Assembly technique of the 920M microminiature computer proves feasibility of quantity production methods

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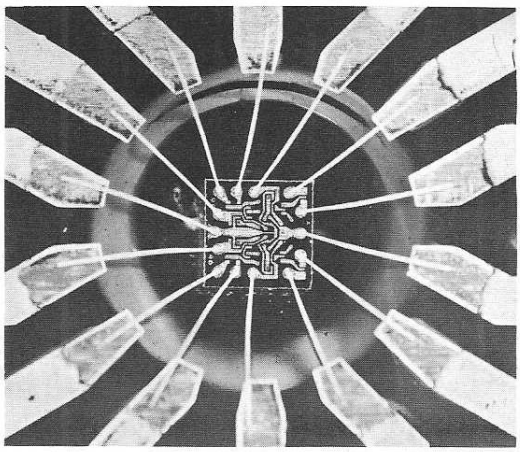

The 920M microminiature computer has been designed for quantity production and for extreme ease of servicing. It is constructed from about 450 inexpensive throw-away modules and includes a miniature 8,192-word core store, all housed in three hinged segments, two containing logic and the other the store and its circuitry. There are two basic forms of non-reparable throw-away module, one for logic circuitry and the other for store circuitry. Of the 450 modules there are only 38 sub-types so that spares complement is kept to a minimum.

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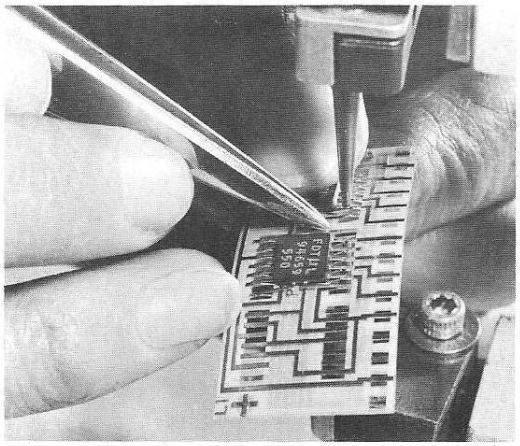

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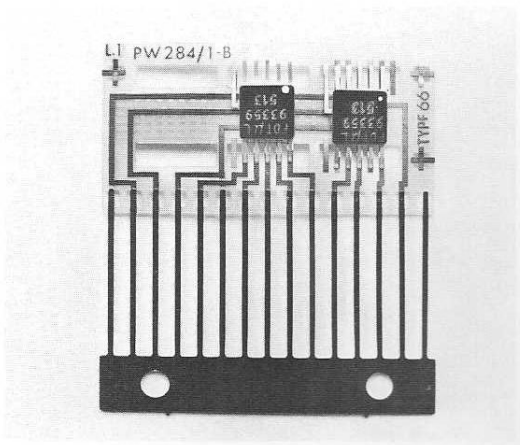

Assembly of a logic module is illustrated in *figures 1, 2* and *3*. A typical integrated circuit chip, smaller than a pin-head, joined to its interconnecting leads before final sealing within its "flat-pack" is shown in *fig. 1*. In *fig. 2* a complete and fully tested flat-pack is being welded to an etched nickel-mylar multi-layer interconnection circuit. *Fig. 3* shows the logic assembly before it is "potted", together with an aluminium heat-sink, to form an easily handled unit unaffected by vibration. The backwiring interconnection system used throughout the 920M is by the etched nickel-mylar multi-layer printed circuitry technique developed by Elliott-Automation. This technique, illustrated in *figures 4, 5,* and *6,* is an important factor in the suitability of the 920M for quantity production. *Fig. 4* shows inter-connecting tabs being turned up on a typical mylar layer before it is laid on to a back-wiring board stack in *Fig. 5*. *Fig. 6* shows the tabs being resistance welded to the header-pins of a backwiring stack which may hold twenty or so mylar layers.

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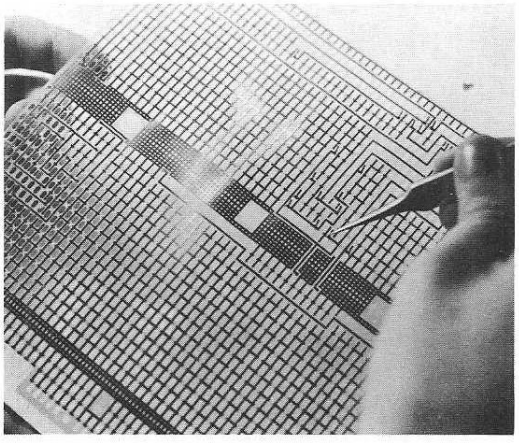

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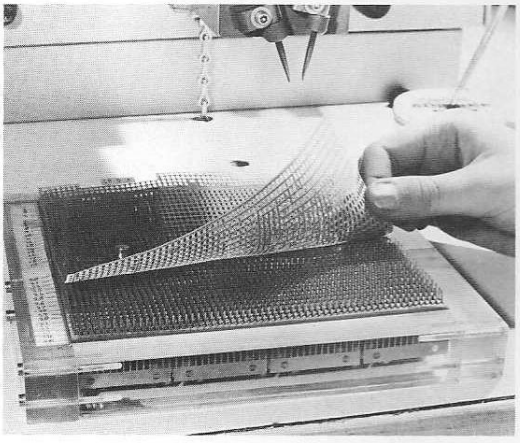

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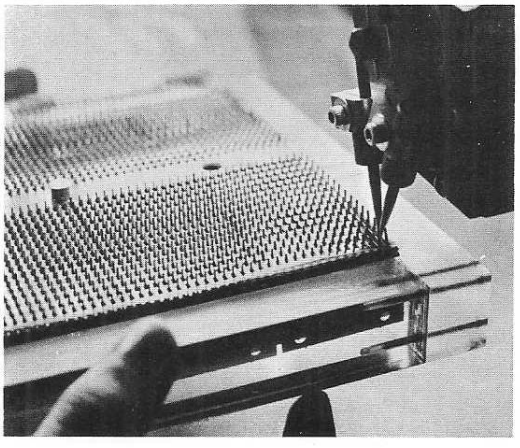

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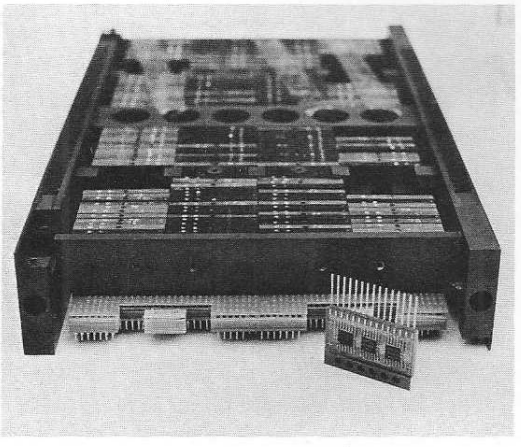

One of the two logic segments of the 920M computer is shown in *fig. 7* with, in the foreground, a completed logic module which will be plugged into one of the spaces remaining in the back-wiring board of the segment.

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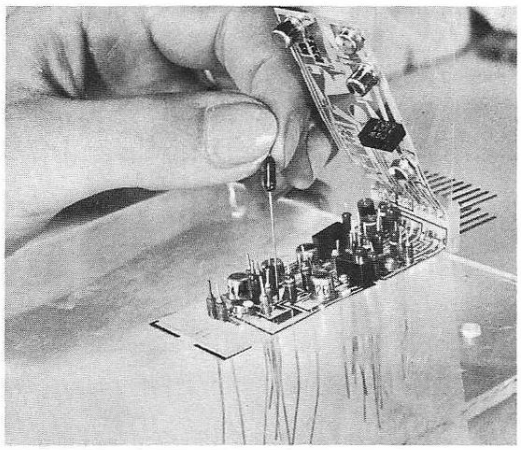

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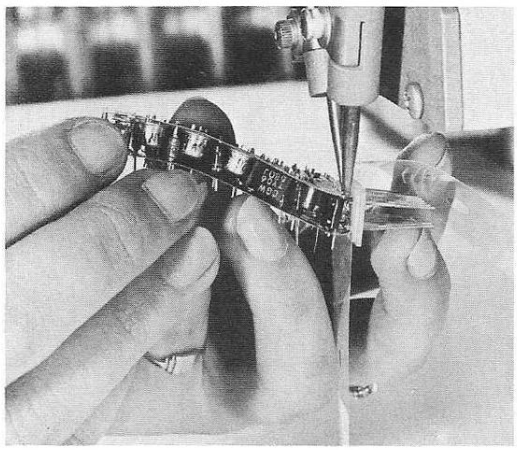

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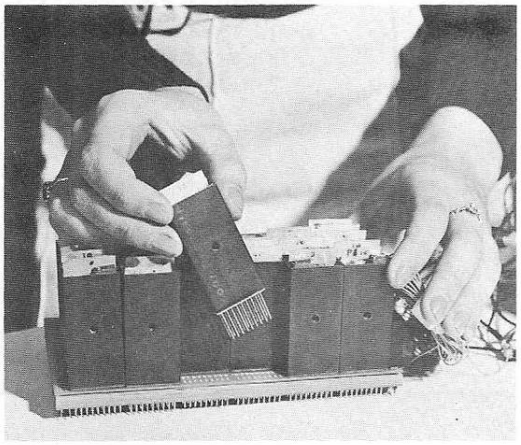

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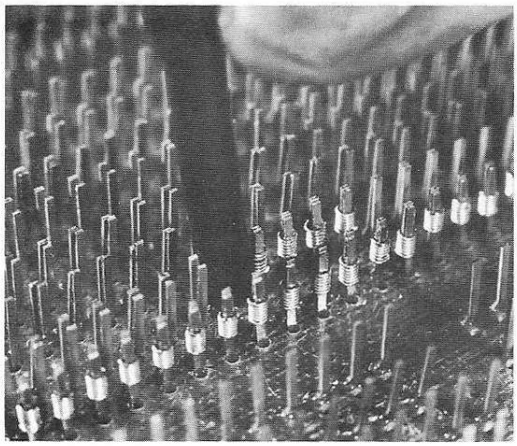

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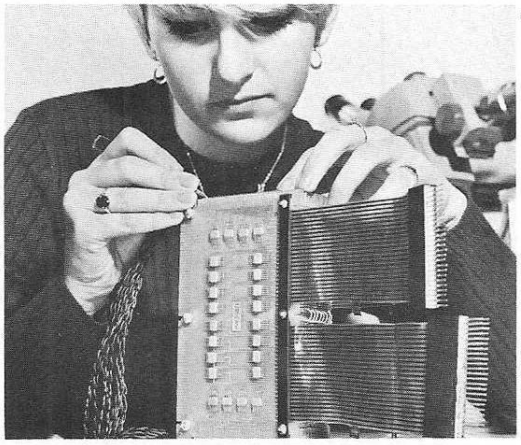

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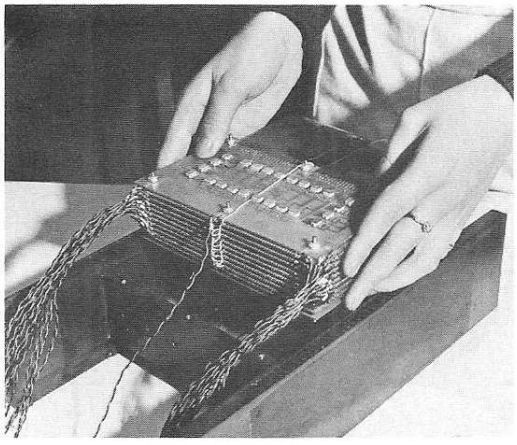

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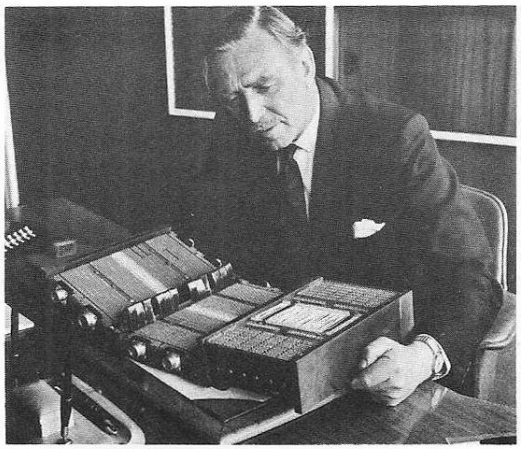

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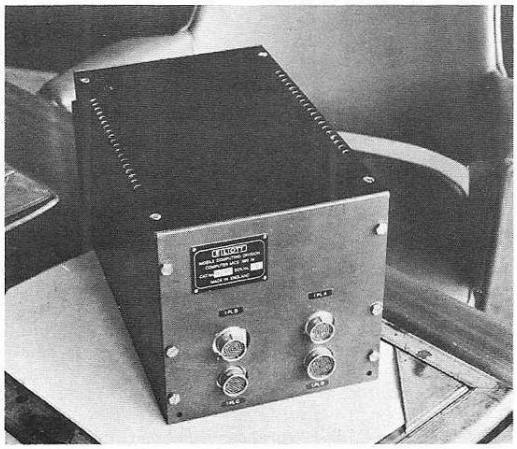

The mylar backwiring layers can be seen protruding beneath the segment.

Assembly of a typical 920M store module is illustrated in *figs. 8 and 9*. A neat, high density packing technique has been devised for the store modules and the illustrations show how the components, all having weldable leads, are sandwiched between an etched-nickel-mylar interconnection pattern. *Fig. 10* shows a store module in its final encapsulated form being plugged into the backwiring board of a 920M store segment. All the modules, both logic and store types, are wire-wrapped to corresponding backwiring board pins *(fig. 11)* allowing easy removal and replacement during maintenance.

The 920M core store being checked in *fig. 12*, consists of 7 epoxy-glass printed circuit boards bearing an array of cores on each side to give an 18-bit 8,192-word capacity. The drive wires are selected by a diode matrix, the diodes of which are mounted directly on the core stack itself and are visible in *fig. 12*. By mounting the diodes in this way store connection terminals are reduced in number from 450 to 156. *Fig. 13* shows the core stack being placed in the 920M store segment.

Flexible film wire connectors link the three segments of the 920M computer which, when complete, opens out like a book for easy access to all parts (*fig. 14*). When closed up (*fig. 15*) the 920M measures only 12.56″ x 7.50″ x 7.63″. This three-layer configuration in the form of a $\frac{3}{4}$ ATR package for airborne mounting is ideal for the computer's aerospace applications e.g. the Europa I satellite launcher and advanced military aircraft.

Brief details of the 900 Series' specification and applications are given in the table overleaf