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# United States Patent [19]

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Grosswald et al.

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[54] **METHOD FOR THE MANUFACTURE OF PHARMACEUTICAL CELLULOSE CAPSULES**

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[21] Appl. No.: **461,026**

[22] Filed: **Jun. 5, 1995**

### Related U.S. Application Data

[63] Continuation of Ser. No. 377,669, Jan. 24, 1995, Pat. No. 5,698,155, which is a continuation of Ser. No. 893,091, May 29, 1992, abandoned, which is a continuation-in-part of Ser. No. 708,023, May 31, 1991, abandoned.

[51] Int. Cl.<sup>6</sup> ..... **B29C 41/14; B29C 41/40; B29C 41/46**

[52] U.S. Cl. .... **264/304; 264/301; 264/327; 264/402; 425/270; 425/275**

[58] Field of Search ..... **264/306, 255, 264/299, 304, 305; 425/269-275, 327, 402**

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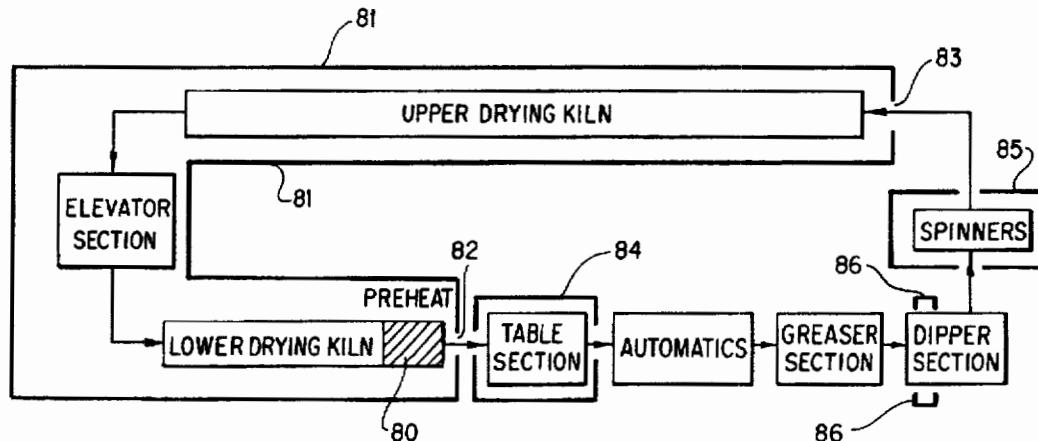
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Primary Examiner—Angela Ortiz  
Attorney, Agent, or Firm—John L. Lee

### [57] ABSTRACT

A method and apparatus for manufacturing pharmaceutical capsules use an aqueous solution of a thermogelling cellulose ether composition and use capsule body pins and capsule cap pins as molds. The method involves heating the pins, dipping the pins into the solution to cause the solution to gelatinize on the surface of the pins, removing the pins and drying the gelatinized solution on the surface of the pins to form capsule bodies and capsule caps. Pins are heated pre-dip and post-dip to facilitate gelating. Counterflow air is applied to provide drying from the inside. Capsule parts are removed by gripping. Capsule parts may have a thick wall and a stiffening ring.

**20 Claims, 15 Drawing Sheets**



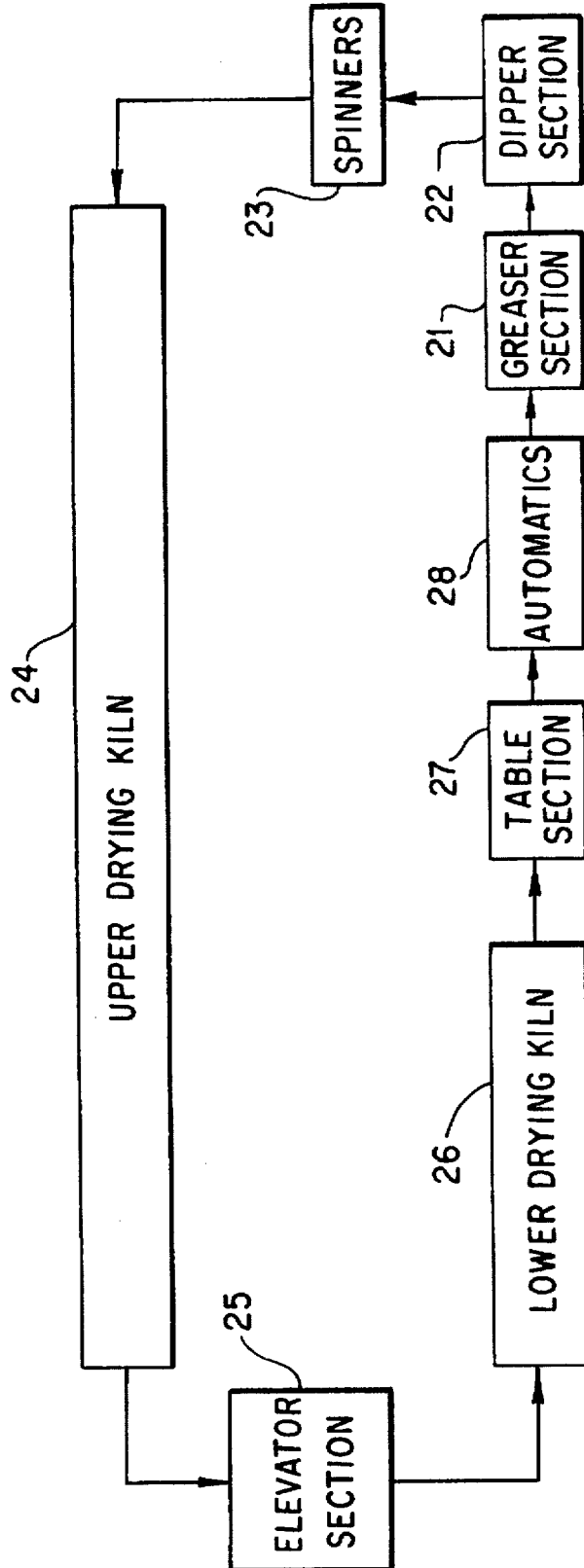
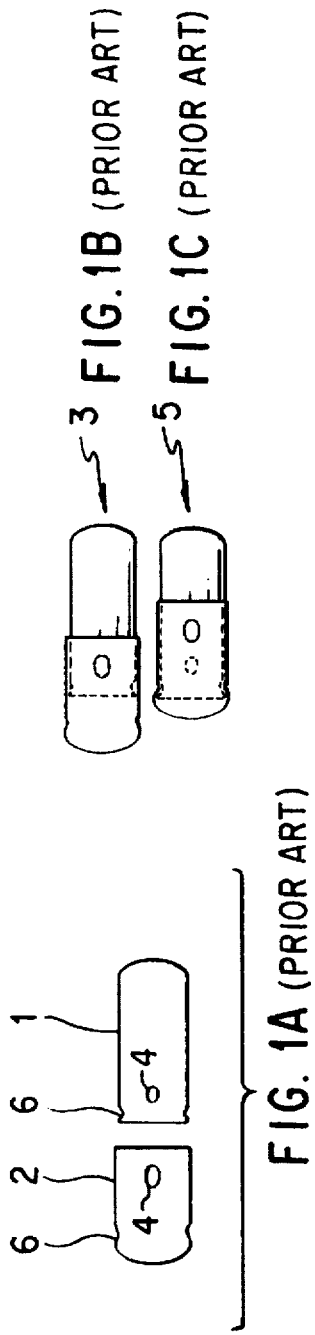
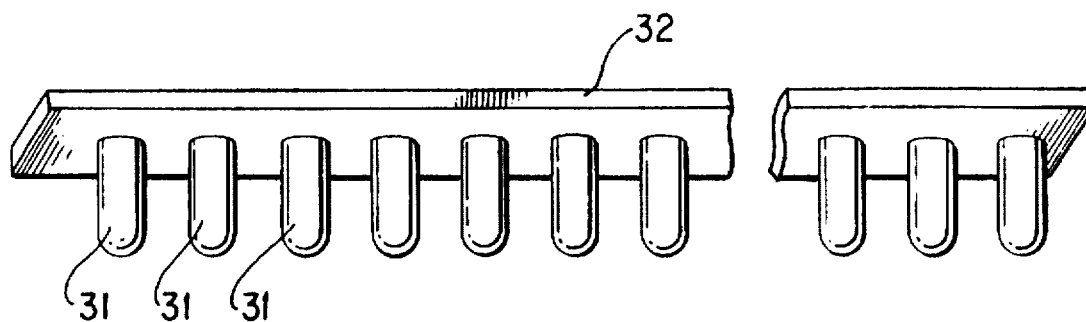
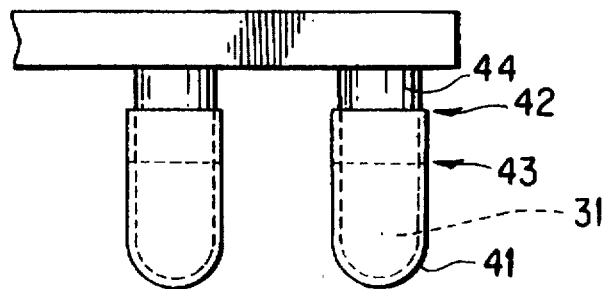


FIG. 2 (PRIOR ART)



**FIG. 3**  
(PRIOR ART)



**FIG. 4**  
(PRIOR ART)

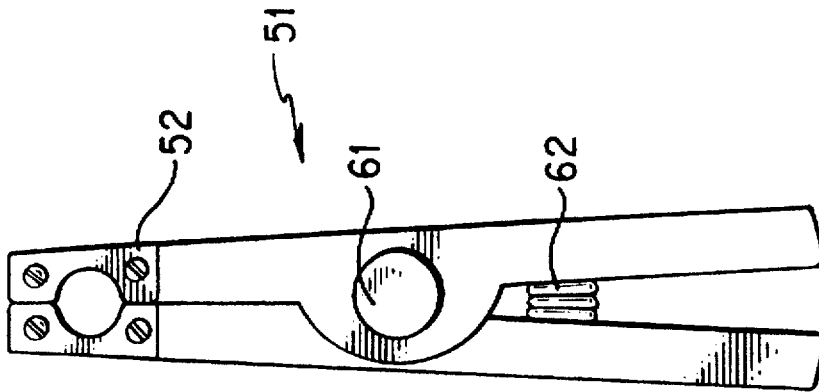


FIG. 6  
(PRIOR ART)

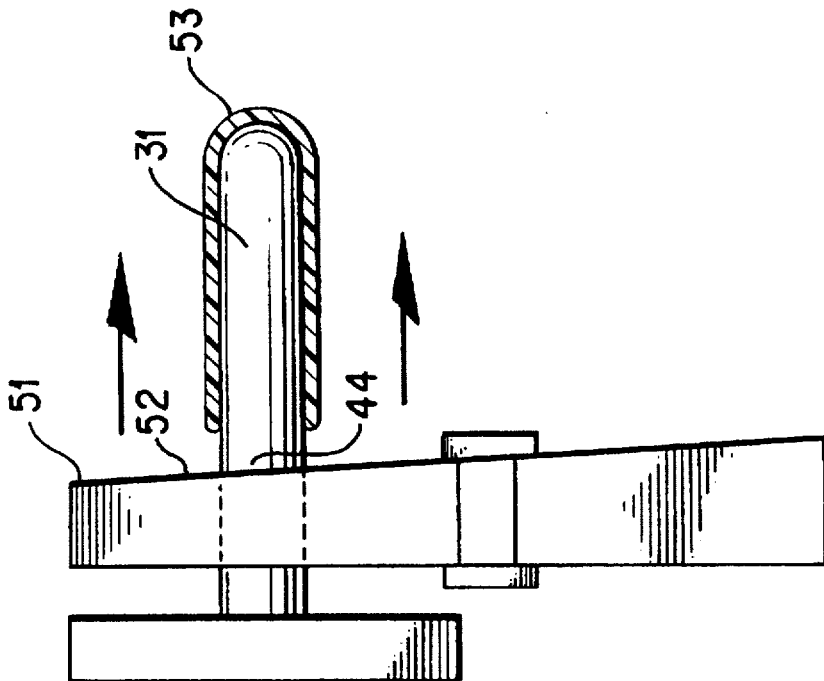


FIG. 5  
(PRIOR ART)

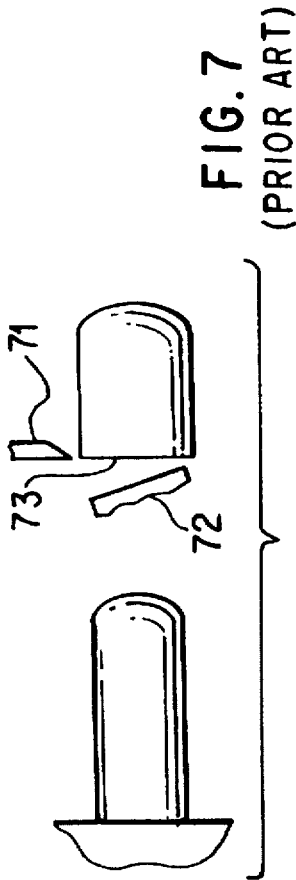


FIG. 7  
(PRIOR ART)

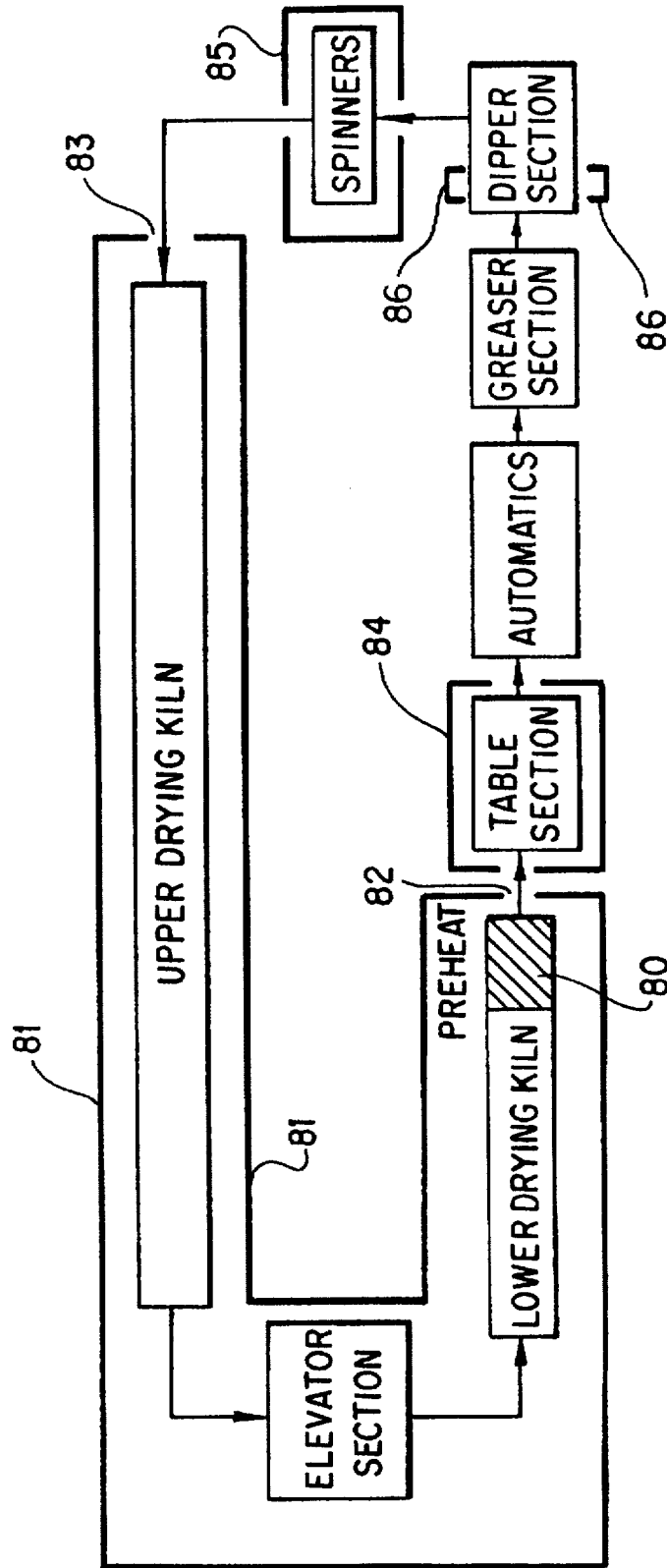


FIG. 8A

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