

[54] **METHOD OF PROVIDING METAL MOUNTINGS OR THE LIKE ON MEMBERS OF WOOD OR SIMILAR MATERIAL**

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[51] Int. Cl. **B23p 19/00**

[58] Field of Search..... **29/509, 200 A, 222, 208 R, 29/33 P, 33 K, 26 A, 243.53, 429, 460; 219/150 V**

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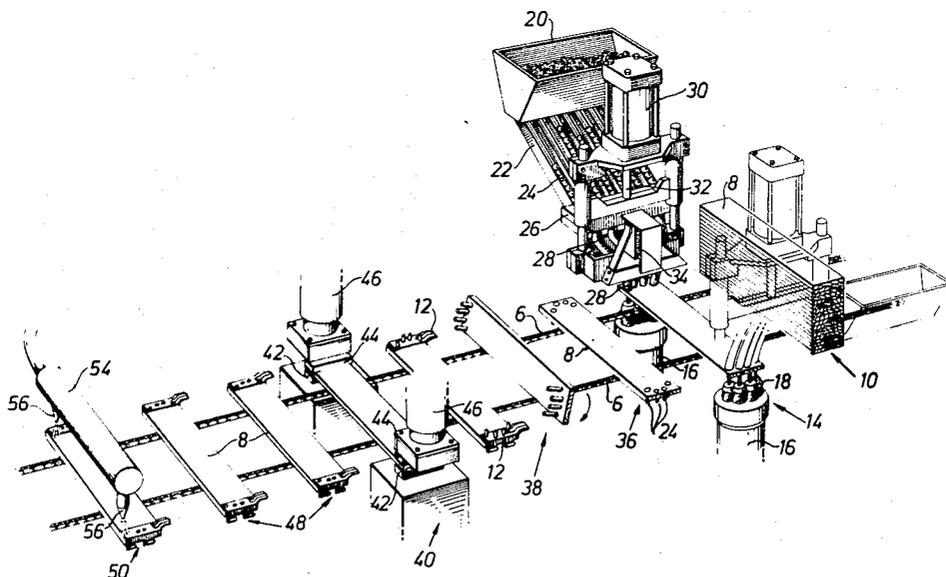
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[57] **ABSTRACT**

A method of securing metal mountings to wooden members with rivets is disclosed. The wooden members are drilled to a slightly smaller diameter than the rivets. The rivets are inserted through the holes at the conclusion of the drilling operation, and are frictionally held in place by the wooden member. The metal mountings are then mounted on the member and the assembly is passed to a rivet upsetting station. The rivets are softened by electrical current as the upsetting pressure is applied. The specification discloses several configurations of electrodes that provide simultaneous heating and pressure. After upsetting, the rivets are sprayed with a colored powder or protective coating. The heat retained in the upset rivet is used to melt the powder and spread the coating.

13 Claims, 4 Drawing Figures



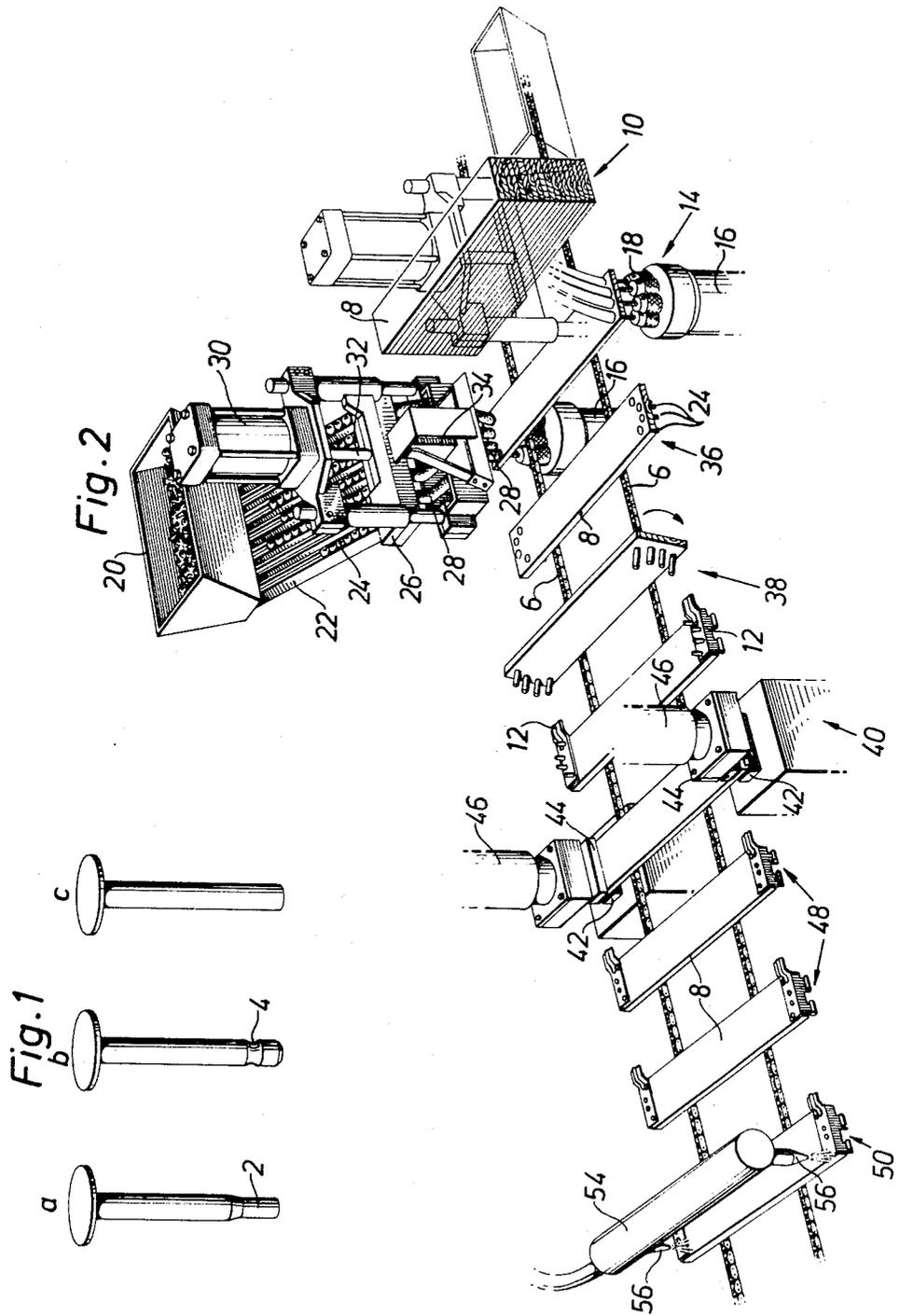


Fig. 3

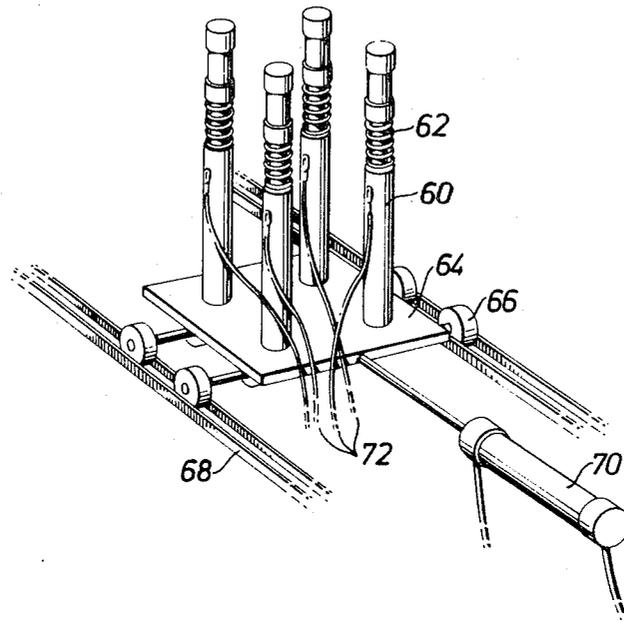
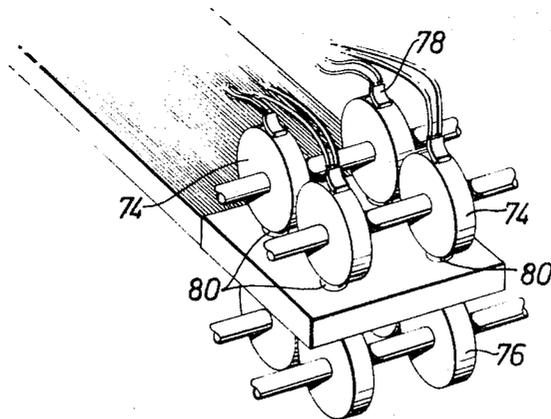


Fig. 4



METHOD OF PROVIDING METAL MOUNTINGS OR THE LIKE ON MEMBERS OF WOOD OR SIMILAR MATERIAL

The present invention relates to a method of providing metal mountings or the like on members of wood or similar material.

In the manufacture of objects of wood of various kinds, e.g., cases or side walls of cases, it is often necessary to reinforce the corners by means of metal mountings of various types. On side walls only hinge-like mountings are usual.

The mountings are usually fixed by means of riveting, which when performed in a conventional manner by means of hammering, requires considerable manual labor and at the same time causes substantial noise. It is also known to heat the rivets electrically by means of electrodes and in connection therewith upset them manually.

The object of the present invention is to speed up and simplify considerably the fixing of metal mountings or the like on members of wood or similar material by means of automatization of the fixing process. According to the invention this has been achieved in that the members are fed in a close sequence on a conveyor to a drilling and rivet inserting station, in which in a first step the drilling of rivet holes and in a second step a rivet insertion is performed, initiated by the termination of the drilling, whereafter the members during continued feeding on the conveyor to a riveting station are provided with mountings with prebored rivet holes, said members being arranged loosely on the members with the rivets inserted through the rivet holes of the mountings, whereafter the upsetting of the rivets is performed at the riveting station. In a particularly suitable embodiment a method is utilized in which rivets are used in the rivet joints, the rivet shanks of which in a manner known per se present a reduced portion which is adapted by means of electric heating and upsetting to provide the intended securing of the mounting and that the riveting station comprises current supply and upsetting electrodes, by means of which current is automatically supplied to the rivets, the upsetting electrodes simultaneously pressing the rivets in their longitudinal direction against current removing electrodes, serving as abutments. In this method electrically heated and upset rivets are thus utilized. In order to obtain a well concentrated heating point on the rivet, which is desirable in view of the requirements of reliability of the automatic process, and also to reduce the electric power required, a rivet known per se is used, presenting a tapered portion on the rivet body, at the location where the upsetting is to take place. The rivet during current flow therethrough will mainly be heated to red-heat only at this location. Variations in unavoidable manufacturing tolerances could without the heating location defined cause various portions of the rivet body to attain the highest temperature, which would evidently jeopardize the operation of the automatic equipment.

The invention will now be described more closely below with reference to the attached drawings, on which FIG. 1 is a perspective view of embodiments of rivets utilized in the method and FIGS. 2 through 4, schematically and in perspective are illustrations of a few various embodiments of a machine for carrying out a method of the invention.

In the rivet illustrated in FIG. 1a an end portion 2 of the rivet shank presents a smaller cross section than the rest of the rivet shank and the rivet of FIG. 1b presents a recess 4 near the end of the rivet shank. The portions 2 and 4 have the same function in both rivet forms, i.e., during current flow in the rivet to be heated to red-heat, the upsetting of the rivet being intended to take place at the red-hot location 2 or 4. The upsetting of a rivet, however, may in the method of the present invention also be performed by means of ultrasonics, whereby a recess 2 or 4 will be unnecessary in the rivet and, consequently, the usual rivet shape of FIG. 1c can be utilized.

In FIG. 2, which shows an example of an automatic riveting machine for carrying out the method of the invention, 6 indicates parallel moving transport chains, which can form part of an endless conveyor. Boards 8, which are to be provided with mountings in the machine, are fed onto the conveyor in the form of a stack 10. Dogs, not illustrated, which are mounted on the transport chains 6 with an equal spacing are adapted each time they pass the stack station 10 to carry the bottom board in the stack for further transport into the machine. In the embodiment illustrated in FIG. 2 the boards 8 are adapted to be provided with hingelike mountings 12 at both ends, which are fixed by means of rivet joints comprising four rivets. For this purpose the boards 8 are one after one first carried to a drilling and rivet inserting station 14 which comprises a drilling machine 16 at each side of the conveyor 6-6. Each drilling machine 16 comprises four drills 18 arranged for upwardly directed operation and located in the same pattern as the pattern of bores desired in the end of the board 8. Since in the station 14 each element at one side of the conveyor corresponds to a similar element at the other side of the conveyor, only the remote side elements have been illustrated in detail, except the drilling machines 16, while the near side elements for the sake of clearness have only been shown schematically. At each side of the conveyor the station 14 thus comprises a rivet hopper 20, which is supplied with rivets of the type shown in FIG. 1a or b. From the rivet hopper 20 a plurality of inclined guides 22 extend, along which the rivets 24 by their own weight slide down to a receiver box indicated 26. The guides 22 consist of two parallel rails each, whereon the head of the rivet rests, while its shank extends between the rails. In the receiver box 26 the guides 22 are terminated in a horizontal channel extending in the direction of the conveyor, not illustrated on the drawing. From this channel and slightly laterally offset relative the guides a plurality of tubes 28 extend, the mouths of which are located immediately over a board 14, which has just arrived at the station, and arranged in the same pattern as the drills 18. In the box 26 the piston of a pneumatic or hydraulic cylinder, not illustrated in the drawing, is movable horizontally and provided with pusher elements, adapted during the movement of the piston to push the rivets 24, which have arrived along the guides 22 and are present in the above-mentioned channel in the box 26, laterally towards the top mouths of the tubes 28 opening into the box 26. At either side of the conveyor a vertically oriented pneumatic cylinder 30 is also provided, which via an actuator piston rod 32 simultaneously actuates a plurality of vertical punches, each of which engages through an opening in a corresponding tube 28 at a distance above the bottom

mouth of the tube. Finally, the two identical assemblies provided at each side of the conveyor and comprised in the station 14 contain a clamping device, shown at 34 and not described in detail, which comprises a, e.g., pneumatically actuated piston, which is movable towards the top surface of a board 8 arrived at the station 14.

The station 14 operates in the following manner. The arrival of a board 8 at the station is detected by an air valve, not illustrated, which stops the movement of the conveyor and lowers the piston comprised in the clamping device 34 to abutment against the surface of the board 8 so as to secure the board, whereafter the drilling machines 16 are started and the drills 18 are raised and start to force their way through the board. When the drills 18 have passed through the board this fact is detected by means of a suitably located micro-switch or air valve, which in turn starts the pneumatic cylinder placed in the box 26 so that its piston as well as the pusher are displaced horizontally and pushes one rivet down into each of the tubes 28. Said rivets will rest in a vertical position with their ends against the mouth of one each of the drilled bores, but due to friction they cannot by themselves force their way further down into these bores. In addition, in this position the rivet heads are located in front of the corresponding piston actuated by the cylinder 30. At the same time as a rivet has been caused to fall down through each tube 28 a downward movement of the drilling machines 16 has also been performed and when the drills 18 leave the board, the cylinder 30 is actuated and via the piston 32 causes the punches engaging in the tubes 28 to press downwards against the heads of the rivets located in the tubes, whereby the rivets are pressed down into the board, until their heads abut the top side of the board. Thereafter the conveyor 6—6 is started again and feeds away the board provided with rivets. At 36 the board is shown in this position.

At 38 the board has arrived at a turning and mounting-application station, at which, as illustrated, the board is first turned 180° and provided with a mounting 12, wherein bores for the rivet shanks are ready drilled. Separate details comprised in the station 38 have been removed, but the design of the station should be evident to a person skilled in the art.

At the same time as a board arrives at the station 14 for drilling and rivet insertion, another board provided with loose mountings 12 arrives at a riveting station 40, which comprises a riveting assembly at either side of the conveyor 6—6. Each riveting assembly contains a lower fixed plate-shaped metal electrode 42 and an upper vertically movable plate-shaped metal electrode 44. The plates 42 and 44 have substantially the same size and are located straight over each other and have such an extension that they cover the part of the end portions of the board 8 containing the rivets 24. Current supply conductors, not illustrated, are connected to the plates 42 and 44 and the plates 44 are vertically movable by means of a hydraulic or pneumatic piston device indicated at 46.

The position of the board 8 in the station 40 is detected by means of an air valve, microswitch or the like, which initiates the riveting process, whereby the movable plates 44 are pressed downwards against the ends of the rivets 24, while the rivet heads are supported by the electrode plates 42 serving as an abutment. When contact between the electrode plates and the rivets is

established, a current path is closed from the upper plate 44 to the lower plate 42 via the rivet shanks and the current passing through the rivets is sufficient for heating the rivet portions 2 or 4 to red-heat, whereby upsetting is performed under pressure of the plates 42 and 44 and thus riveting in position of the mountings 12 is performed. After the riveting the boards provided with the mountings are transported as illustrated at 48 to a colouring station 50. At this station a cylinder 54, containing protective colour powder, comprises a spray nozzle 56 arranged centrally above the path of movement of the two mountings of the boards 8. Via the spray nozzle 56 the protective colour powder is sprayed towards the mountings on the board passing the station 50. Since the up-set rivet ends are still warm, the colour powder, which is deposited thereon, melts forming a protective adhesive colour film, while the powder deposited on other portions of the mounting will remain loose and can be removed.

As is evident from the description above, the riveting in the machine illustrated in FIG. 2 is performed in steps, the station 40 being fixed. Finally, in FIG. 3 it is illustrated how the riveting station can be made movable so as to accompany a member intended for the fitting of mountings during the riveting process. Contrary to the station 40 of FIG. 2, a common electrode plate for all rivets at the same mounting is not used while, of course, such a plate is also possible, but instead a separate upsetting electrode 60 is used for each rivet. Corresponding abutments are not shown in the arrangement of FIG. 3. As illustrated, it has been assumed in FIG. 3 that four rivets are arranged in a substantially square pattern in the mounting and, thus, four upsetting electrodes 60 are used. 62 indicates return springs and 64 a guide plate for the vertical movement of the electrodes. As illustrated, the guide plate 62 is movable reciprocally by means of pulleys 66 on rails 68 in, e.g., a hydraulic or pneumatic manner, such as indicated schematically by means of a piston 70. At 72 current supply conductors for the upsetting electrodes are illustrated.

A further variety of an upsetting electrode device, allowing a continuous transport of boards provided with mountings during the riveting process, is illustrated in FIG. 4. The upsetting electrodes are here formed as rotatable pulleys 74 with abutting pulleys 76. The electrodes 74 are supplied with current via sliding contacts 78. At 80 it is illustrated how the rotatable electrodes 74 are pressed against the rivet shanks.

In the machine of the present invention it is in the first place desirable to avoid that the riveting is performed in a mechanical way so as to eliminate noise and the other disadvantages which are connected with such a riveting process. Within the scope of the invention, in addition to the electrical riveting described above, riveting by means of ultrasonics is also possible and is well adaptable in the automatic process.

I claim:

1. A method of securing metal mountings on wooden members, comprising:

- a. advancing wooden members in sequence on a conveyor means to a drilling and rivet inserting station,
- b. drilling rivet holes through said member and inserting rivets into said holes, the insertion of said rivets initiated by the termination of said drilling, each of said rivets having a reduced shank portion,

c. advancing said members and said rivets to an assembly station, assembling a mounting having pre-drilled holes with said wooden member, said rivets extending through prebored rivet holes in said mounting,

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d. advancing the wooden members, rivets and mountings to a riveting station and upsetting the rivets by simultaneously applying upsetting pressure and electrical current to said rivets, each of said rivets having a reduced shank portion which is heated and softened by electrical current as said rivet is upset.

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2. A method of securing metal mountings as claimed in claim 1 wherein said assembled members are conveyed to a coloring station, wherein spraying of the rivet heads with a protective color is performed.

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3. A method of securing metal mountings on wooden members as claimed in claim 2 wherein said protective color is sprayed in the form of powder while the rivets are still warm due to the heat generated during the upsetting of said rivets.

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4. A method of securing metal mountings on wooden members as claimed in claim 1 wherein said riveting station comprises stationary electrode rivet upsetting members to simultaneously apply upsetting pressure and electrical current to the said rivets, said members with fitted mountings being brought to a stop during the riveting process.

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5. A method of securing metal mountings on wooden members as claimed in claim 1 wherein said current supply and upsetting means follow the continuous advancing movement of the wooden members during the upsetting process.

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6. A method of securing metal mountings to wooden members as claimed in claim 1 wherein said upsetting process is performed by means of current supply and upsetting electrodes formed as rotatable pulleys, said pulleys being supplied with electric current by a sliding contacts, the members with fitted mountings passing a rivet upsetting station with a predetermined velocity.

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7. A method of securing metal mountings or the like on wooden members, comprising:

a. conveying wooden members in close sequence on a conveyor to a drilling and rivet inserting station,

b. drilling rivet holes and inserting rivets therein, said insertion initiated by the termination of the drilling, said drilling performed on the lower side of said members,

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c. advancing said wooden members with said inserted rivets to a riveting station, said members rotated 180° during said advancement to provide upwardly directed rivet shanks as said member arrives at said riveting station,

d. assembling said wooden member and mountings having preformed rivet holes, said mountings being arranged loosely on said members with the rivets inserted through said mountings,

e. upsetting said rivets at said riveting station,

f. spraying said upset rivets with a protective coating.

8. A method as claimed in claim 7, characterized in that the protective coating is sprayed in the form of powder, when the rivets are still warm due to heat supplied during the riveting, whereby the powder by the heat is caused to form a protective layer on the rivet heads.

9. A method as claimed in any of claims 7, characterized in that rivets are used in the rivet joints, the rivet shanks of which in a manner known per se present a reduced portion, which is adapted by means of electric heating and upsetting to provide the intended securing of the mounting and that the riveting station comprises current supply and upsetting electrodes, by means of which current is automatically supplied to the rivets, the upsetting electrodes simultaneously pressing the rivets in their longitudinal direction against current removing electrodes, serving as abutments.

10. A method as claimed in claim 9, characterized in that the current supply and abutment electrodes are arranged stationary and that members with fitted mountings are brought to sufficient rest during the riveting process.

11. A method as claimed in claim 9, characterized in that the current supply and upsetting electrodes follow the continuous feeding movement of the members during the riveting process.

12. A method as claimed in claim 9, characterized in that the riveting process is performed by means of current supply and upsetting electrodes formed as rotatable pulleys, which are supplied with current via sliding contacts, the members with fitted mountings passing the rivet inserting station with a predetermined velocity.

13. A method as claimed in any of claims 7, characterized in that the upsetting of the rivets is performed by means of ultra-sonics.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,797,096 Dated March 5, 1974

Inventor(s) MATHS S. I. NILSSON

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the first page of the patent after the application number insert --- Foreign Application Priority Data

November 25, 1970 Sweden15981/1970 ---

Signed and sealed this 17th day of September 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

UNITED STATES PATENT OFFICE
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