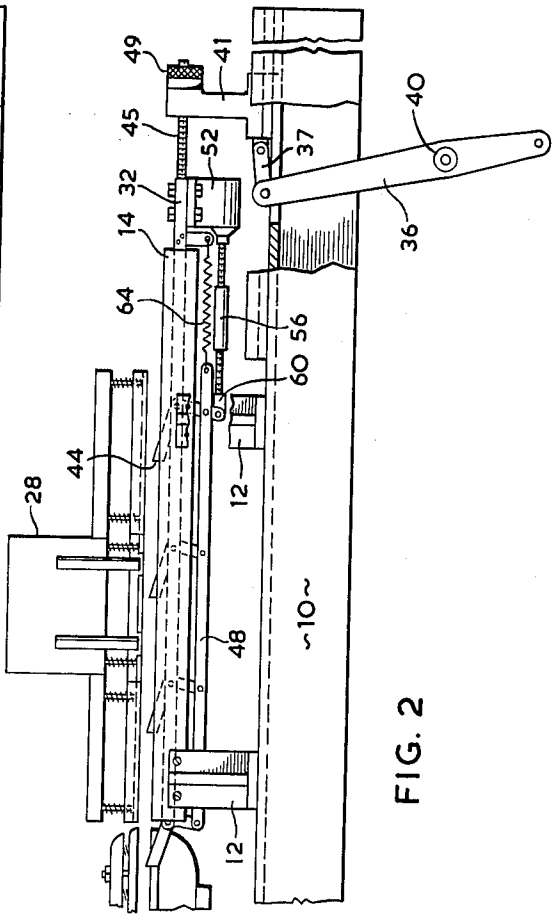



FIG. 2

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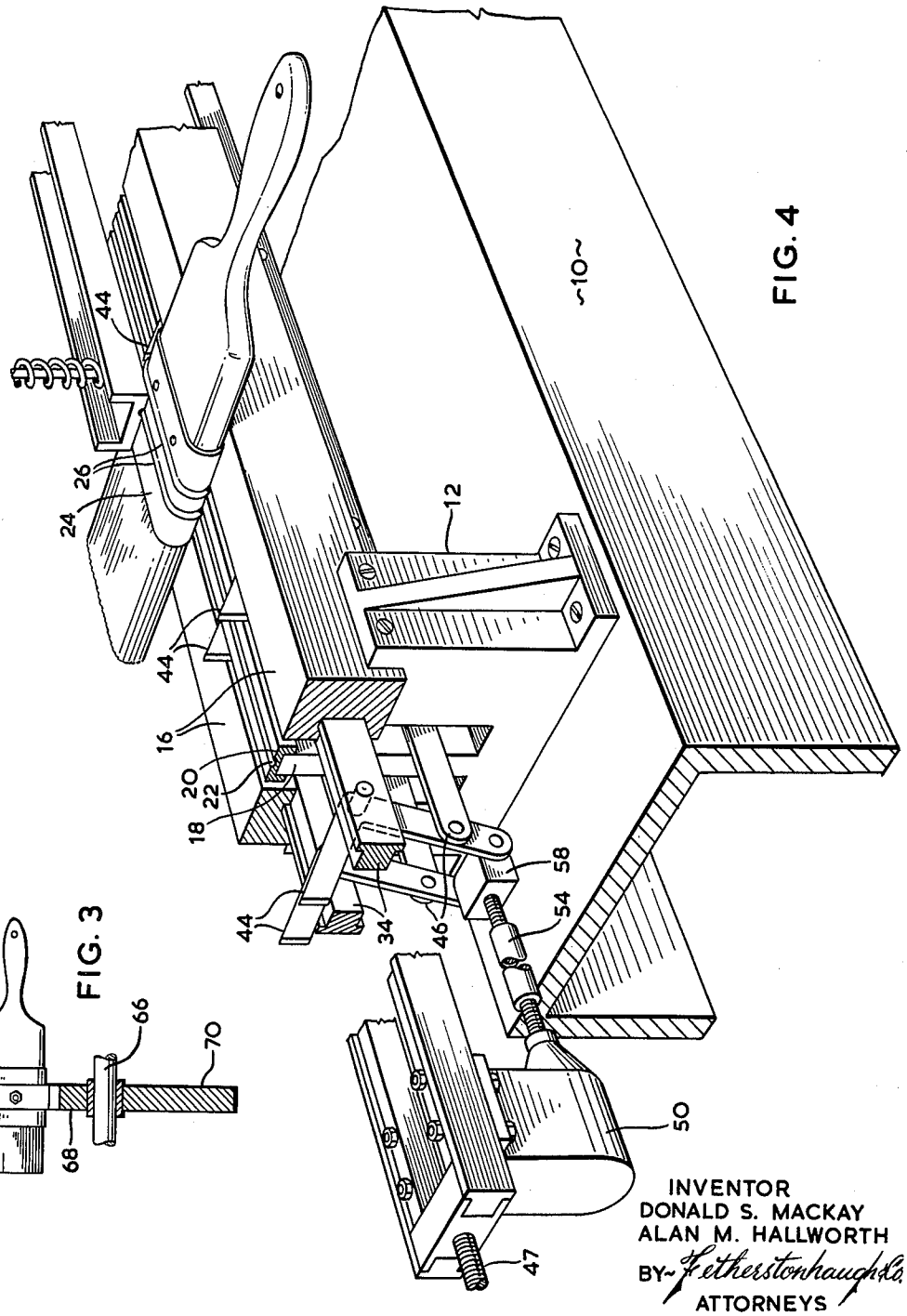



FIG. 4




FIG. 3

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# BRUSH ASSEMBLY MACHINE

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This invention relates to brush assembly machines and is particularly concerned with an apparatus for securing handles to brush units consisting of ferrules having bristles cemented therein.

The apparatus in accord with the invention is primarily suited to the assembly of paint brushes and is an improvement on the machine disclosed in United States Patent 2,033,259, issued March 10, 1936. The apparatus disclosed in this prior patent performed the functions of inserting handles in brush ferrules having bristles cemented therein, nailing the ferrules to the handles and finally finishing the bristles. The present invention is primarily concerned with the step of nailing the ferrules to the handles.

The apparatus of the prior patent suffered several drawbacks. Paint brush handles are usually finished in clear, hard surface lacquer and are subject to scratching of the lacquer. Also, the steel ferrule is commonly made from a soft, tin-plated mild steel, also very susceptible to scratching and marking. One of the drawbacks of the prior apparatus is that the conveyor mechanism for moving the ferrules and handles through the apparatus had characteristics which tended to scratch or otherwise mark both the handles and ferrules. Further, the assembled brushes tended to become misaligned relative to their direction of travel, causing breakdown in the operation of the apparatus. This tendency to misalignment of the brushes followed from the principle of guiding the brushes by the forward and rearward ends of the ferrules. As the thickness of the ferrule material is normally in the order of .012 inch, the brushes tended to jump out of the guideways provided for engagement therewith. Further, the prior apparatus employed a reciprocating pusher bar having a number of upstanding dogs for pushing the brushes through the machine. The dogs were arranged in single file along the pusher bar so that constant adjustment of the dogs relative to the length of the ferrules was necessary to avoid an unbalanced pushing movement on the ferrules. In other words, considerable care was required to ensure that the dogs engaged the ferrules at the point of balance thereof to prevent a twisting movement on the ferrules which would cause the ferrules to become misaligned.

The prior apparatus was so designed that as the pusher bar moved backwards, the dogs were pressed downwardly by the ferrules themselves. As a result, the dogs were biased upwardly against the ferrules during the backward movement of the pusher bar and the dogs tended to scratch the under-surface of the ferrules.

Included in the apparatus of the prior patent was a device for turning over the assembled brushes between two nailing stations so that nails could be first applied through the ferrules from one side of the brushes and then from the opposite side. This turnover device, which was referred to as a transfer unit, employed two side by side transfer plates and it was necessary to constantly adjust the spacing between the plates to accommodate various sized brushes. The transfer plates gripped the bristles to one side and the handle on the other side of the ferrule and unless they were adjusted perfectly to offer equal gripping force on both the bristle and the handle, the brushes tended to swing from the desired transverse position relative to their direction of movement.



It is, therefore, a primary object of this invention to provide an improved nailing unit of a brush assembly machine.

It is a more specific object of the invention to provide an improved brush assembly machine of the type disclosed in the said prior United States Patent 2,033,259 as to particularly avoid misalignment of brushes as they move through the machine and to avoid scratching and otherwise marking of the ferrules and brush handles.

These and other objects of the invention will be more thoroughly understood from the following description of a preferred embodiment thereof and read in conjunction with the accompanying drawings.

In the drawings,

FIG. 1 is a front elevation view of a first portion of this preferred embodiment of the invention.

FIG. 2 is a front elevation view of a second portion of this embodiment.

FIG. 3 is a transverse cross-sectional view taken along the line 3—3 of FIG. 1; and

FIG. 4 is a perspective view of the left-hand end of FIG. 2.

It is to be understood that FIGS. 1 and 2 should be seen as coupled together as to show the apparatus in accord with the invention in its entirety. The assembled brushes move through the apparatus from the right-hand end of FIG. 2 to the left-hand end of FIG. 1. During this travel, the handles which have been previously inserted in the ferrules are nailed to the ferrules from each side. Between the two nailing operations, the assembled brushes are turned over. As thus generally described, the apparatus is similar to the earlier apparatus shown in the prior United States patent referred to above.

The apparatus is supported on a bed **10**, which, in turn, is mounted on appropriate legs or the like which are not shown but which hold the bed **10** at a suitable distance above floor level. Fixed to bed **10** are a number of brackets **12** which support a pair of two-part rails **14** and **16** and include center posts **18** supporting guide tracks **20**. Generally speaking, the brushes are caused to move along the top surfaces of rails **14** and **16** and are maintained transverse to the longitudinal axes of the guide track by a groove **22** in the guide track **20** with the groove engaging one of the ridges formed in the brush ferrule. A typical brush is shown in FIG. 4 from which it can be seen that the ferrule **24** carries a pair of ridges **26**. The brushes are moved through the apparatus with an intermittent motion so that their movement is stopped completely beneath the nailer units **28** and **30** for a period of time sufficient to carry out the nailing operations.

This intermittent movement of the brushes is effected by means of the two reciprocating pusher bars **32** and **34**. As can be seen in FIG. 4, each of these bars actually consists of two T-shaped members received in guideways in the two-part rails **14** and **16**. The pusher bars are caused to reciprocate by the levers **36** and **38** which are pivotally supported at their lower ends. At points **40** and **42**, the levers carry rollers engaged with rotating cams which are not shown but which might correspond to those illustrated in the said earlier United States Patent 2,033,259. By the rotation of the cams, the levers are caused to move through limited arcs sufficient to move the pusher bars **32** and **34** back and forth. The upper ends of levers **36** and **38** are fixed, through linkages **37** and **39**, to a pair of slides **41** and **43** which carry the outer ends of the pusher bars. The connection between the ends of the pusher bars and the slides is preferably effected by some sort of adjustment means, such as the illustrated threaded rods **45** and **47** and the knurled nuts **49** and **51**.

The pusher bars carry a plurality of dogs **44**, each of

which actually consists of two V-shaped members pivotally connected at the point of juncture of the two arms to the bars **32** and **34**. The lower ends of the dogs are coupled together by two pairs of longitudinally extending rods **46** and **48**. It can be seen that as rods **46** and **48** are moved relative to the pusher bars, the upper ends of the dogs **44** are raised and lowered. To provide this relative movement between the rods and the pusher bars, there is provided a pair of solenoid devices **50** and **52** which are coupled to the rods through adjustable members **54** and **56**. These members actually extend from the solenoid devices to pivot blocks **58** and **60** connected to the end-most dogs **44**. The solenoid **50** upon activation pulls member **54** to the left as seen in FIG. 2 as to move rod **46** to the left and raise the dogs, with the return motion being provided by a spring **62** upon deactivation of solenoid **50** as to lower the dogs. In the case of solenoid **52**, activation of the solenoid pushes member **56** to the left as seen in FIG. 1 as to raise the dogs, with the dogs being lowered by the action of spring **64**. The activation of both solenoids can be effected in a number of ways, preferably by limit switches positioned to be tripped by the motion of the pusher bars **32** and **34** so that there is a timed relationship between movement of the bars and the raising and lowering of the dogs. As can be readily appreciated, the dogs are raised to the position shown in each of the drawings as to contact the brush ferrules with movement of the pusher bars to the left, as shown in the drawings, as it is the object of the combined action of the pusher bars and the dogs to move the ferrules through the machine from right to left. As previously mentioned, the members **54** and **56** are adjustable. More specifically, they are adjustable in length so that the height that the upper ends of the dog elements **44** project above the rails **14** and **16** can be adjusted whereby the assembly is adapted to move brush units of different thicknesses. This ability to adjust the final height of the upper end of the dog elements is a desirable feature as it is preferable that the ferrules be contacted at their widest points as the sides of the ferrules are normally curved. Moreover, due to other mechanical restrictions, it is desirable that the upper ends of the dogs never be elevated above the top edges of the ferrules.

It is to be noted that both the lowering and raising of the dogs are carried out in a positive manner as distinct from the apparatus in accord with the earlier United States Patent 2,033,259. In accord with that patent, the lowering of the dogs on the return stroke of the pusher bars was effected by the ferrules themselves as the dogs were spring biased towards their upper position and could move past the ferrules on the return stroke only by the ferrules overcoming this spring bias. In the result, the ferrules were scratched by the dogs as the latter moved under the ferrules.

A further distinct advantage of the dog arrangement in accord with this invention is the use of double dogs as to create a balanced force on the ferrules. In accord with the apparatus of the prior patent, single dogs only were employed and even a slight misalignment of the ferrules on the guide tracks would create an unbalanced force on the ferrules by the dogs whereby the ferrules would be moved out of the desired transverse position relative to the guide tracks.

The transfer mechanism in accord with this invention is shown in the right-hand end of FIG. 2 and in FIG. 3. Connected to a transverse rotatable shaft **66** there is a single transfer plate **68** having four radial arms **70** carrying spring biased jaw mechanisms having shoes **72** for gripping the brush ferrules. The shoes **72** each contain longitudinally extending grooves corresponding in size to the grooves **22** in the guide tracks **20** whereby the grooves in the guide tracks and in the shoes cooperate to control the orientation of the brush ferrules as the latter move into and out of engagement with the jaw mechanisms. Following the nailing of the ferrules by the nailer **28**, shown in FIG. 1, they are moved by the dogs to the particular jaw **72** which is oriented with the left-hand end of rail **14**. The ferrules are then flipped over by the transfer mechanism in a two-step operation and lined up with the other guide rail **16**. The rotation of the transfer mechanism is timed with the movement of the pusher bars as to achieve a smooth operation transferring the ferrules from the right-hand end of the mechanism to the left-hand end. These timing mechanisms and the mechanical means for turning over the transfer mechanism are not shown in the drawings as they substantially correspond with the equivalent mechanism shown in the said earlier United States patent.



It is to be noted that the transfer mechanism in accord with this invention consists of a simple transfer plate as distinct from the double transfer plate transfer mechanism of the prior patent. This avoids the difficulty previously mentioned associated with double plate arrangement whereby the transfer mechanism must be constantly adjusted to grip the brushes with the same degree of gripping action by both transfer plates to ensure constant transverse alignment of the brushes. This difficulty is simply overcome by using the single transfer plate in accord with this invention.

What we claim as our invention is:

**1.** In a brush assembly machine for nailing brush ferrules having bristles fixed therein to handles, means for moving brush units consisting of brush ferrules having bristles fixed and handles received therein through said machine, said moving means including a first horizontal rail consisting of two parallel members spaced from one another as to define a longitudinally extending channelway, a second horizontal rail of like construction aligned with said first rail, a transfer mechanism positioned between opposed ends of said rails for transferring brush units from the first rail to the second, pusher bar mechanisms associated with each of said rails and adapted to reciprocate longitudinally thereof, and means for reciprocating said pusher bar mechanisms, said pusher bar mechanisms each including a number of pairs of dog elements, and means for raising and lowering said pairs of dog elements from a first position in which the upper ends of the dog elements project above said rails for engagement with brush units lying thereon to a second position in which the said upper ends of the dog elements are positioned below the top surface of said rails and out of contact with said ferrules, said means for raising and lowering said pairs of dog elements consisting of rod means pivotally connected to the lower ends of the dog elements as to interconnect the said lower ends, a solenoid device carried by the pusher bar mechanism, linkage means connecting said solenoid device with said rod means whereby the actuation of said solenoid device causes said dog elements to be raised or lowered, and spring means for urging said dog elements in a direction opposite to the direction in which they are moved by actuation of the solenoid device.

**2.** A brush assembly as claimed in claim **1** in which the linkage means connecting said solenoid device to said rod means is adjustable in length whereby the distance the upper ends of the dog elements project above said rails may be adjusted whereby the assembly is adapted to move brush units of different thicknesses.

**3.** In a brush assembly machine for nailing brush ferrules having bristles fixed therein to handles, means for moving brush units consisting of brush ferrules having bristles fixed and handles received therein through said machine, said moving means including a first horizontal rail consisting of two parallel members spaced from one another as to define a longitudinally extending channelway, a second horizontal rail of like construction aligned with said first rail, a transfer mechanism positioned between opposed ends of said rails for transferring brush units from the first rail to the second, pusher bar mechanisms associated with each of said rails and adapted to

reciprocate longitudinally thereof, means for reciprocating said pusher bar mechanisms, said pusher bar mechanisms each including a number of pairs of dog elements, and means for raising and lowering said pairs of dog elements from a first position in which the upper ends of the dog elements project above said rails for engagement with brush units lying thereon to a second position in which the said upper ends of the dog elements are positioned below the top surface of said rails and out of contact with said ferrules, longitudinally extending guide tracks positioned between the parallel members forming said rails, said guide tracks having their upper surfaces substantially level with the upper surfaces of said rails, the upper surfaces of the guide tracks being provided with longitudinally extending grooves for receiving one of the transverse ridges normally provided on brush ferrules; said transfer mechanism consisting of a single transfer plate having four radially projecting arms, means for mounting said transfer plate for rotation about an axis extending transversely of the longitudinal axis of said rails, each of said arms carrying at its outer end a spring biased jaw mechanism for gripping the ferrule of a brush unit as it is



delivered to the end of said first rail, said jaw mechanisms each including a shoe having a groove corresponding in size to the grooves in said guide tracks whereby the grooves in said shoes and in said guide tracks cooperate to control the orientation of the brush ferrules as they move into and out of engagement with said jaw mechanisms, and means for rotating said transfer plate as to turn over said brush units between said rails.

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