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Schlotthauer

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[54] **APPARATUS FOR SELECTIVE PLATING**

[75] Inventor: **Roy Schlotthauer,** Phoenix, Ariz.

[73] Assignee: **Motorola, Inc.,** Chicago, Ill.

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[52] **U.S. Cl.**..... **204/224 R;** 204/15; 204/198

[51] **Int. Cl.**[2]..... **C25D 5/02**

[58] **Field of Search**... 204/224 R, 15, 198, 202–205

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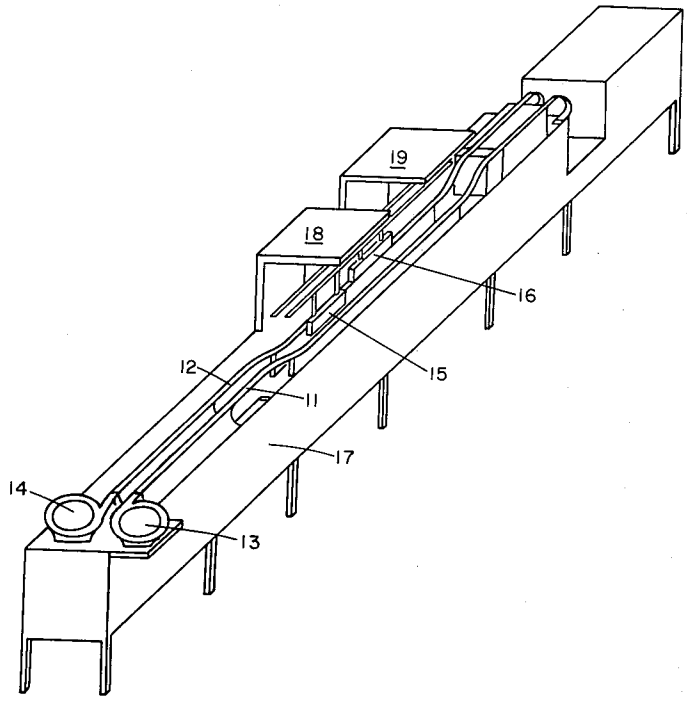
Primary Examiner—T. M. Tufariello

Attorney, Agent, or Firm—Vincent J. Rauner; Henry T. Olsen

[57] **ABSTRACT**

A method of selective or "spot" plating, particularly electroplating, of articles including the steps of masking predetermined portions of the article to be plated so that those portions will not be contacted by the plating solution, establishing an electrical connection to conductive portions of the article and then contacting the unmasked portions of the article with plating solution, for sufficient length of time to plate those portions. The apparatus includes means for feeding the article into an apertured conveyor belt which forms the mask between the portions of the article to be plated and those portions which are not to be plated. The masked portion of the article is then contacted by a conductive liquid and the unmasked portion of the article contacted by the plating solution, through means of a reciprocating plating head which travels with the conveyor for a sufficient length of time to affect the plating of the unmasked portions of the article.

3 Claims, 5 Drawing Figures



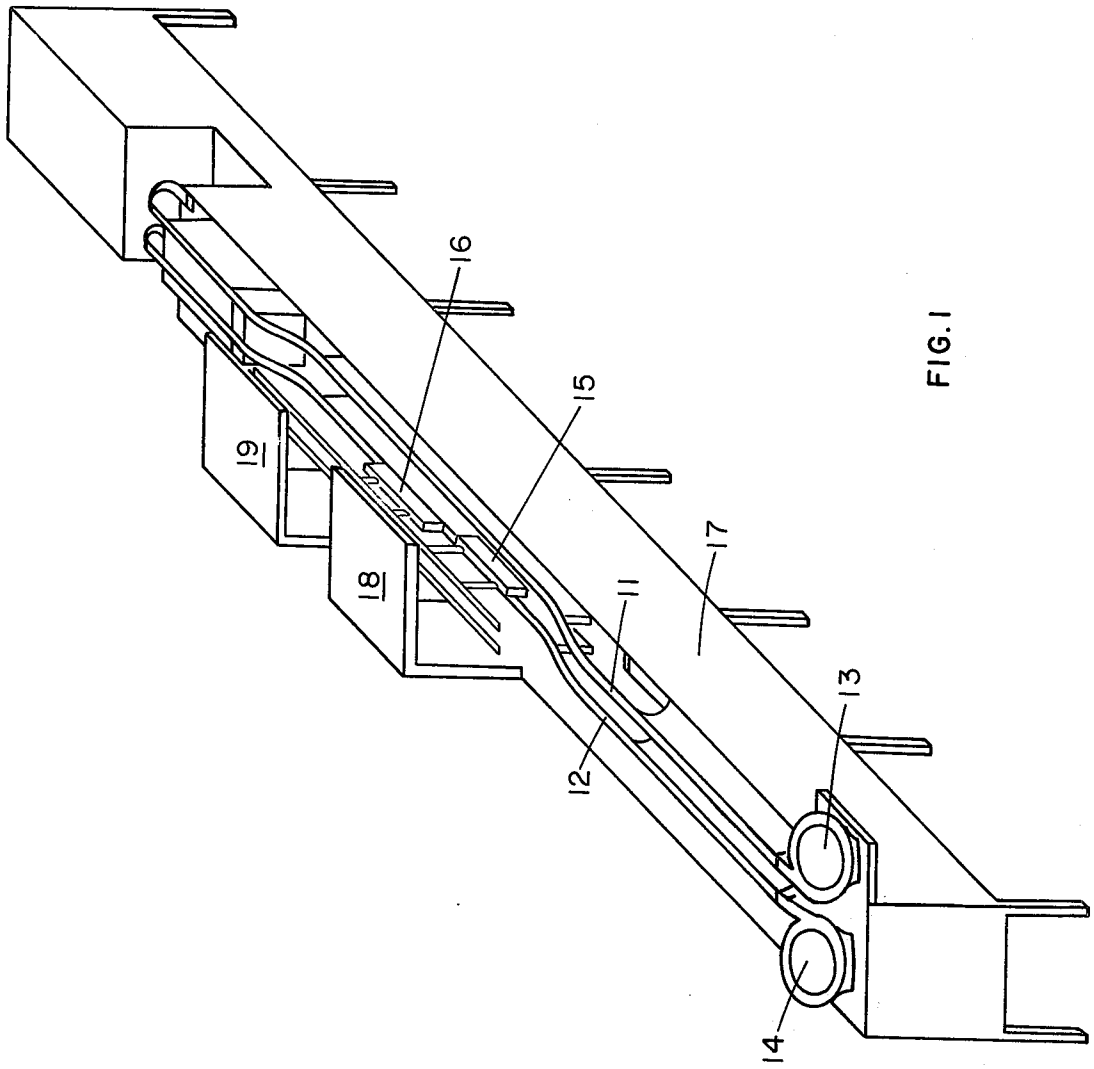


FIG. 1

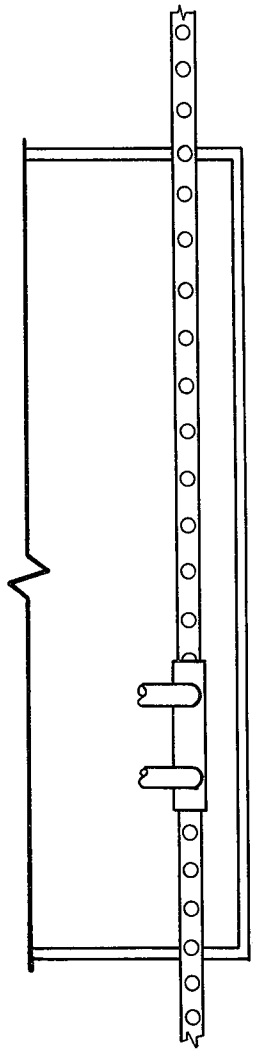


FIG. 2A

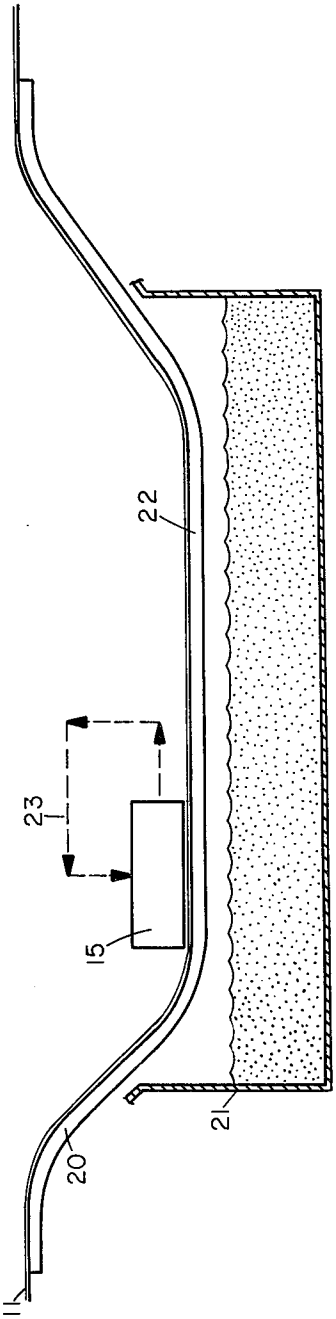


FIG. 2B

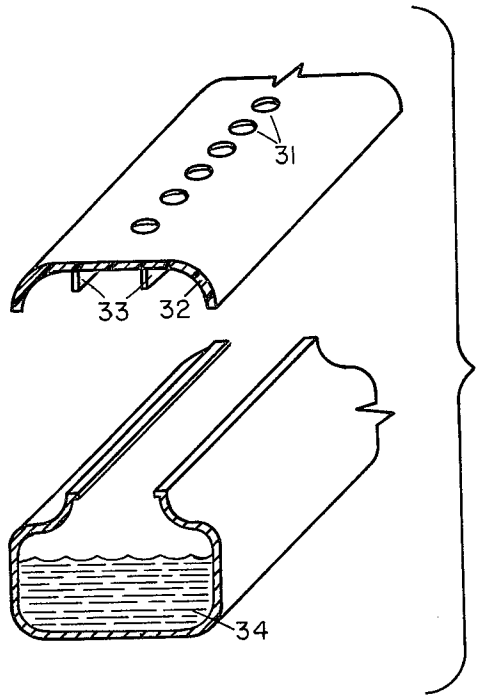


FIG. 4

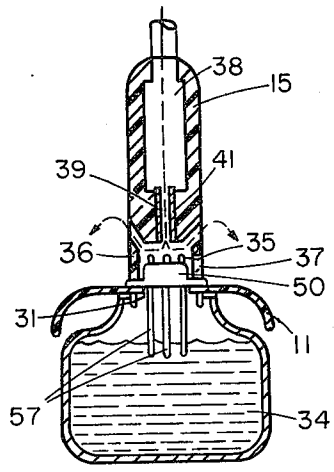


FIG. 3

APPARATUS FOR SELECTIVE PLATING

BACKGROUND OF THE INVENTION

This invention is related to a method and apparatus for electroplating articles, and more particularly to a method and apparatus for plating semiconductor package headers.

Previous attempts to selectively plate transistor headers have not been successful, as they have been too cumbersome to be adapted for mass production purposes. By selective plating is meant, as related to transistor headers, the plating of only the base and inner leads of the header and not the outer portion of the base and the outer leads. To accomplish this previously required complicated or manual procedures which were not adaptable to mass production. As a result, most transistor headers have been bulk plated, which is somewhat wasteful of the plating material.

SUMMARY OF THE INVENTION

It is therefore an object of the invention to provide a method of selectively plating articles.

A further object of the invention is to selectively plate transistor headers.

A still further object of the invention is to provide a method and apparatus for selectively plating transistor headers which is suitable for mass production.

In accordance with these objects, there is provided a method and apparatus for automatically masking the transistor headers, contacting portions of the transistor header to render those portions to be plated electrically conductive, and then contacting only those portions of the article to be plated with the plating solution.

THE DRAWINGS

Further objects and advantages of the invention will be understood from the following complete description and from the drawings wherein:

FIG. **1** is a perspective view somewhat schematically of an assembly line for selectively plating transistor headers in accordance with a preferred embodiment of the invention.

FIGS. **2***a* and **2***b* are a top and side view further illustrating the operation of the apparatus in contacting the transistor headers.

FIG. **3** is a cross-section of a detail illustrating the operation of the apparatus.

FIG. **4** is an exploded view depicting the relationship of the conveyor belt to the electrical contact mechanism.

COMPLETE DESCRIPTION

The method of the present invention will be better understood by reference to the preferred embodiment of the apparatus which, as shown in FIG. **1**, includes two parallel conveyor lines **11** and **12.** Each conveyor line is fed with articles to be selectively plated from vibratory feeder bowls **13** and **14.** The conveyor belts **11** and **12** then feed the articles to reciprocating plating heads **15** and **16** and then to an unload station whereat the articles can be removed and inspected. All of the foregoing can be mounted on and within a cabinet **17.** Since the plating solution may give off undesirable odors and gasses, hood sections **18** and **19** may be provided over the actual plating area.

After the articles are fed onto the conveyor belt **11** from the feeder, the track of the conveyor slopes downwardly at **30** (FIG. **2**) toward the interior of the cabinet support **17** within which a plating solution recovery tank **21** and a pump for circulating the plating solution through the plating heads is located. At the lower part **22** of the conveyor track, the plating head **15** moves down into contact with the articles on the conveyor, then travels with the conveyor while the plating takes place, then moves upwardly and returns to plate the next group of articles, as indicated by the dashed travel line **23.** The relationship of the conveyor belt **11** with relation to the plating head and its configuration, is illustrated in detail in FIGS. **3** and **4** wherein it will be noted that the conveyor belt has a plurality of centrally spaced masking apertures **31** centrally located therein and the belt has downwardly curved wings on either side **32.** The underside of the conveyor belt is provided with alignment guides **33.** The alignment guides **33** cooperate with suitable members of the conveyor pulleys and the contactor tank **34** to maintain the conveyor belt **11** in its proper track. The plating head **15** includes a lower plating chamber **35** defined by downwardly extending side walls **36, 37** in an upper reservoir chamber **38.** Suitable valving means may be provided in the inlet **39** between the reservoir chamber and the plating chamber. Since the plating solution flows continuously from the plating reservoir **38** to the plating chamber **35** during the plating operation, overflow ports **39** provide an outlet for the plating solution, which then drains out over the wings **32** of the conveyor belt **11** for return to the plating tank **21.**

Insofar as previously described, the apparatus would be suitable for electroless plating, but is more particularly suitable for electrolytic plating and, therefore, the contactor tank **34** contains a conductive liquid **40,** such as mercury, which will establish one electrical connection to the article to be plated. The other electrical connection to the plating solution is provided by a conductive contact **41** lining the inlet port **39.** Thus, for example, the contact **41** provides the anode to the plating solution and the conductive liquid **40** provides the cathodic contact, completing the electrolytic plating circuit.

The apparatus is particularly adapted for selectively plating transistor headers. As shown in FIG. **3** the header includes a base **50** and a plurality of leads **57,** one of which is electrically connected to the base and the others being insulated therefrom. The level of conductive liquid **40** is such that the leads **57** are in electrical contact therewith.

While the invention has been disclosed by way of certain preferred embodiments, it will be appreciated that suitable modifications may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. Apparatus for selective plating of articles having conductive portions to be plated and conductive portions extending therefrom not to be plated comprising a conveyor belt having apertures; means for feeding the articles into the apertures with the portions not to be plated extending therethrough, thereby masking those portions of the article from contact by the plating solution; means for moving the conveyor belt so that conductive liquid means establish an electrical connection to those portions of the article extending through the belt; and, plating header means for contacting the unmasked portions of the article with plating solution for a sufficient length of time to plate those portions.

2. Apparatus as recited in claim 1 and further including means for reciprocating the plating head means in a rectilinear travel pattern whereby the plating header means travels with the conveyor belt for said time.

3. Apparatus as recited in claim 1 and further including means for effecting the flow of plating solution to and through said plating head and whereby said conveyor belt is configured to drain the excess plating solution away from contact with the conductive liquid means.

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