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Anhalt et al.

[11] **3,797,107**

[45] **Mar. 19, 1974**

[54] **BACKPLANE MANUFACTURE**

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[52] **U.S. Cl.** ..... **29/625**, 29/212 R

[51] **Int. Cl.** **H05k 13/04**, B23q 7/10

[58] **Field of Search** ..... 29/212 R, 200 R, 200 D, 29/625, 212 D, 212 T

[56] **References Cited**

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[57] **ABSTRACT**

A method is described for manufacturing a backplane in which plugs are inserted into apertures in the backplane to mask the surfaces of the apertures. A nonconductive coating is formed on the backplane while the plugs are positioned in such apertures. Thereafter, electrical contacts are inserted into the apertures to remove the plugs therefrom.

5 Claims, 11 Drawing Figures

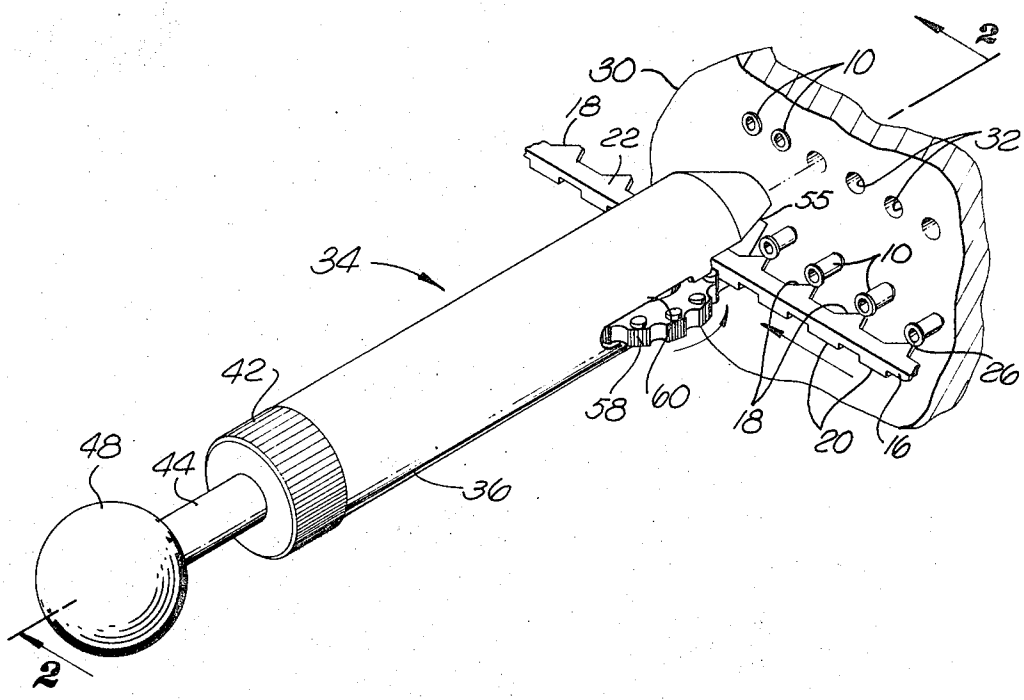


Fig. 1.

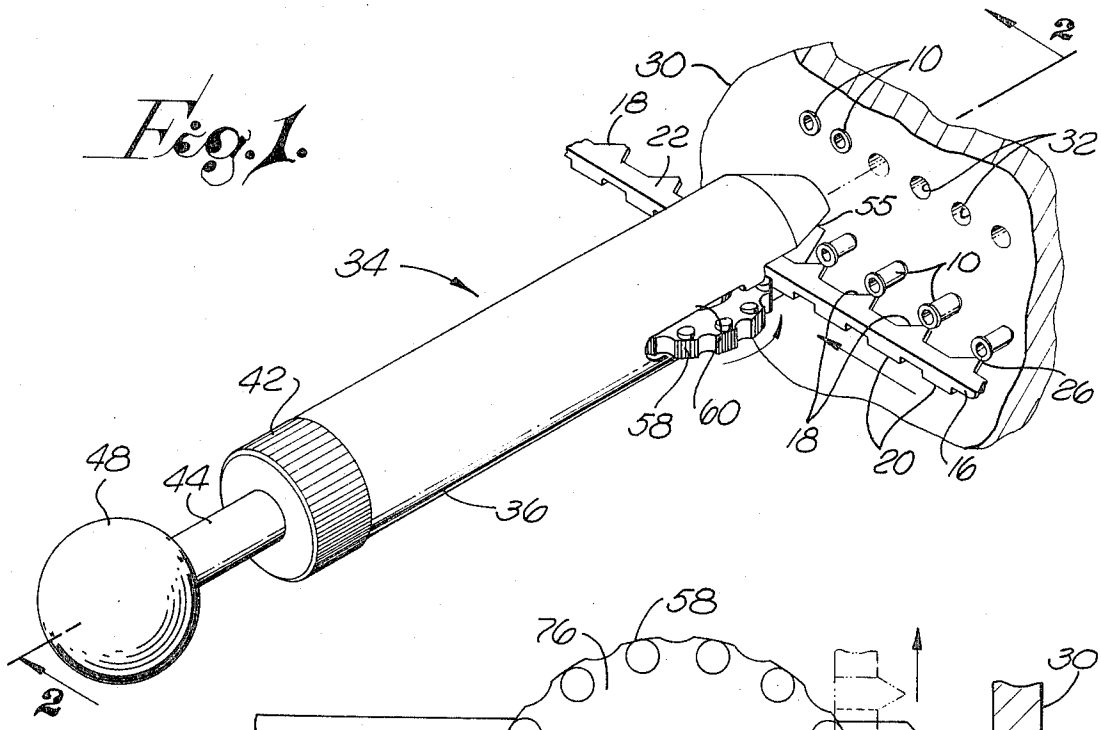


Fig. 7.

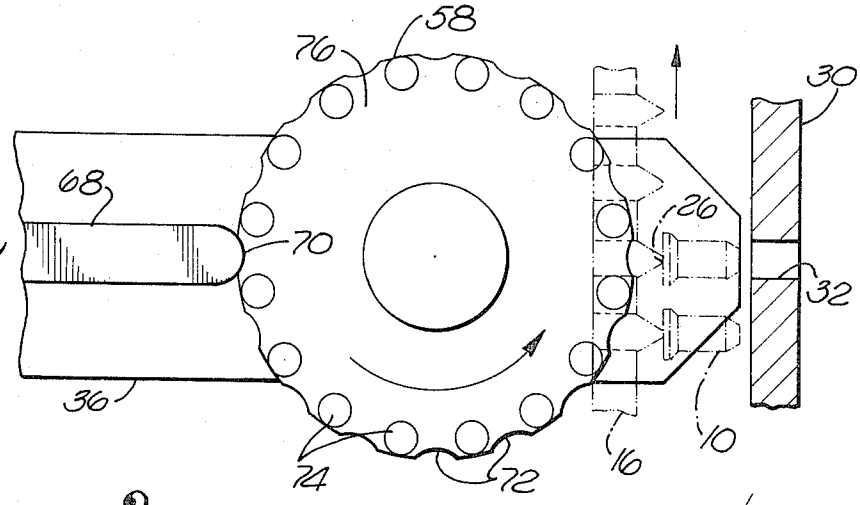


Fig. 8.

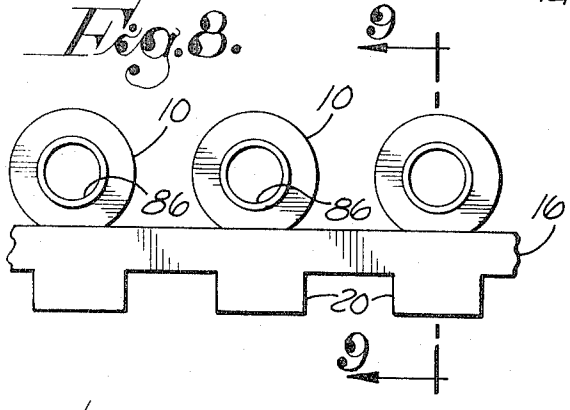


Fig. 9.

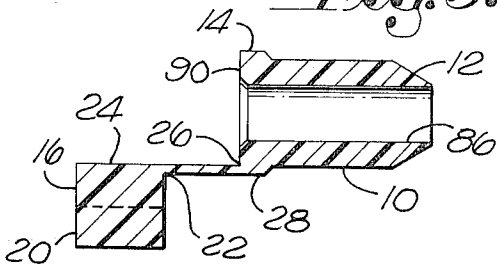


Fig. 10.

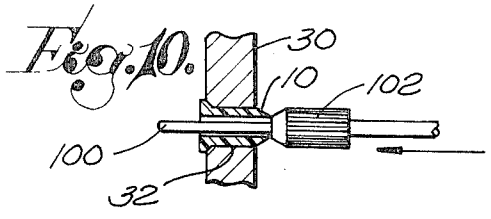
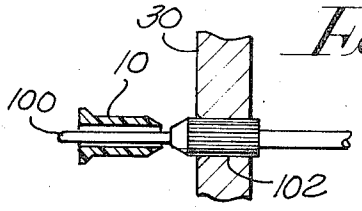


Fig. 11.



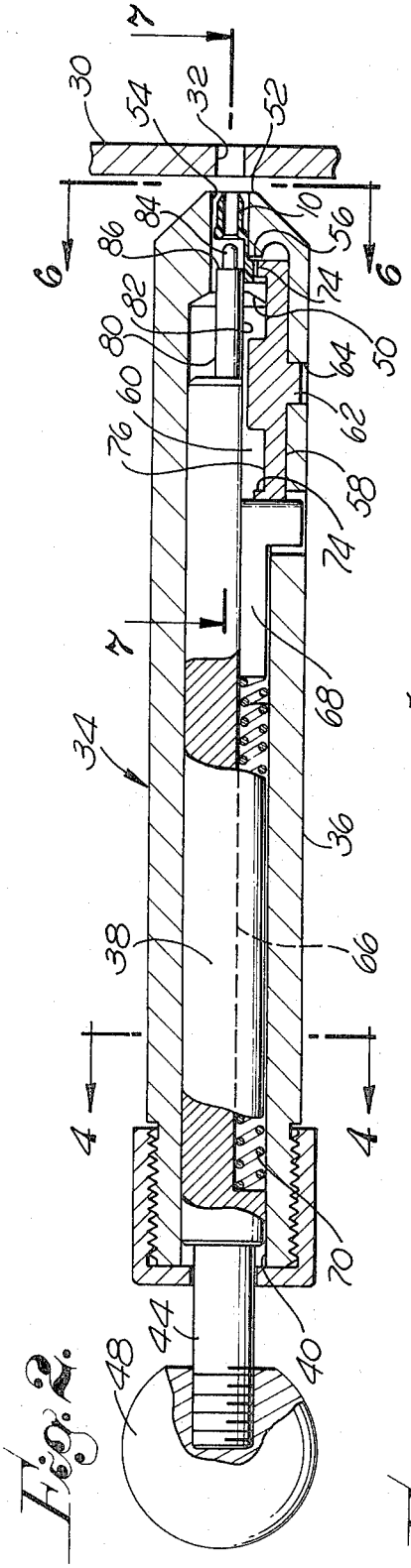


Fig. 2.

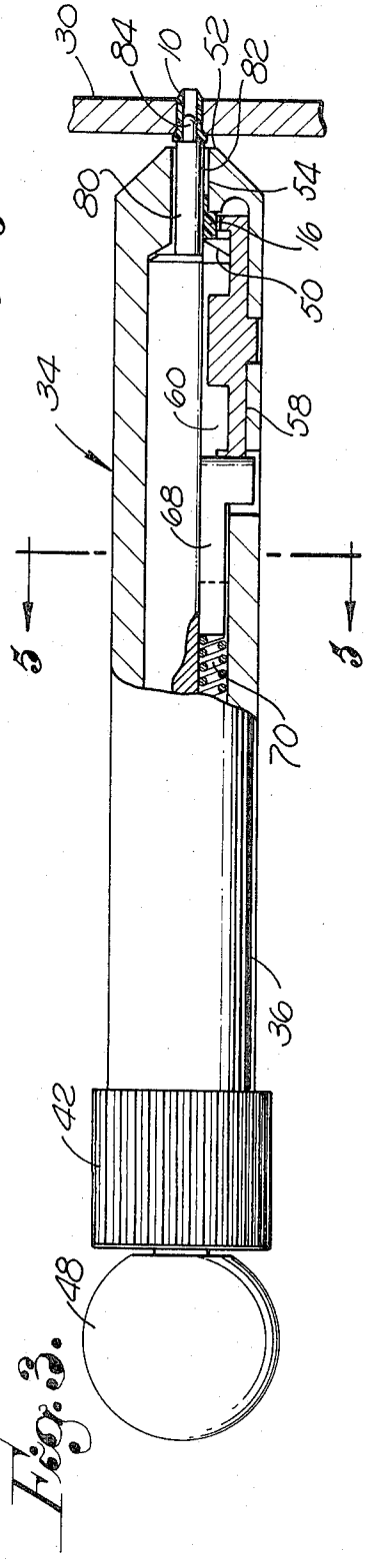


Fig. 3.

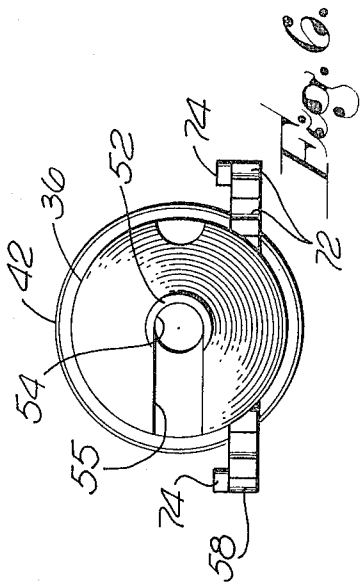


Fig. 6.

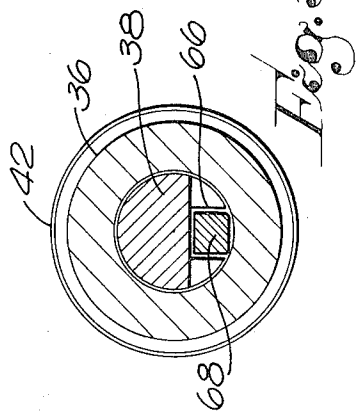


Fig. 5.

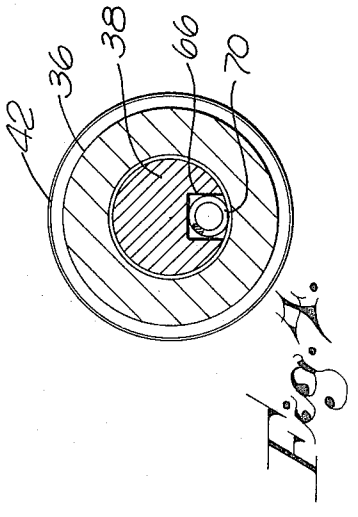


Fig. 4.

BACKPLANE MANUFACTURE

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

This invention relates generally to backplane manufacture and, more particularly, to an improved method for manufacturing backplanes.

2. DESCRIPTION OF THE PRIOR ART

Backplane connector technology is the art of mounting and arranging electrical contacts on a metal plate, typically an aluminum alloy. Such a plate is usually machine-punched to provide a plurality of apertures positioned in a precise grid. After punching the apertures, the backplane is anodized to provide a corrosion-preventing and electrically non-conductive surface layer. The apertures are used for mounting and positioning backplane connector contacts. It is necessary that the contacts be conductively inserted into the anodized backplane. To obtain this conductive connection usually requires drilling or reaming of the apertures to remove the anodizing layer. The anodizing layer is a very hard material and difficult to remove. Thus, the reaming operation is time-consuming and costly. Therefore, what is needed and constitutes the principal object of the present invention, is to provide an improved method for inhibiting the anodizing layer from the surface of backplane apertures.

SUMMARY OF THE INVENTION

According to the principal aspect of the present invention, after a backplane has been punched to provide a plurality of apertures therein, plugs are inserted in selected apertures to mask the surfaces thereof. The backplane is then anodized, while the plugs are positioned in such apertures, so that the surfaces of the apertures will not be anodized. In those apertures where it is desired to make an electrical connection to the backplane, the plugs are removed therefrom, preferably by inserting the electrical contacts into the apertures thereby forcing the plugs out of the apertures in a single step. Thus, by this invention, the step of reaming apertures in backplanes is eliminated thereby substantially reducing the time and expense in manufacturing backplanes.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the tool of the present invention used for inserting plugs in a backplane, a portion of the backplane being illustrated adjacent the forward end of the tool;

FIG. 2 is a partial vertical sectional view taken along line 2—2 of FIG. 1 showing a plug in the tool in position to be driven into a backplane aperture;

FIG. 3 is a partial sectional view similar to FIG. 2 showing the tool after it has inserted a plug into the backplane aperture;

FIG. 4 is a transverse sectional view taken along line 4—4 of FIG. 2;

FIG. 5 is a transverse sectional view taken along line 5—5 of FIG. 3;

FIG. 6 is an end view of the tool taken along lines 6—6 of FIG. 2;

FIG. 7 is an enlarged horizontal sectional view taken along line 7—7 of FIG. 2 showing the indexing mechanism of the tool;

FIG. 8 is an enlarged side elevation of a series of plugs connected to a common carrier strip;

FIG. 9 is a transverse sectional view taken along 9—9 of FIG. 8;

FIG. 10 is a partial sectional view taken through a backplane showing a plug mounted therein with an electrical contact positioned to be inserted into the backplane aperture carrying the plug; and

FIG. 11 is a sectional view similar to FIG. 10 showing the contact mounted in the backplane aperture and the plug removed therefrom.

DESCRIPTION OF THE PREFERRED EMBODIMENT

According to the method of the present invention, a backplane, normally an aluminum plate, is punched to provide a plurality of apertures therein. Plastic plugs are then inserted into selected apertures in the backplane to mask the surfaces of the apertures. Thereafter the backplane is anodized while the plugs are positioned in such apertures to provide a non-conductive coating on the backplane except upon the surfaces of the apertures masked by the plugs. In those apertures where it is desired to position an electrical contact for electrical connection to the backplane, the plug in the aperture is removed and a contact inserted therein. Preferably, this is accomplished in a single step by forcing the contact, or a metallic bushing carrying the contact, into the aperture simultaneously removing the plug from the aperture. Thus, reaming of the backplane apertures is not necessary since no anodization has occurred where the plugs are mounted in the apertures. Thus, a substantial reduction in manufacturing time and expense in manufacturing backplanes is provided by the present invention.

Reference is now made to the drawings which illustrate the plastic plugs utilized in the method of the present invention and a tool for inserting the plugs in backplane apertures. The plugs, generally designated **10**, are cylindrical plastic elements formed at their forward ends with a chamfered guiding surface **12** and at their rear ends with an outwardly extending flange **14**. The plugs are connected in parallel juxtaposition to a common flexible carrier strip **16** by tongues **18**. The strip **16** extends transversely of the plugs **10** and is formed on its lower surface with teeth **20** in alignment with the plugs. The tongues **18** are of generally triangular configuration. The base **22** of each tongue is adjacent to and integral with the strip **16**. The tongue extends laterally from the strip adjacent to its upper surface **24**. The apex or narrow section **26** of the triangular tongue is integral with and connected to the bottom **28** of flange **14** on the plug. Thus, the upper surface **24** of the strip **16**, the tongue **18**, and the bottom of the plug lie in substantially the same horizontal plane.

Referring now to FIG. **1**, there is seen a section of a backplane **30** having a plurality of apertures **32** formed therein. Plugs **10** are shown as being positioned in two of the apertures. The tool for inserting the plugs in the backplane apertures, generally indicated by reference numeral **34**, comprises an elongated, cylindrical barrel **36** having a plunger **38** slidably mounted within the bore **40** within the barrel. A retaining cap **42** is threadably mounted on the rear portion of the barrel **36**. A stem **44** on the plunger **38** extends outwardly through an opening **46** in the cap and terminates in a handle **48**.

The bore 40 of the barrel 36 terminates in a shoulder 50 which is spaced from the forward end 52 of the barrel. A reduced diameter bore 54 extends from the bore 40 to such forward end. A transverse slot 55 extends from the bore 54 to one side of the barrel 36 as best seen in FIGS. 1 and 6. As seen in FIGS. 2 and 3, a transversely extending passageway 56 passes through the barrel body 36 and intersects the bottom of the bore 54 near the rear of the bore but forward of the shoulder 50. The sidewalls of the passageway 56 are spaced apart a distance slightly greater than the width of the teeth 20 on the carrier strip 16 which carries the plugs 10. The height of the slot 55 is sufficient to receive the plugs 10 carried by the strip 16. The strip of plugs is fed through the passageway 56 by an indexing wheel 58 which is rotatably mounted in a generally horizontally extending cavity 60 extending to the opposite sidewalls of the barrel 36. As best seen in FIG. 1, the wheel 58 projects from the sides of the barrel so that it can be turned by thumb and finger and held in position to align successive plugs 10 with the bore 54. The wheel 58 is rotatably mounted in the cavity 60 by means of a cylindrical boss 62 which extends into a vertically extending cylindrical opening 64 in the lower wall of the barrel 36.

A longitudinally extending channel 66 of generally square cross-section is formed in the lower portion of the plunger 38. A pawl or detent bar 68 is slidably mounted in the forward portion of the channel 66 and is urged in a forward direction by means of a coil spring 50 lying lengthwise in the channel. The forward portion of the pawl 68 is formed with a curved surface 70, as best seen in FIG. 7, which is engageable with concave recesses 72 formed about the outer periphery of the indexing wheel 58. The spring biased pawl serves to releasably hold the wheel in a position wherein the respective plugs 10 on the strip 16 are in alignment with the bore 54. Upstanding pins 74 extend from the upper surface 76 of the wheel 58 intermediate the recesses 72. These pins are of a height which allows them to engage the sides of the teeth 20 on the carrier strip 16 so that upon rotation of the indexing wheel the strip will be fed through the transverse passageway 56.

The plunger 38 is provided at its forward end with a small cylindrical section 80 of a diameter less than that of the bore 54 in the forward end of the barrel. The forward section 80 of the plunger is dimensioned so that its lower surface 82 is spaced above the bottom of the bore 54 a distance slightly greater than the thickness of the tongue 18 on the carrier strip 16 so that the forward section of the plunger may slide over the upper surface of the tongue 18. A guide pin 84 is formed on the forward section 80 of the plunger. This pin has a diameter slightly less than the diameter of the bore 86 in the plug 10 and is coaxial therewith when the plug is positioned within the bore 54 of the barrel. In the use of the tool 34 in the method of the present invention, the tool is aligned with an aperture 32 in the backplane 30. The strip 16 carrying the plugs 10 is fed through the passageway 56 of the barrel by rotating the indexing wheel 58. When a plug is brought into alignment with the bore 54 as seen in FIG. 2, the plunger 38 is moved forwardly to insert the pin 84 within the plug bore 86. After the pin is forwardly inserted in such bore, the shoulder 86 formed between the pin and the forward section 80 of the barrel engages the rear 90 of the plug. Further forward movement of the plunger will cause the tongue 18 to tear at its connection to the plug at the apex 26 and the plug will be moved out of the bore 54 and driven into the aperture 32 in the backplane, as seen in FIG. 3. Thereafter, the plunger is retracted and the indexing wheel rotated to bring successive plugs into alignment with the bore 54 of the barrel for further plugging operations.

Reference is now made to FIGS. 10 and 11 which illustrate an electrical contact element 100 which is mounted in a metal bushing 102. The contact is passed through the plug 10 in the backplane 30 until the bushing engages the plug. The bushing is then forced in a rightward direction as indicated by the arrow in FIG. 10 to push the plug 10 out of the backplane aperture 32 so that the bushing replaces the plug as seen in FIG. 11. If desired, the bushing 102 can be eliminated and the contact 100, if formed with a sufficiently wide body portion, may be press-fitted directly in the aperture 32. Thus, in a single step, the plug 10 is removed from the backplane aperture 32 and an electrical contact is positioned in the backplane in electrical engagement therewith. Alternatively, the plug 10 may be removed from the backplane in one step and the contact mounted in the backplane in a second subsequent step. In either case, by the method of the present invention, wherein the aperture surfaces 32 are masked during the anodizing procedure, the time-consuming and expensive procedure of reaming plated backplane apertures is eliminated.

Although we have herein shown and described our invention in what we have conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of our invention which is not to be limited to the details disclosed herein but it to be accorded the full scope of the claims so as to embrace any and all equivalent structures and methods.

What is claimed is:

1. In the method of manufacturing a backplane, the steps comprising:
   - forming a plurality of apertures in the backplane;
   - inserting plugs in selected apertures in said backplane to mask the surfaces of said apertures;
   - forming a nonconductive coating on said backplane while said plugs are positioned in said selected apertures;
   - thereafter removing at least some of said plugs from their respective apertures; and
   - mounting conductive elements in at least some of said aper-tures from which said plugs are removed.

2. A method as set forth in claim 1 wherein:
   - said backplane is formed of aluminum; and
   - said coating is formed by anodizing said backplane.

3. A method as set forth in claim 1 wherein:
   - said plugs are connected to a common carrier strip prior to insertion into said selected apertures; and
   - said plugs are torn from said strip upon insertion into said apertures.

4. A method as set forth in claim 1 wherein:
   - said plugs are removed from said apertures by mounting said conductive elements in said apertures.

5. In the method of manufacturing a backplane, the steps comprising:

forming an aperture in an aluminum backplane;

inserting a plug in said aperture to mask the surfaces of the aperture;

anodizing said backplane while said plug is positioned in said aperture; and

inserting a conductive element into said aperture to remove said plug therefrom.

* * * * *