Methods for manufacturing microminiature solid state devices and apparatus for use in such methods.

This invention relates to methods for manufacturing a microminiature solid state device, particularly but not exclusively a semiconductor device. The invention further relates to apparatus for use in these methods.

Well-known microminiature devices are semiconductor devices, for example discrete transistors. Other examples include surface acoustic wave devices.

In the manufacture of microminiature solid state devices there are known techniques which require the accurate orientation of a header of the device. For example, a known technique for making wire connections between a device body and lead pins of a header of the device necessitates the accurate orientation of the header, so that the lead pins and the electrodes of the device body are correctly aligned for the subsequent wire bonding step. Such a technique, is multiwedge wire bonding and is described in U.K. Patent Specification No. 1,127,439. In this technique the wire bonding step is effected by thermocompression bonding.

In a previously used method of orientation the header is mounted in a carrier strip, which has rectangular holes cut along its length. The holes restrain the header from excessive rotation while allowing it a certain degree of rotational freedom. The lead pins of the header extend through the body of the header to form contact posts above the body and terminal leads below the body. The contact posts have widened heads to form a larger contact area for the lead pins. The header is mounted in the strip in approximately the desired orientation so that all the terminal leads of each header extend through a hole in the strip. The strip is then introduced into the work area of a multiwedge wire bonding machine. When the header has entered the work area a section of a wheel engages the body of the header causing the header to rotate and forcing two contact posts against an abutment, which is positioned so that when the two posts contact the abutment the header is correctly orientated. Alternatively, when the header has entered the work area a tongue engages at least one contact post of the header forcing the header against a wheel. The wheel is free to rotate so that the header is pivoted at the point where the tongue engages the post. The continued force of the tongue against the header and the free rotation of the wheel cause the header to rotate until two contact posts engage the tongue. The header is thus correctly orientated. The header is then firmly clamped prior to the subsequent multiwedge wire bonding step.

These methods present certain disadvantages. Firstly, the tongue engaging the contact posts of the section of the wheel forcing the contact posts against the abutment may cause the contact posts to bend. Thus the lead pins and the electrodes of the device body are no longer correctly aligned and the subsequent bonding step may fail to connect the lead pins with the electrodes.

A further disadvantage results from the contact of the header with the wheel and/or the tongue which tends to collect gold from the header, as the header is usually gold-plated. The combination of the rotation of the wheel and the pressure exerted on the header by the wheel or the tongue may cause the header to adhere to the wheel and/or the tongue and this effect can only be prevented by constantly removing the deposit of gold from the surface of the wheel.

A further disadvantage of these methods is the lack of reliability of the mechanism associated with the wheel or the tongue and consequently the loss of machine operating time caused by maintenance work being carried out on the machine as a result of mechanical failure of the mechanism.

The present invention dispenses with some of the moving parts associated with previous methods and adopts a novel technique for orientating the headers using magnetic attraction.

According to a first aspect of the present invention there is provided a method for manufacturing a microminiature solid state device including the step of orientating a header of the device, which header has at least two lead pins extending through the body of the header to form posts above the body and terminal leads below the body, in which method the header is transported with approximately the desired orientation into a work area, and the header is then accurately orientated in the work area by using magnetic attraction of part of the header to pull two lead pins of the header against a non-magnetizable abutment, the magnetic attraction resulting from one pole of an electromagnet at the area of the posts and the opposite pole at the area of the terminal leads.

By using such methods the header may be orientated accurately and reliably in a simple manner.

The transportation and orientation of the header may be adversely affected by magnetization of parts of the work area. In order to prevent the abutment being magnetized it is made of a non-magnetizable material. In order to prevent the permanent magnetization of other parts of the work area it is generally preferable and particularly advantageous to demagnetize or reverse the polarity of the electromagnet each time a header is transported into the work area. The electromagnet can be off during transportation of the header into the work area so as not to disturb the header during transportation.

Because one pole of the magnet is situated at the area of the posts and the opposite pole at

the area of the terminal leads when the header is in the work area, the header tends not to experience á turning force so that it remains in a substantially vertical position.

Part of the header is made of a ferromagnetic material and in one specific example of a method in accordance with the invention the lead pins, the posts and the body of the header are made of ferromagnetic material. It is not necessary that all of the terminal leads, the posts and the body be made of a ferromagnetic material.

Methods in accordance with the invention are particularly suitable for the manufacture of devices using T0.3, T0.5, T0.9, T0.18 or other multipin headers, all of which generally have two or more terminal leads and two or more contact posts.

According to a further aspect of the invention apparatus for use in orientating a header in a method for manufacturing a microminiature solid-state device, which header has at least two lead pins extending through the body of the header to form posts above the body and terminal leads below the body, the apparatus comprising a work area and transport means for transporting the header with approximately the desired orientation into the work area is characterized in that the apparatus further comprises a non-magnetizable abutment for defining a desired orientation of the header in the work area when two lead pins of the header are pulled against the abutment, and an electromagnet for attracting part of the header to pull the two lead pins against the abutment, the poles of which electromagnet are arranged such that when a header is in the work area one pole is at the area of the posts and the opposite pole is at the area of the terminal leads.

Methods in accordance with the invention may be used for a wire bonding stage or for a previous or subsequent stage in the manufacture of semiconductor devices. Such a method may, for example, be employed where a semiconductor device body is to be bonded to a header in an accurately defined orientation.

Embodiments of the invention will now be described, by way of example, and to illustrate these aspects of the invention, with reference to the accompanying drawings, in which:—

Figure 1 is a perspective view of the base of a bonding machine with a carrier strip for transporting headers into the work area of the machine in a method in accordance with the invention;

Figure 2 is a plan view of the carrier strip mounted with headers as seen from the underside of the strip;

Figure 3 is a plan view of the work area of the bonding machine and showing a carrier strip mounted with headers;

Figure 4 is a cross-sectional view of the work area of the machine and a header orientated by a method in accordance with the invention taken on the line I—I' of Figure 3;

Figure 5 is a cross-sectional view of a header in a multiwedge wire bonding machine during a wire bonding stage;

Figure 6 is a cross-sectional view of a header in a die-bonding machine during a die-bonding stage, and

Figure 7 is a partly cut-away perspective view of an electromagnet enclosed within a water cooling jacket.

Figure 1 shows the base section of a bonding machine as used in a wire bonding operation during the manufacture of semiconductor devices, for example, devices having a T0.5 or T0.18 outline. A series of headers 1*a*, which are to be wire-bonded is mounted in a carrier strip 2. The carrier strip 2 has notches 3 cut along its length which can co-operate with a pawl 4 of an indexing mechanism for moving the carrier strip 2 through the bonding machine along the channels 9*a* and 9*b*.

Figure 2 shows a length of the underside of a carrier strip 2, which has rectangular holes 5*a* to 5*f* cut along its length. Holes 5*b* to 5*f* are mounted with headers 1*a* and 1*b* and for clarity the hole 5*a* is shown vacant. The cut-away section of the carrier strip 2 shows the underside of the headers 1*b* and the broken outline of the headers 1*a* and 1*b* is shown to indicate the orientation of each header. Each header 1*a* and 1*b* has three terminal leads 10 which extend through the holes 5*b* to 5*f*. The arrangement of the terminal leads 10 is such that they loosely fit into the corners of the holes 5*a* to 5*f* as shown by the headers 1*b* in holes 5*d* to 5*f*. Excessive rotation is prevented when the terminal leads 10 abut the edges of the holes 5*a* to 5*f* as shown by the headers 1*a* in slots 5*b* and 5*c*. Thus the dimensions of the rectangular holes 5*a* to 5*f* with respect to the spacing of the terminal leads 10 determines the amount of rotational freedom of the headers 1*a* and 1*b*. In the case of T0.18 headers a square hole with sides of 2.5 mm allows the headers to be easily mounted while limiting the amount of rotation as described. The headers 1*a* and 1*b* are mounted in the holes 5*b* to 5*f* in approximately the desired orientation for the subsequent bonding stage.

The carrier strip 2 thus mounted is introduced into the machine via the channel 9*a* (Figure 1). The pawl 4 of the indexing mechanism engages the notches 3 and the carrier strip 2 progresses along the channel 9*a* transporting the headers 1*a* towards the work area 6 of the machine.

The carrier strip 2 passes over an oven 23 which heats the headers 1*a* to a temperature, which is sufficiently high for a thermocompression bond to be effected at the work area 6 of the machine. This temperature may be as high as 420°C for multiwedge wire bonding. Although not shown in the drawing the part of the channel 9*a* above the oven is normally covered.

Figure 1 also shows an electromagnet com-

prising a coil 7 wound onto a soft iron core 8. The poles 8*a* and 8*b* of the electromagnet are extended towards the work area 6 of the machine. Figures 3 and 4 show how a header 1*c* is positioned at the work area with respect to the poles 8*a* and 8*b* of the magnet. The header 1*c* has lead pins which extend through the body of the header to form posts 12*a* and 12*b* above the body and terminal leads 10 below the body. The posts 12*a* and 12*b*, the terminal leads 10 and the body of the header are made of a ferromagnetic material, which may be, for example, a low carbon steel or an alloy of iron, nickel and cobalt having the Trade Mark Fernico. When the header 1*c* experiences the field of the magnet the pole 8*a* exerts an attractive force on the posts 12*a* and 12*b* of the header 1*c* and the pole 8*b* exerts an attractive force on the terminal leads 10 of the header 1*c*. As the magnetic field is not localised the body of the header also experiences the attractive force of the magnet. The contact posts 12*a* and 12*b* are pulled towards an abutment 14*a* which is positioned so that when the contact posts 12*a* and 12*b* engage the abutment 14*a* the contact electrodes 11*a* and 11*b* and the contact posts 12*a* and 12*b* are correctly orientated for the subsequent wire bonding step. Because the abutment engages the posts above the header the same abutment 14*a* may then be used in a subsequent clamping operation. If a header is correctly orientated prior to entering the work area the two contact posts 12*a* and 12*b* will experience an equal attractive force and will be pulled against the abutment 14*a* simultaneously. If, however, the header 1*a* is approximately in the desired orientation prior to entering the work area as shown in Figure 3, a first contact post 12*a* will be pulled against the abutment 14*a*. The second post 12*b* will then be attracted towards the pole 8*a* of the magnet in the continued effect of the field. Thus the first contact post 12*a* acts as a pivot as the second contact post 12*b* is pulled against the abutment 14*a* and the header 1*c* becomes correctly orientated for the subsequent wire-bonding step. The abutment 14*a* is made of a non-magnetizable material so that the header does not contact the pole of the electromagnet but can pivot freely to bring both of the posts 12*a* and 12*b* into engagement with the abutment 14*a*.

It has been found advantageous to employ a slab of ferromagnetic material 13 adjacent the pole 8*a* of the magnet. This causes the magnetic field to be spread to that area immediately outside the work area so that the influence of the magnetic field can be experienced by the next header as it enters the work area of the machine. In this way the orientation becomes a gradual process rather than the discrete application of a magnetic field in the work area. In particular a 10 mm square slab of mild steel has produced desirable results and suitable magnetic field strengths have been obtained using a coil of, for example, 300 to 400 turns of copper wire wound onto a soft iron core and activated with a current of, for example, 1A at 2V D.C. It has been found necessary to reverse the current flow in the coil each time a device is transported into the work area to prevent those parts of the wire bonding machine which are susceptible to magnetization from becoming permanently magnetized. Figure 1 shows the lead 16 to a cam operated microswitch which reverses the direction of current flow each time another header 1*a* is transported into the work area 6. The coil 7 of the electromagnet is cooled by a nitrogen jet 17.

When the header 1*c* has been correctly orientated an air driven clamp 15 engages the underside of the carrier strip 2 in which the header 1*c* is mounted as shown in Figure 4. The clamp 15 forces the upper side of the header 1*c* against the underside of the abutment 14*a* and against the abutment 14*b*. Once the header 1*c* is firmly clamped in position the current flowing in the coil is switched off in preparation for the wire bonding step. The current is not switched on again until the next header is transported into the work area. Thus the header 1*c* is accurately orientated. Figure 5 shows the bonding step, where the header 1*c* is mounted in the carrier strip 2 and a bonding wire 18 is supported above the device body and the contact post 12. The wire bonding is effected by the known technique of multiwedge wire bonding using wedges, for example wedges 19*a* and 19*b*, which have fixed positions with respect to each other.

A first wedge is previously aligned with the cross-wires of a microscope so that when the first wedge is aligned over one contact area of a correctly orientated device the other wedges become aligned over the other contact areas of the device. Any correctly orientated device may then be viewed through the microscope and the cross-wires need be aligned with only one of the contact areas of the device. Thus the correct orientation of the header allows several wedge bondings to occur simultaneously as all of the wedges become correctly aligned above the contact areas of the device. Similarly the supported wire 18 is in correct alignment. The wire is bonded between the electrode 11*a* and the contact post 12 by thermocompression bonding.

The dimensions of the contact areas involved may be approximately 120 micrometers for the diameter of the contact electrodes of the device body and may be 850 micrometres for the diameter of the top of the contact posts, in the case of, for example, TO.18 headers.

Figure 3 shows a header 1*b* which has undergone the wire bonding operation and as such wire connections 20 connect the electrodes of device body 11 with the contact posts 12. The carrier strip 2 then leaves the machine via the channel 9*b* transporting the

wire bonded headers 1*b* away from the work area 6 as shown in Figure 1.

Figure 6 shows how methods in accordance with the invention may be used for the orientation of a device header 1*d* mounted in a carrier strip 2 during a different stage in the assembly of a semiconductor device. In the mounting and attaching of a semiconductor device body 21 to a header 1*d* it is necessary to accurately position and orientate the device body with respect to the header 1*d*. A known operation for attaching such a semiconductor device body 21 to a header 1*d* is called "die-bonding". The headers are mounted in carrier strips and fed into a die-bonding machine which heats the headers up to a temperature as high as 480°C. Figure 6 shows the header 1*d* in the work area of the machine. The device body 21 is vacuum held above the header 1*d* in a die collet 22 until the header 1*d* is correctly orientated and firmly clamped by methods in accordance with the invention. The device body 21 is then lowered onto the header 1*d* and bonded to the header 1*d* in known manner.

Figure 7 shows how the electromagnet 7 may alternatively be cooled using a water cooling jacket 23 which surrounds the electromagnet 7. The water enters the jacket through the inlet 24*a* and leaves the jacket through the outlet 24*b*.

Although a method in accordance with the invention may be used to pull two lead pins of a header against an abutment it is obvious that such a method may also be used to pull more than two lead pins of a header against an appropriately shaped abutment.

The abutment against which the lead pins of the header are pulled need not act exclusively as such an abutment. For example, an edge of a hole 5 in the carrier strip 2 may be used as an abutment for the terminal leads of the header.

Claims

1. A method for manufacturing a microminiature solid state device including the step of orientating a header of the device, which header has at least two lead pins extending through the body of the header to form posts above the body and terminal leads below the body, in which method the header is transported with approximately the desired orientation into a work area, characterized in that the header is then accurately orientated in the work area by using magnetic attraction of part of the header to pull two lead pins of the header against a non-magnetizable abutment, the magnetic attraction resulting from one pole of an electromagnet at the area of the posts and the opposite pole at the area of the terminal leads.

2. A method as claimed in Claim 1, in which said abutment engages the posts when the lead pins are pulled against the abutment.

3. A method as claimed in Claim 1 or 2, in which the header is transported into the work area on a carrier strip having a series of holes along its length in each of which holes a header is mounted in approximately the desired orientation, which holes restrain the headers from excessive rotation.

4. A method as claimed in any of the preceding Claims, in which the polarity of the electromagnet is reversed each time a device is transported into the work area.

5. A method as claimed in Claim 4, in which a piece of ferromagnetic material adjacent a pole of the electromagnet causes the magnetic field to be spread to an area immediately outside the work area so that the influence of the magnetic field can be experienced by the header as it enters the work area.

6. A method as claimed in any of the preceding Claims, in which after the header is accurately orientated in the work area using magnetic attraction a clamp forces the header upwards against the underside of an abutment to restrain the header during a subsequent operation.

7. A method as claimed in Claim 6, in which the electromagnet is switched off after the header has been forced against the abutment by the clamp.

8. A method as claimed in Claim 6 or Claim 7, in which after the clamp forces the header against the abutment wire connections are made between the posts and a device body present on the header.

9. A method as claimed in Claim 6 or Claim 7, in which after the clamp forces the header against the abutment a device body is mounted on and bonded to the header.

10. Apparatus for use in orientating a header in a method for manufacturing a microminiature solid-state device as claimed in any of the preceding Claims, which header has at least two lead pins extending through the body of the header to form posts above the body and terminal leads below the body, the apparatus comprising a work area and transport means for transporting the header with approximately the desired orientation into the work area characterized in that the apparatus further comprises a non-magnetizable abutment for defining a desired orientation of the header in the work area when two lead pins of the header are pulled against the abutment, and an electromagnet for attracting part of the header to pull the two lead pins against the abutment, the poles of which electromagnet are arranged such that when a header is in the work area one pole is at the area of the posts and the opposite pole is at the area of the terminal leads.

Revendications

1. Procédé permettant de réaliser un dispositif à corps solide microminiature, comprenant une étape d'orientation d'un support du dispositif, support qui présente au moins deux conducteurs s'étandant à travers le corps du

wire bonded headers 1*b* away from the work area 6 as shown in Figure 1.

Figure 6 shows how methods in accordance with the invention may be used for the orientation of a device header 1*d* mounted in a carrier strip 2 during a different stage in the assembly of a semiconductor device. In the mounting and attaching of a semiconductor device body 21 to a header 1*d* it is necessary to accurately position and orientate the device body with respect to the header 1*d*. A known operation for attaching such a semiconductor device body 21 to a header 1*d* is called "die-bonding". The headers are mounted in carrier strips and fed into a die-bonding machine which heats the headers up to a temperature as high as 480°C. Figure 6 shows the header 1*d* in the work area of the machine. The device body 21 is vacuum held above the header 1*d* in a die collet 22 until the header 1*d* is correctly orientated and firmly clamped by methods in accordance with the invention. The device body 21 is then lowered onto the header 1*d* and bonded to the header 1*d* in known manner.

Figure 7 shows how the electromagnet 7 may alternatively be cooled using a water cooling jacket 23 which surrounds the electromagnet 7. The water enters the jacket through the inlet 24*a* and leaves the jacket through the outlet 24*b*.

Although a method in accordance with the invention may be used to pull two lead pins of a header against an abutment it is obvious that such a method may also be used to pull more than two lead pins of a header against an appropriately shaped abutment.

The abutment against which the lead pins of the header are pulled need not act exclusively as such an abutment. For example, an edge of a hole 5 in the carrier strip 2 may be used as an abutment for the terminal leads of the header.

Claims

1. A method for manufacturing a miniature solid state device including the step of orientating a header of the device, which header has at least two lead pins extending through the body of the header to form posts above the body and terminal leads below the body, in which method the header is transported with approximately the desired orientation into a work area, characterized in that the header is then accurately orientated in the work area by using magnetic attraction of part of the header to pull two lead pins of the header against a non-magnetizable abutment, the magnetic attraction resulting from one pole of an electromagnet at the area of the posts and the opposite pole at the area of the terminal leads.

2. A method as claimed in Claim 1, in which said abutment engages the posts when the lead pins are pulled against the abutment.

3. A method as claimed in Claim 1 or 2, in which the header is transported into the work area on a carrier strip having a series of holes along its length in each of which holes a header is mounted in approximately the desired orientation, which holes restrain the headers from excessive rotation.

4. A method as claimed in any of the preceding Claims, in which the polarity of the electromagnet is reversed each time a device is transported into the work area.

5. A method as claimed in Claim 4, in which a piece of ferromagnetic material adjacent a pole of the electromagnet causes the magnetic field to be spread to an area immediately outside the work area so that the influence of the magnetic field can be experienced by the header as it enters the work area.

6. A method as claimed in any of the preceding Claims, in which after the header is accurately orientated in the work area using magnetic attraction a clamp forces the header upwards against the underside of an abutment to restrain the header during a subsequent operation.

7. A method as claimed in Claim 6, in which the electromagnet is switched off after the header has been forced against the abutment by the clamp.

8. A method as claimed in Claim 6 or Claim 7, in which after the clamp forces the header against the abutment wire connections are made between the posts and a device body present on the header.

9. A method as claimed in Claim 6 or Claim 7, in which after the clamp forces the header against the abutment a device body is mounted on and bonded to the header.

10. Apparatus for use in orientating a header in a method for manufacturing a miniature solid-state device as claimed in any of the preceding Claims, which header has at least two lead pins extending through the body of the header to form posts above the body and terminal leads below the body, the apparatus comprising a work area and transport means for transporting the header with approximately the desired orientation into the work area characterized in that the apparatus further comprises a non-magnetizable abutment for defining a desired orientation of the header in the work area when two lead pins of the header are pulled against the abutment, and an electromagnet for attracting part of the header to pull the two lead pins against the abutment, the poles of which electromagnet are arranged such that when a header is in the work area one pole is at the area of the posts and the opposite pole is at the area of the terminal leads.

Revendications

1. Procédé permettant de réaliser un dispositif à corps solide miniature, comprenant une étape d'orientation d'un support du dispositif, support qui présente au moins deux conducteurs s'étandant à travers le corps du

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support de façon à former des fiches de contact au-dessus du corps et des terminaux au-dessous du corps, procédé selon lequel le support est transporté avec approximativement l'orientation désirée dans une zone de travail, caractérisé en ce que le support est ensuite rigoureusement orienté dans la zone de travail à l'aide d'attraction magnétique d'une partie du support, afin d'attirer deux conducteurs du support contre une butée non magnétisable, l'attraction magnétique provenant d'une pôle d'un électro-aimant dans la zone des fiches et du pôle opposé dans la zone des terminaux.

2. Procédé selon la revendication 1, caractérisé en ce que ladite butée entre en contact avec les fiches lorsque les conducteurs sont attirés contre la butée.

3. Procédé selon la revendication 1 ou 2, caractérisé en ce que le support est transporté dans la zone de travail sur une bande porteuse dans la direction longitudinale de laquelle sont découpés une série de trous, dans chacun desquels est appliqué un support présentant pratiquement l'orientation désirée, ces trous empêchant une trop grande rotation des supports.

4. Procédé selon l'une des revendications précédentes, caractérisé en ce que la polarité de l'électro-aimant est chaque fois inversée lorsqu'un dispositif est transporté dans la zone de travail.

5. Procédé selon la revendication 4, caractérisé en ce qu'une pièce de matériau ferromagnétique dans la proximité d'un pôle de l'électro-aimant provoque l'extension du champ magnétique vers une zone située immédiatement à l'extérieur de la zone de travail, de sorte que le support peut subir l'effet du champ magnétique lorsqu'il atteint la zone de travail.

6. Procédé selon l'une des revendications précédentes, caractérisé en ce qu'après orientation convenable du support dans la zone de travail à l'aide d'attraction magnétique, une pince applique le support contre la face inférieure d'une butée pour limiter le déplacement du support pendant l'opération suivante.

7. Procédé selon la revendication 6, caractérisé en ce que l'électro-aimant est mis hors circuit après application du support contre la butée par la pince.

8. Procédé selon la revendication 6 ou la revendication 7, caractérisé en ce qu'après que la pince a appliqué le support contre la butée, des soudures de fil sont réalisées entre les fiches et le corps du dispositif présent sur le support.

9. Procédé selon la revendication 6 ou la revendication 7, caractérisé en ce qu'après que la pince a appliqué le support contre la butée, le corps d'un dispositif est appliqué sur le support et relié au support.

10. Appareil à utiliser pour l'orientation d'un support dans un procédé permettant de réaliser un dispositif solide microminiature selon l'une des revendications précédentes, support qui présente au moins deux conducteurs s'étendant à travers le corps du support de façon à former des fiches au-dessus du corps et des terminaux au-dessous du corps, appareil qui comprend une zone de travail et des moyens de transport destinés au transport du support avec approximativement l'orientation désirée dans la zone de travail, caractérisé en ce que l'appareil comprend en outre une butée non magnétisable permettant de définir l'orientation désirée du support dans la zone de travail lorsque deux conducteurs du support sont attirés contre la butée et un électro-aimant servant à attirer une partie du support afin d'attirer une partie du support pour attirer les conducteurs contre la butée, les pôles de l'électro-aimant étant disposés de façon que lorsqu'un support se trouve dans la zone de travail, un pôle se trouve dans la zone des fiches et le pôle opposé dans la zone des terminaux.

Patentansprüche

1. Verfahren zur Herstellung einer Mikrominiatur-Feststoff-Anordnung, das den Schritt des Orientierens eines Halters der Anordnung umfasst, welcher Halter mindestens zwei Leiterstifte enthält, die sich durch den Körper des Halters erstrecken, derart, dass sie über dem Körper stiftförmige Ansätze und unter dem Körper Anschlussleiter bilden, wobei bei diesem Verfahren der Halter mit nahezu der gewünschten Orientation in ein Arbeitsgebiet befördert wird, dadurch gekennzeichnet, dass der Halter dann in dem Arbeitsgebiet genau dadurch orientiert wird, dass eine magnetische Anziehungskraft eines Teiles des Halters angewandt wird, um zwei Leiterstifte des Halters gegen einen nichtmagnetisierbaren Anschlag zu ziehen, wobei die magnetische Anziehungskraft vom einen Pol eines Elektromagneten an der Stelle der stiftförmigen Ansätze und vom anderen Pol an der Stelle der Anschlussleiter herrührt.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, dass der genannte Anschlag mit den stiftförmigen Ansätzen zusammenarbeitet, wenn die Leiterstifte gegen den Anschlag gezogen werden.

3. Verfahren nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass der Halter in das Arbeitsgebiet auf einem Trägerstreifen befördert wird, der eine Reihe von Löchern in seiner Längsrichtung aufweist, wobei in jedem dieser Löcher ein Halter in nahezu der gewünschten Orientation angeordnet wird, wobei diese Löcher verhindern, dass die Halter zu grosse Drehbewegungen vollführen.

4. Verfahren nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass die Polarität des Elektromegnetan jeweils umgekehrt wird, wenn eine Anordnung in das Arbeitsgebiet befördert wird.

5. Verfahren nach Anspruch 4, dadurch gekennzeichnet, dass ein Stück ferromagnetischen Materials in der Nähe eines Poles des

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Elektromagneten bewirkt, dass sich das Magnetfeld zu einem Gebiet sofort ausserhalb des Arbeitsgebietes ausbreitet, so dass der Einfluss des Magnetfeldes von dem Halter empfunden werden kann, wenn er in das Arbeitsgebiet gelangt.

6. Verfahren nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass, nachdem der Halter genau in dem Arbeitsgebiet unter Anwendung magnetischer Anziehungskraft orientiert worden ist, der Halter durch eine Klammer aufwärts gegen die Unterseite eines Anschlags gedrückt wird, derart, dass der Halter während einer darauffolgenden Bearbeitung in seiner Bewegung beschränkt wird.

7. Verfahren nach Anspruch 6, dadurch gekennzeichnet, dass der Elektromagnet ausgeschaltet wird, nachdem der Halter durch die Klammer gegen den Anschlag gedrückt worden ist.

8. Verfahren nach Anspruch 6 oder 7, dadurch gekennzeichnet, dass, nachdem die Klammer den Halter gegen den Anschlag drückt, Drahtverbindungen zwischen den stiftförmigen Ansätzen und einem auf dem Halter vorhandenen Körper der Anordnung hergestellt werden.

9. Verfahren nach Anspruch 6 oder 7, dadurch gekennzeichnet, dass, nachdem die Klammer den Halter gegen den Anschlag drückt, der Körper einer Anordnung auf den Halter angebracht und mit dem Halter verbunden wird.

10. Vorrichtung zur Anwendung beim Orientieren eines Halters bei einem Verfahren zur Herstellung einer Mikrominiatur-Feststoff-Anordnung nach einem der vorhergehenden Ansprüche, wobei dieser Halter mindestens zwei Leiterstifte enthält, die sich durch den Körper des Halters derart erstrecken, dass sie über dem Körper stiftförmige Ansätze und unter dem Körper Anschlussleiter bilden, wobei die Vorrichtung ein Arbeitsgebiet und Beförderungsmittel zur Beförderung des Halters mit nahezu der gewünschten Orientation in das Arbeitsgebiet enthält, dadurch gekennzeichnet, dass die Vorrichtung weiter einen nichtmagnetisierbaren Anschlag zum Definieren einer gewünschten Orientation des Halters in dem Arbeitsgebiet beim Ziehen zweier Leiterstifte des Halters gegen den Anschlag, und einen Elektromagneten enthält, der einen Teil des Halters anzieht um die zwei Leiterstifte gegen den Anschlag zu ziehen, wobei die Pole dieses Elektromagneten derart angeordnet sind, dass, wenn sich ein Halter in dem Arbeitsgebiet befindet, ein Pol an der Stelle der stiftförmigen Ansätze und der andere Pol an der Stelle der Anschlusslieter liegt.

* C L M S *