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(54) **LOADING A SOCKET AND/OR ADAPTER DEVICE WITH A SEMICONDUCTOR COMPONENT**

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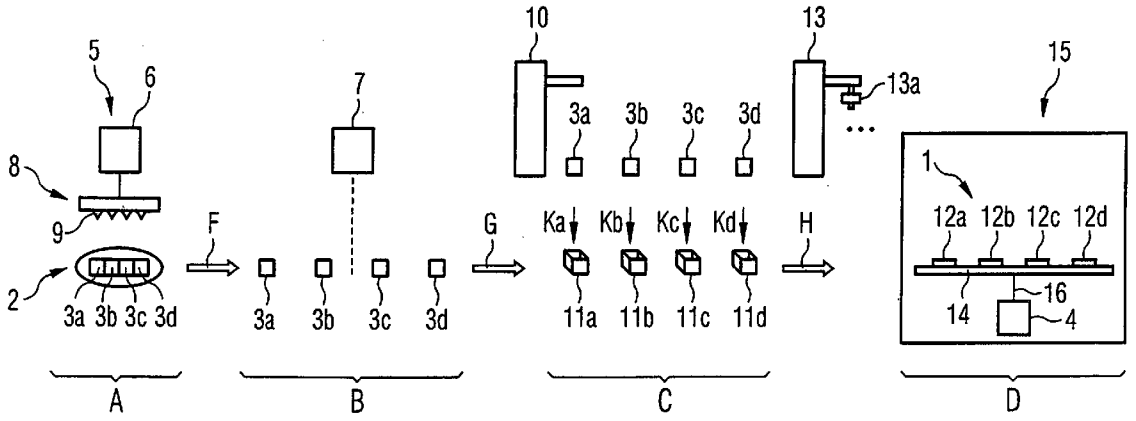
(57) **ABSTRACT**

A process, device and a mechanism for loading a socket and/or adapter device with a semiconductor component is disclosed. The mechanism has a device, in particular a mechanical device, for instance an appropriate attachment, for opening the socket and/or adapter device.



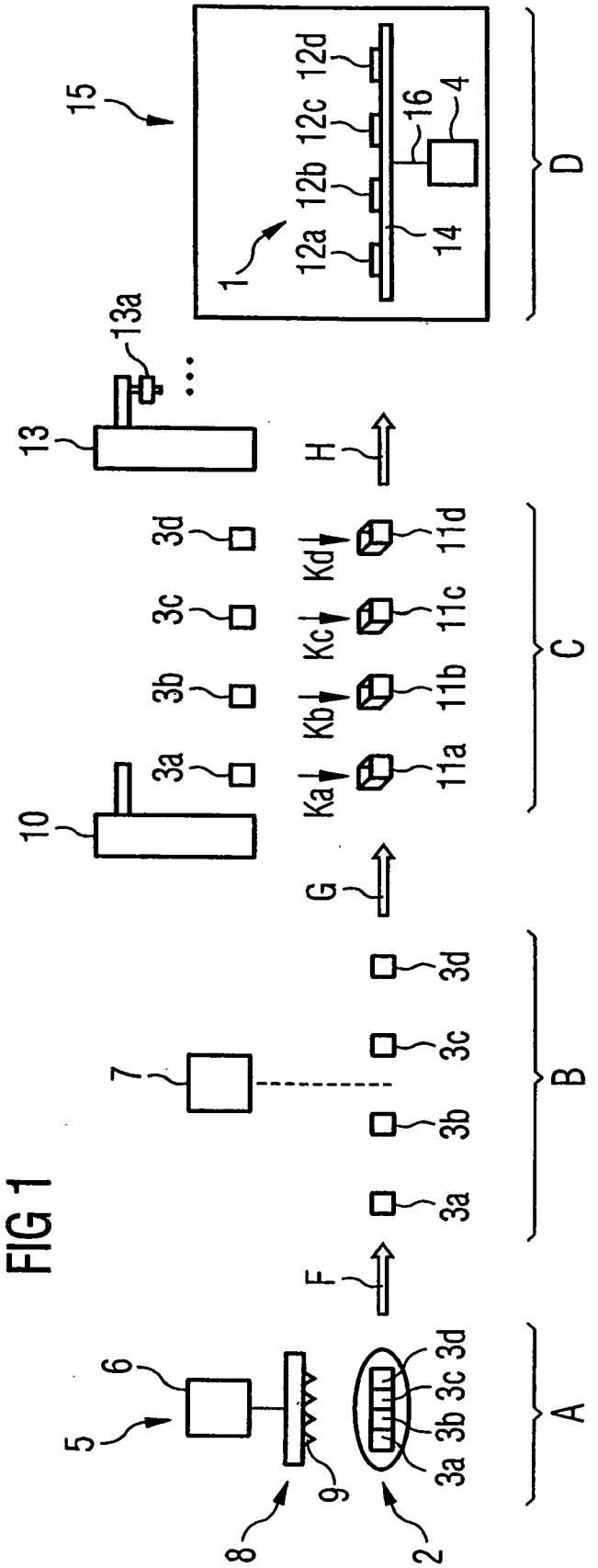

A
B
C
D
F
G
H
Ka
Kb
Kc
Kd
1
2
3a
3b
3c
3d
4
5
6
7
8
9
10
11a
11b
11c
11d
12a
12b
12c
12d
13
13a
14
15
16

FIG 1

FIG 2

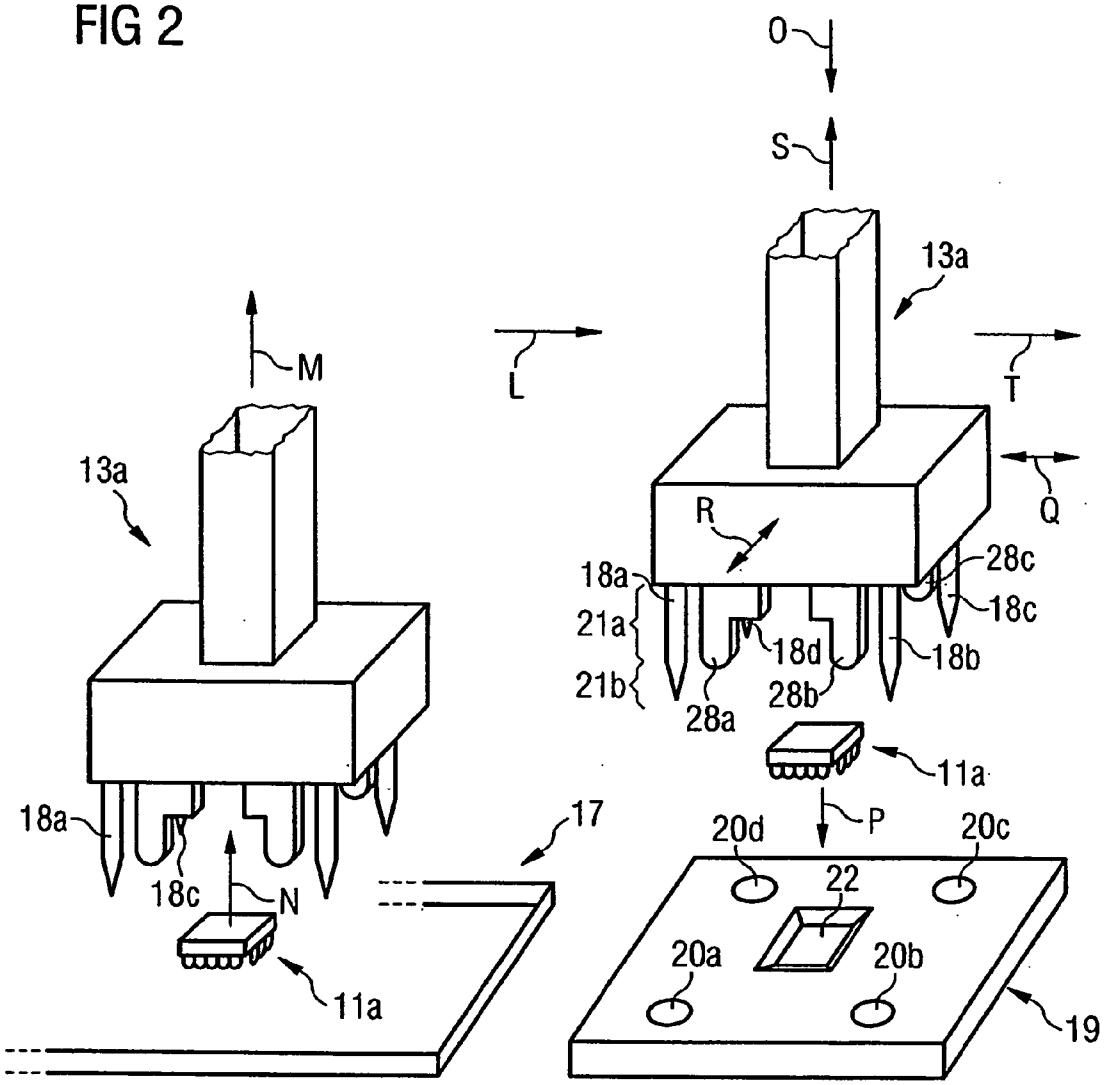

O
S
13a
L
T
M
13a
R
Q
18a
28c
21a
18c
18d
18b
21b
28b
28a
11a
18a
17
P
20d
20c
22
18c
N
20a
20b
11a
19

FIG 3

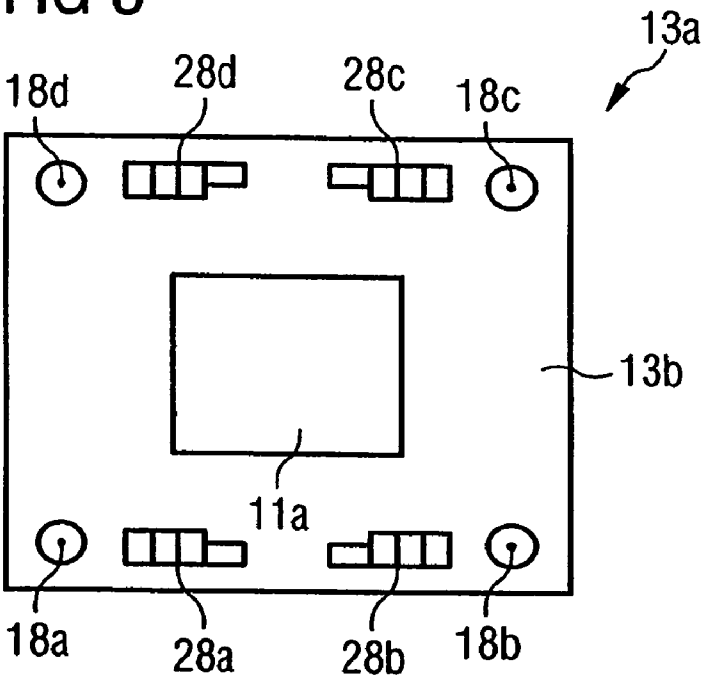

13a
18d
28d
28c
18c
13b
11a
18a
28a
28b
18b

FIG 4

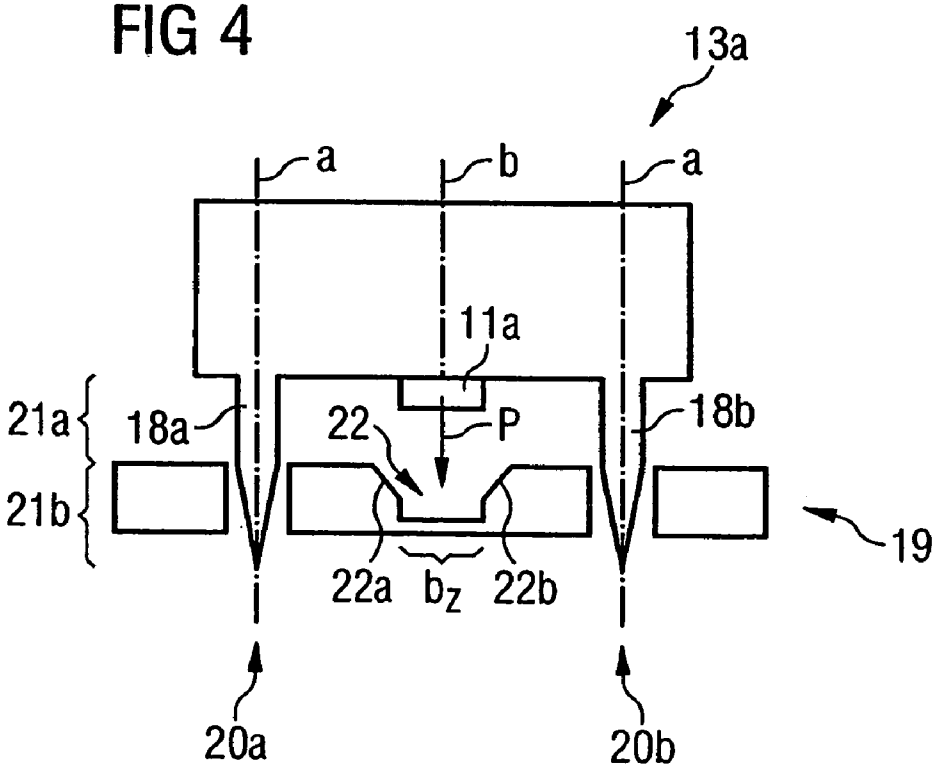

13a
a
b
a
11a
21a
18a
22
P
18b
21b
19
22a
b_z
22b
20a
20b

FIG 5

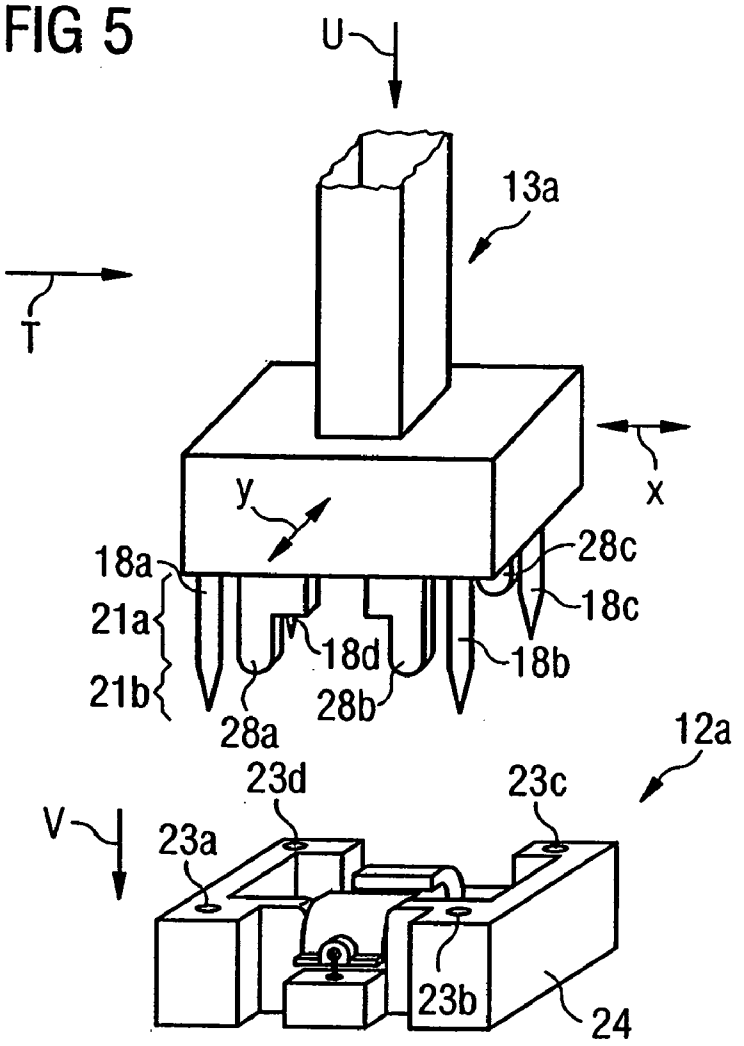
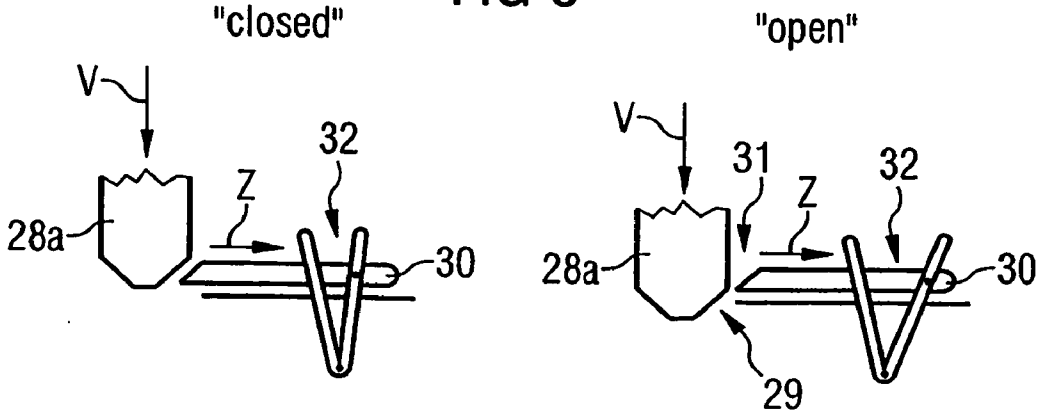

U
13a
T
y
x
18a
21a
21b
28c
18c
18d
18b
28a
28b
12a
23d
23c
V
23a
23b
24

FIG 6


"closed"
"open"
V
32
Z
28a
30
V
31
32
Z
28a
30
29

LOADING A SOCKET AND/OR ADAPTER DEVICE WITH A SEMICONDUCTOR COMPONENT

[0001] This application is a continuation of U.S. patent application Ser. No. 11/012,715, which was filed Dec. 16, 2004, which application claims priority to German Application No. 103 59 648.8, which was filed Dec. 18, 2003. Both of these applications are incorporated herein by reference.

TECHNICAL FIELD

[0002] The invention relates to a socket and/or adapter device, in particular for testing a semiconductor component, loaded into the socket and/or adapter device, and to an apparatus and a process for loading a socket and/or adapter device with a corresponding semiconductor component, and to a precision alignment device to be used in a corresponding procedure.

BACKGROUND

[0003] Semiconductor components, for instance corresponding integrated (analog and/or digital) computer circuits, semiconductor memory components, for instance functional memory components (PLAs, PALs, etc.) and table memory components (e.g., ROMs or RAMs, in particular SRAMs and DRAMs) are subjected to extensive testing during the manufacturing process.

[0004] For the simultaneous, combined manufacture of numerous (generally identical) semiconductor components, a so-called wafer (i.e., a thin disk of monocrystalline silicon) is used.

[0005] The wafer is appropriately treated (for instance subjected in succession to numerous coating, exposure, etching, diffusion and implantation process steps, etc.), and then for instance sliced up (or scored and snapped off), so instance sliced up (or scored and snapped off), so that the individual components become available.

[0006] After the wafer has been sliced up (and/or scored and snapped off) the, individually available components, are each individually loaded into special housings or packages (for instance, so-called TSOP or FBGA housings etc.) and then, by means of appropriate trays, transported to a corresponding further station, especially a test station (and/or in succession to several other test stations).

[0007] The above test station may for instance be a so-called "burn-in" testing station (at which, by creating extreme conditions (for instance increased temperatures) artificial aging of the components is caused) in particular a "burn-in" test station, at which the so-called burn-in test procedure is performed, i.e., a test done under extreme conditions (for instance increased temperature, for instance above 80° or 100° C., increased operational voltage, etc.).

[0008] At the (test) station each individual component, present in the above-mentioned housings, is loaded into a corresponding adapter and/or socket, connected to a corresponding test apparatus and then the component in each housing is tested.

[0009] Loading the (burn-in) adapter and/or socket with a component to be tested can be done with the help of one or several appropriate loading apparatuses ("loaders").

[0010] For doing this, a grabber device, for instance a loader head, provided at an appropriate loading apparatus (loader), can be provided with a partial vacuum, with the help of which a component can be removed from a tray and then, by means of an appropriate (for instance a swiveling or shifting) motion of the grabber device and/or the "loader head", positioned above a so-called precision alignment device.

[0011] Then the component positioned above the precision alignment device can be dropped by the loader of the grabber device, by reducing the vacuum, into one of the recesses provided with appropriate tapered guiding planes on the precision alignment device.

[0012] By means of the tapered guiding planes it can be achieved that the component and/or component housing is (pre- or coarsely) aligned by being dropped into the corresponding precision alignment recess.

[0013] Next the component can again be removed by the above loading apparatus (and/or by any additional loading apparatus) from the recess provided in the precision alignment device (for instance by creating a partial vacuum at the grabber device and/or the loader head provided at the above or at any additional loading apparatus).

[0014] Then the component can be positioned above a corresponding (burn-in) adapter and/or socket by means of an appropriate (for instance a swiveling or shifting) motion of the grabber device and/or the loader head.

[0015] Conventional (burn-in) adapters and/or sockets may for instance consist of a base element and a cover ("lid"), which is adjustable in a vertical direction in relation to the base element by means of corresponding spring sections attached to the base element.

[0016] By appropriate downward pressure on the adapter and/or socket cover, the adapter and/or socket can be "opened", whereafter the component suspended above the adapter and/or socket by the above loader the grabber device can be dropped into the adapter and/or socket by reducing the vacuum.

[0017] Appropriate tapered guiding planes can be provided inside the adapter and/or socket, for the purpose of aligning the component and/or the component housing when it falls into the adapter.

[0018] When the adapter and/or the socket cover is then released again, it is forced upwards by the above-mentioned spring sections, whereby it is achieved that connections provided on the corresponding component (and/or component housing) make contact with connections provided on the corresponding adapter and/or socket, i.e., until the adapter and/or socket is "closed" so that the above test procedure can then be performed on the component.

[0019] In the manufacture/testing of semiconductor components the above-mentioned (burn-in) adapters and/or sockets are usually required in relatively large numbers.

[0020] Conventional (burn-in) adapters and/or sockets are relatively expensive, due to the costly precision engineering of basic socket components and covers, which is needed to avoid faulty contacts between component (and/or component housings) and adapters and/or socket connections.

SUMMARY OF THE INVENTION

[0021] The invention discloses a socket and/or adapter device, in particular for semiconductor components, as well

as a novel apparatus and a novel process for loading a socket and/or adapter device with a corresponding semiconductor component.

[0022] In one embodiment of the invention, an apparatus, especially a loader head, is provided for loading a socket and/or adapter device with a semiconductor component, whereby the apparatus includes a device, especially a mechanical device, for opening the socket and/or adapter device.

[0023] Particularly advantageously the device includes one or more appropriate attachments, such as attachments provided with one or more corresponding tapered planes.

[0024] Advantageously the device is designed such that when the apparatus is moved towards the socket and/or adapter device, contacts and/or latches provided at the socket and/or adapter device are opened by the device, in particular the attachments.

[0025] In a preferred embodiment the socket and/or adapter device will have no cover and/or lid.

[0026] Particularly advantageously the function assumed by a corresponding cover in conventional socket and/or adapter devices is taken over by the apparatus, in particular by the above-mentioned device.

[0027] In another embodiment the socket and/or adapter device, in particular the socket contacts and/or latches, are directly opened by the device (without a socket and/or adapter cover being provided at all).

[0028] By dispensing with a socket and/or adapter cover the socket and/or adapter device can be produced considerably more simply and cheaply than conventional sockets and/or adapter devices.

[0029] In this way the total cost of manufacturing and/or testing of semiconductor components can be reduced.

[0030] In addition, by dispensing with the socket and/or adapter cover the circulation of air in the "burn-in" station (which is adversely affected in conventional socket and/or adapter devices by the socket and/or adapter covers provided) can be improved.

[0031] In this way any unintended excessive heating of semiconductor components loaded into the corresponding socket and/or adapter in the "burn in" station can be prevented, which, when conventional socket and/or adapter devices are used, can lead to damage to or destruction of the semiconductor components.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] The invention is described in detail below with reference to exemplary embodiments and the attached drawings. In the drawings:

[0033] FIG. **1** shows various stations passed through during the manufacture of corresponding semiconductor components;

[0034] FIG. **2** shows a perspective representation of the grabber device of the loading machine used in the "burn-in" test system shown in FIG. **1**, of a tray and a precision alignment device;

[0035] FIG. **3** shows a view from below of the grabber device shown in FIG. **2**;

[0036] FIG. **4** shows a sectional view of the grabber device shown in FIGS. **2** and **3**, and the precision alignment device alignment shown in FIG. **2**;

[0037] FIG. **5** shows a perspective representation of the grabber device, and of an adapter and/or socket; and

[0038] FIG. **6** shows a highly simplified representation of a grabber device attachment shown in FIGS. **2**, **3** and **5**, a contact operating device, and a V-shaped socket contact, at closed and open settings of the socket contact.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0039] In FIG. **1**, some stations A, B, C, D (of several further stations not shown here) passed through by the corresponding semiconductor components **3***a*, **3***b*, **3***c*, **3***d* during the manufacture of the semiconductor components **3***a*, **3***b*, **3***c*, **3***d* are schematically represented.

[0040] Station A serves to subject the semiconductor components **3***a*, **3***b*, **3***c*, **3***d*, still present on a silicon disk or wafer **2**, to one or more test procedures (for instance by means of an appropriate test system, such as a test apparatus **6** and a semiconductor component test card and/or probe card **8** (which has been provided with contact pins **9** for contacting corresponding contacts on the semiconductor components **3***a*, **3***b*, **3***c*, **3***d*)).

[0041] At stations not shown here and upstream from the stations A, B, C, D shown in FIG. **1**, the wafer **2** has been subjected to conventional coating, exposure, etching, diffusion and implantation process steps etc.

[0042] The semiconductor components **3***a*, **3***b*, **3***c*, **3***d* may be integrated (analog and/or digital) computer circuits, or semiconductor memory components, for instance functional memory components (i.e., PLAs, PALs, etc.), and table memory components, (for instance ROMs or RAMs), in particular SRAMs or DRAMs (here for instance DRAMs (Dynamic Random Access Memories and/or Dynamic Read-Write Memories) with double data rate (DDR DRAMs= Double Data Rate-DRAMs), preferably high-speed DDR DRAMs.

[0043] When the test procedure has been successfully completed at station A, wafer **2** is (fully automatically) transported to the next station B (see arrow F), where (after wafer **2** has had foil glued to it in a recognized fashion) it is sliced up by means of an appropriate machine **7** (or for instance scored and snapped off), so that the individual semiconductor components **3***a*, **3***b*, **3***c*, **3***d* become available.

[0044] After wafer **2** has been sliced up at station B, the components **3***a*, **3***b*, **3***c*, **3***d* are then (again fully automatically, for instance by means of an appropriate conveyer machine) transported to the next test station (here a loading station C) for instance directly (and/or individually) or alternatively by means of a tray (see arrow G).

[0045] At the loading station C the components **3***a*, **3***b*, **3***c*, **3***d* are, each individually, loaded in fully automatic fashion into corresponding housings **11***a*, **11***b*, **11***c*, **11***d* and/or packages (see arrows Ka, Kb, Kc, Kd), with the help of machine **10** (loading machine) and the housings **11***a*, **11***b*, **11***c*, **11***d* are

then closed, in recognized fashion, so that the semiconductor component contacts provided on the semiconductor components **3***a*, **3***b*, **3***c*, **3***d* make contact with corresponding housing contacts provided at each housing **11***a*, **11***b*, **11***c*, **11***d*.

[**0046**] Conventional TSOP housings or for instance conventional FBGA housings, etc., may be used for the housings **11***a*, **11***b*, **11***c*, **11***d*.

[**0047**] Next, the housings **11***a*, **11***b*, **11***c*, **11***d*, together with the semiconductor components **3***a*, **3***b*, **3***c*, **3***d*, again fully automatically, for instance by means of a corresponding conveyer, and where appropriate, by using a corresponding tray **17** (for instance one shown in FIG. **2**) are conveyed to a further station D, for instance a testing station (see arrow H), and/or in succession to several further stations, especially testing stations (not shown here).

[**0048**] Station D (or one or several of the above further stations, not shown here) may be, for example, a so-called "burn-in" station, especially a burn-in testing station.

[**0049**] At the burn-in station artificial aging of the components **3***a*, **3***b*, **3***c*, **3***d* is caused by extreme conditions (for instance increased temperatures) being generated.

[**0050**] Additionally one or several burn-in test procedures can be performed at the burn-in station, i.e., tests done under extreme conditions (for instance increased temperatures, for instance above 80° C. or above 100° C., and/or increased operating voltages, etc.).

[**0051**] At station D the housings **11***a*, **11***b*, **11***c*, **11***d*, as is more closely described below, are loaded with the help of one or more appropriate machines (for instance a loading machine **13**, "loader") (and where appropriate, a further loading machine (a "loader", not shown here)) into specially designed "coverless" (burn-in) sockets and/or (burn-in) adapters **12***a*, **12***b*, **12***c*, **12***d*.

[**0052**] The loading machine **13** (and correspondingly also the further loading machine, where provided) has, as shown in FIGS. **1** and **2**, a grabber device and/or a loader head **13***a*.

[**0053**] To load a (burn-in) socket and/or (burn-in) adapter **12***a* with a corresponding component **3***a* and/or component-housing **11***a*, the grabber device **13***a* is first positioned, for example, as shown in FIG. **2**, directly above the corresponding tray **17** (and/or more accurately: directly above the corresponding component **3***a* and/or component housing **11***a*), similar to conventional loading machines, whereupon a suitable vacuum is created at the grabber device and/or the loader head **13***a* (and/or more accurately: below the grabber device and/or the loader head **13***a*).

[**0054**] In this way the component **3***a*, arranged in a corresponding housing **11***a* and lying on tray **17** (similarly constructed to conventional trays) is moved upwards in the direction of arrow N, as shown in FIG. **2**, and firmly held by the underside **13***b* of the grabber device **13***a*, as shown in FIG. **3**, (essentially in the middle of several centering devices **18***a*, **18***b*, **18***c*, **18***d*, more accurately described below) i.e., the component **3***a* is removed from tray **17**.

[**0055**] Next, by means of an appropriate movement (for instance swiveling or shifting) of the grabber device **13***a* and/or the loader head **13***a* (for instance first upwards in the direction of the arrow M shown in FIG. **2**, and then laterally in the direction of the arrow L shown in FIG. **2**, etc.), the grabber device **13***a*, together with the component **3***a* and/or component housing **11***a* held at the underside **13***b* of the grabber device **13***a*, by the vacuum being maintained, is positioned above the precision alignment device **19**, shown to the right in FIG. **2**, (more accurately: above a centering recess **22** of the precision alignment device **19**).

[**0056**] The precision alignment device **19** is similarly constructed to conventional precision alignment devices, yet has been provided, as shown in FIG. **2** and FIG. **4**, with several centering holes **20***a*, **20***b*, **20***c*, **20***d* on the underside **13***b* of the grabber device **13***a* for receiving the above centering devices **18***a*, **18***b*, **18***c*, **18***d*.

[**0057**] The centering holes **20***a*, **20***b*, **20***c*, **20***d* are essentially circular in section and reach, with an essentially constant inside diameter, partially or completely downwards through the whole precision alignment device **19** in a vertical direction from the upper side of the precision alignment device **19**.

[**0058**] As shown in FIGS. **2** and **4**, the centering devices **18***a*, **18***b*, **18***c*, **18***d* provided on the grabber device **13***a* reach vertically downwards from the underside of the grabber device. Each of the centering devices **18***a*, **18***b*, **18***c*, **18***d* (here: four, alternatively for instance two or three, etc.) has, as is for instance apparent from FIG. **3** when seen from below, an essentially circular cross section.

[**0059**] As shown in FIG. **4**, the vertical axes of the centering devices **18***a*, **18***b*, **18***c*, **18***d*, running centrally through the conical sections of the centering devices **18***a*, **18***b*, **18***c*, **18***d*, are, when the grabber device **13***a* has been correspondingly aligned, in alignment with the central vertical axes of the corresponding centering openings **20***a*, **20***b*, **20***c*, **20***d* of the precision alignment device **19**.

[**0060**] The inside diameter of each centering opening **20***a*, **20***b*, **20***c*, **20***d* is essentially identical to the maximum outside diameter of the corresponding conical sections **21***b* of each centering device **18***a*, **18***b*, **18***c*, **18***d* (at the top end of the corresponding conical sections **21***b*), i.e., the outside diameter of the corresponding cylindrical sections **21***a* of each of the centering devices **18***a*, **18***b*, **18***c*, and/or **18***d* is somewhat smaller.

[**0061**] The grabber device **13***a* and/or the loader head **13***a* is supported on a "floating" bearing in relation to the other parts of the loading machine **13**.

[**0062**] When the grabber device **13***a* is moved from the position shown at the top right-hand side in FIG. **2**, i.e., from above the precision alignment device **19** (and/or above the centering recess **22** of the precision alignment device **19**), in the direction of the arrow O, vertically downwards, to for instance the position shown in FIG. **4** (or even further downwards), the centering devices **18***a*, **18***b*, **18***b*, **18***c* (and/or their conical sections **21***b*) provided on the underside of the grabber device **13***a*, are inserted into each corresponding centering opening **20***a*, **20***b*, **20***c*, **20***d* of the precision alignment device **19**.

[**0063**] Due to the above-mentioned "floating" bearing of the grabber device **13***a* (i.e., due to its lateral flexibility) the grabber device **13***a*, not yet accurately centered and/or aligned in relation to the precision alignment device **19** and/or its centering-recess **22**, is centered and/or aligned (i.e., moved slightly laterally as shown by the arrows Q and R in FIG. **2** so

that once the centering devices **18***a*, **18***b*, **18***b*, **18***c* have been inserted into each of the corresponding centering openings **20***a*, **20***b*, **20***c*, **20***d*, the central axes a of the centering devices **18***a*, **18***b*, **18***b*, **18***c* coincide with the corresponding central axes a of the centering openings **20***a*, **20***b*, **20***c*, **20***d* of the precision alignment device **19**.)

[**0064**] The component **3***a* and/or component-housing **11***a*, suspended above the precision alignment device **19** and/or its centering recess **22**, is then dropped into the centering recess **22** by the grabber device **13***a* (for instance arrow P in FIGS. **2** and **4**) by releasing the vacuum.

[**0065**] The centering recess has, as is for instance shown in FIG. **4**, tapered sides **22***a*, **22***b*.

[**0066**] The tapered sides **22***a*, **22***b* run at an angle downwards and inwards from the inside edges of the centering recess **22** on the upper side of the precision alignment device **19**.

[**0067**] At a lower point inside the centering recess **22** the dimensions of the centering-recess **22** essentially correspond with the dimensions of component **3***a* and/or component housings **11***a* (for instance the width, as shown in FIG. **4**, of the centering recess **22** in the above-mentioned lower point essentially corresponds with the width of component **3***a* and/or the component-housing **11***a*, and the length of the centering recess **22** essentially corresponds with the length of the component **3***a* and/or component housing **11***a*).

[**0068**] By means of the guiding tapers **22***a*, **22***b* it can be achieved that component **3***a* and/or the component housing **11***a* and thereby also the grabber device **13***a* is appropriately aligned and/or centered in relation to the precision alignment device **19** (i.e., moved slightly in a lateral direction when falling into the centering recess **22**, so that when, after falling into the centering recess **22**, the central axis a of the component **3***a* and/or component housing **11***a* coincides with the corresponding central axis b of the centering recess **22**).

[**0069**] Next the grabber device **13***a* of the above loading machine **13** (or, for example, a grabber device of an additional loading machine, if provided, such as the one mentioned above) for instance at the setting of the grabber device **13***a* shown in FIG. **4**, or at a setting in which the grabber device **13***a* has been moved even further downwards until the underside **13***b* of the grabber device **13***a* touches the component **3***a* and/or component housing **11***a*, can again remove the component **3***a* and/or component-housing **11***a* from the centering recess **22** provided in the precision alignment device **19** (for instance by (again) creating a vacuum at the grabber device **13***a* and/or the loader head **13***a* (and/or more accurately: underneath the grabber device **13***a* and/or the loader head **13***a*).

[**0070**] Hereby the component **3***a* and/or component-housing **11***a*, inserted in the centering recess **22**, is pulled upwards against the direction of the arrow P shown in FIGS. **2** and **4**, and, as shown in FIG. **3**, again held at the underside **13***b* of the grabber device **13***a* (by now due to the centering of the component **3***a* in relation to the precision alignment device **19**, and the centering of the grabber device **13***a* in relation to the precision alignment device **19**, for instance exactly in the middle between the above-mentioned centering devices **18***a*, **18***b*, **18***c*, **18***d*, i.e., in a way that exactly aligns it, in particular, centers it in relation to the grabber device **13***a*).

[**0071**] Next, by appropriately moving (for instance by swiveling and/or shifting) the grabber device **13***a* and/or the loader head **13***a* (for instance initially upwards in the direction of the arrow S shown in FIG. **2**, and then laterally in the direction of the arrow T shown in FIG. **2** and FIG. **5**, etc.) the grabber device **13***a* is held, while the vacuum is maintained, for instance together with the centered and/or aligned component **3***a* and/or component-housing **11***a* at the underside **13***b* of the grabber device **13***a*, in position above a corresponding (burn-in) socket and/or (burn-in) adapter **12***a*, **12***b*, **12***c*, **12***d* (FIG. **5**).

[**0072**] As is clear from FIG. **5**, the (burn-in) adapters and/or sockets **12***a*, **12***b*, **12***c*, **12***d* each has, in contrast to conventional (burn-in) sockets and/or adapters, a base element **24** but no cover (which in conventional (burn-in) sockets and/or adapters has been fitted above a corresponding base element, and is vertically moveable in relation to the base element **24**, for instance in a vertical direction, due to spring elements fitted in between).

[**0073**] Furthermore the (burn-in) adapters and/or sockets **12***a*, **12***b*, **12***c*, **12***d*, in contrast to conventional sockets and/or adapters, have no tapered component guiding planes and/or "guide" devices.

[**0074**] The sockets and/or adapters **12***a*, **12***b*, **12***c*, **12***d* and/or more accurately: the sockets and/or adapter base elements **24** (used here without covers), can otherwise be constructed essentially similar or identical to conventional "burn in" sockets and/or "burn in" adapters (and/or more accurately: to corresponding sockets and/or adapter base elements), for instance correspondingly similar or identical to the base elements of conventional "open top" sockets, in particular TSOP sockets (or for instance correspondingly similar or identical to the base elements of FBGA "burn in" sockets, etc.), for instance correspondingly similar or identical to the burn in sockets base elements in the model range NP367 of the Yamaichi company (here for instance schematically represented).

[**0075**] As is apparent from FIG. **5** and is more closely described below, the openings provided in the base element **24** (and used in conventional socket base elements for attaching springs) can in the present embodiment be used as centering holes **23***a*, **23***b*, **23***c*, **23***d* (instead of as attachment points for springs). Naturally, separate centering openings may also be provided in the base element **24** as an alternative.

[**0076**] The centering openings **23***a*, **23***b*, **23***c*, **23***d* have, similar to the centering openings **20***a*, **20***b*, **20***c*, **20***d* provided in the precision alignment device **19**, a substantially circular cross-section, and run vertically downwards, with an essentially constant inside diameter, in each case from corresponding corner areas on the upper side of the base element **24** of the socket and/or adapter—passing partially or wholly through the entire base element **24**.

[**0077**] As is clear from FIG. **5**, the central vertical axes a of the centering devices **18***a*, each passing through the middle of the conical sections **21***a* of the centering devices **18***a*, **18***b*, **18***c*, **18***d*, **18***b*, **18***c*, **18***d* coincide, when the grabber device **13***a* is appropriately aligned, with the corresponding central axes running vertically through the corresponding centering openings **23***a*, **23***b*, **23***c*, **23***d* of the adapter and/or socket **12***a*.

[**0078**] The inside diameter of each centering opening **23***a*, **23***b*, **23***c*, **23***d* essentially coincides, just as is the case with the

corresponding centering openings **20***a*, **20***b*, **20***c*, **20***d* of the precision alignment device **19**, with the maximum dimension of the outside diameter of the conical sections **21***b* provided on each centering device **18***a*, **18***b*, **18***c*, **18***d* (at the top end of the corresponding conical sections **21***b*), i.e., with the outside diameter of the corresponding cylindrical sections **21***a* of each centering device **18***a*, **18***b*, **18***c*, **18***d*.

[**0079**] As already described above, the grabber device **13***a* and/or the loader head **13***a* are attached by means of a "floating" bearing in relation to the other parts of the machine **13**.

[**0080**] When the grabber device **13***a* is moved vertically downwards from the setting shown in FIG. **5** above the adapter and/or socket **12***a*, in the direction of the arrow U, the centering devices **18***a*, **18***b*, **18***c*, **18***d* provided at the bottom of the grabber device **13***a*, are inserted into each centering opening **23***a*, **23***b*, **23***c*, **23***d* of the socket and/or adapter **12***a*.

[**0081**] As a result of the above-mentioned "floating" attachment of the grabber device **13***a* (i.e. its ability to move laterally) the grabber device **13***a*, not yet exactly centered and/or aligned, is centered and/or aligned in relation to the adapter and/or socket **12***a* as shown in FIG. **5** by the arrows X and Y, e.g., moved laterally to a certain extent, so that once the centering devices **18***a*, **18***b*, **18***b*, **18***c* have been inserted into the centering openings **23***a*, **23***b*, **23***c*, **23***d* provided in each case, the central axes a of the centering devices **18***a*, **18***b*, **18***b*, **18***c* coincide with the corresponding central axes of the centering openings **23***a*, **23***b*, **23***c*, **23***d* of the socket and/or adapter **12***a*. Conventional sockets and/or adapters (in particular the contacts and latches provided there) can be "opened" by means of appropriately depressing the adapter and/or socket covers (in the direction of arrow V shown in FIG. **5**) and after the adapter and/or socket covers have been released, can again be "closed".

[**0082**] This function of the cover (in particular opening and closing the above-mentioned socket contacts and latches) is taken over, in the case of the present "coverless" socket and/or adapter **12***a*, by the grabber device **13***a*, in particular by the special attachments (shown schematically here) **28***a*, **28***b*, **28***c* (and/or pins **28***a*, **28***b*, **28***c* or studs **28***a*, **28***b*, **28***c*) which have been provided on the grabber device **13***a* in addition to the above-mentioned centering devices **18***a*, **18***b*, **18***c*, **18***d*.

[**0083**] These reach down vertically, as is apparent from FIGS. **2**, **3** and **5**, downward from the underside **13***b* of the grabber device **13***a*.

[**0084**] The attachments **28***a*, **28***b*, **28***c* (and/or pins **28***a*, **28***b*, **28***c* or studs **28***a*, **28***b*, **28***c*) may be constructed correspondingly similar or identical to attachments and/or pins provided on the underside of conventional socket and/or adapter covers, for instance similar or identical to attachments and/or pins provided on conventional "open top" socket covers, in particular "burn-in" socket covers, for instance TSOP socket covers (or for instance FBGA socket covers, etc.), or for instance correspondingly similar or identical to the attachments and/or pins provided on the burn-in socket covers of sockets in the NP367 model range of the Yamaichi company (here, for example, schematically represented), etc. (in particular corresponding to the respective design of the socket base elements **24**).

[**0085**] For example, tapered planes **29** (labeled in FIG. **6**), can be provided on the attachments **28***a*, **28***b*, **28***c* and/or pins **28***a*, **28***b*, **28***c*, similar or identical to attachments and/or pins provided at the underside of conventional socket and/or adapter covers, with which in order to open and close the above-mentioned socket contacts and latches (mechanical) devices at the socket base element **24** can be operated.

[**0086**] In the present embodiment the grabber device **13***a* is moved vertically downwards, from the setting shown in FIG. **3** above the adapter and/or socket **12***a* in the direction of the arrow U, that the attachments **28***a*, **28***b*, **28***c* and/or pins **28***a*, **28***b*, **28***c* provided at the bottom of the cover (correspondingly similarly to the attachments and/or pins provided on conventional sockets and/or adapters) "open" the sockets and/or adapters **12***a* provided there.

[**0087**] Thereby for instance, correspondingly similar to conventional sockets and/or adapters, the vertical movement of the attachments **28***a*, **28***b*, **28***c* and/or pins **28***a*, **28***b*, **28***c* (for instance arrow U, shown in FIGS. **5** and **6**) can be converted into an appropriate horizontal movement, corresponding to that of an operating mechanism (arrow Z, FIG. **6**) by means of a corresponding mechanical device **30** provided at or attached to the socket and/or adapter **12***a* (for instance a device also containing the corresponding tapered planes **31**).

[**0088**] With the help of the mechanical device **30** and/or a corresponding operating mechanism (and/or its movement in a horizontal direction) the shanks of a V-shaped contact terminal **32** of the socket and/or adapter **12***a*, (initially slightly) open towards the top end and pre-tensioned towards a "closed" setting by means of corresponding spring devices connected to operating mechanism(s), can be moved apart (on a horizontal plane) thereby being prepared to receive a component and/or component housing connection (shown in FIG. **6** schematically as an example and represented in highly simplified form).

[**0089**] Advantageously the grabber device **13***a* is forced downwards in the direction of arrow U, until the component **3***a* and/or component-housing **11***a*, still held, by the vacuum being maintained, at the underside **13***b* of the grabber device **13***a* touches the top of the base element **24** in the inner part of the socket **12***a*, and the connections of the component **3***a* and/or component housing **11***a* are inserted into the corresponding (wide open) contact terminals **32** of the socket and/or adapter **12***a*. Then the vacuum is released and the component **3***a* and/or component-housing **11***a* released.

[**0090**] In other words, the component **3***a* and/or component-housing **11***a* is gently placed into the adapter and/or socket **12***a*, and not, as with conventional grabber devices, aligned with the help of tapered guide planes provided at the sockets and/or adapter by being dropped into the adapter and/or socket.

[**0091**] This gentle placing action is possible because the component **3***a* and/or the component-housing **11***a* has already been relatively accurately aligned in relation to the grabber device **13***a* by means of the process described above (i.e., at the precision alignment device **19**), and by inserting the centering devices **18***a*, **18***b*, **18***c*, **18***d* of the grabber device **13***a* into the centering openings **23***a*, **23***b*, **23***c*, **23***d*, provided at the socket and/or adapter **12***a*, the grabber device **13***a* is additionally aligned with relatively high accuracy in relation to the socket and/or adapter **12***a*.

[**0092**] After the component **3***a* and/or component housings **11***a* have been placed into sockets **12***a*, the grabber device **13***a*, with attachments and/or pins **28***a*, **28***b*, **28***c* (and the

centering devices **18***a*, **18***b*, **18***c*, **18***d*) is retracted, vertically upwards, whereby (in corresponding fashion, as if the cover of a conventional adapter and/or socket **12***a* had been released, i.e., moved upwards again) the adapter and/or socket **12** and/or the contacts and latches provided there is "locked" again.

[**0093**] In this way secure electrical contact is made between the terminals provided on each component **3***a* (and/or component housing **11***a*) and the terminals provided at the adapter and/or socket **12***a* (for instance by the shank of the above-mentioned V-shaped contact terminal **32**, again released by attachments and/or pins **28***a*, **28***b*, **28***c*, being forced, by means of spring pressure provided by the above-mentioned spring devices against a component and/or component housing contact, which has been inserted into contact terminal **32**).

[**0094**] In similar fashion to that described above, the grabber device **13***a* (or it being the case the above further grabber device) can load a multitude of further adapters and/or sockets **12***b*, **12***c*, **12***d*, and/or the component-housings **11***b*, **11***c*, **11***d* etc., similarly constructed to the socket and/or adapter **12***a* shown in FIG. **5**, with components **3***b*, **3***c*, **3***d*, etc. (for instance at a rate of more than 100 or 1,000 adapters and/or sockets per hour).

[**0095**] In each case, several of these sockets and/or adapters **12***a*, **12***b*, **12***c*, **12***d* (for instance more than 50, 100 or 200 sockets and/or adapters **12***a*, **12***b*, **12***c*, **12***d*) have been connected, as can be seen in FIG. **1**, to one and the same card **14** and/or board **14** at testing station D (and/or to one and the same test card and/or test board **14**) (for instance more than 50, 100 or 200 sockets and/or adapters **12***a*, **12***b*, **12***c*, **12***d*).

[**0096**] The test-board **14** (and thereby also the semiconductor components **3***a*, **3***b*, **3***c*, **3***d* and/or housing **11***a*, **11***b*, **11***c*, **11***d* loaded into the sockets and/or adapters **12***a*, **12***b*, **12***c*, **12***d*) are loaded, as shown in FIG. **1**, with the help of an appropriate machine into an "oven"**15** that can be shut (and/or into an apparatus **15**, with which extreme conditions can be created for the above semiconductor components **3***a*, **3***b*, **3***c*, **3***d* (for instance increased temperatures, for instance above 70° C., 100° C., or 150° C., and/or increased component operating voltages, etc.)).

[**0097**] The test-card **14** and/or the test board **14** is in each case, in the conventional manner, connected to a test apparatus **4**, for instance by means of lines **16**.

[**0098**] This causes the test signals being generated by the test apparatus **4** to be relayed, for instance by means of the above lines **16**, to the test card **14**, and from there to the sockets **12***a*, **12***b*, **12***c*, **12***d*, and their socket contact pins (not shown here) by means of the card contacts.

[**0099**] From the sockets **12***a*, **12***b*, **12***c*, **12***d* the test signals are then relayed via the above socket connections and the housing connections making contact with them, to the housings **11***a*, **11***b*, **11***c*, **11***d*, and from there via the above housing contacts and the semiconductor component contacts making contact with them, to the semiconductor components **3***a*, **3***b*, **3***c*, **3***d* to be tested.

[**0100**] The signals emitted in reaction to the test signals applied to corresponding semiconductor component contacts are then scanned by housing contacts (in contact with them) and led via the sockets **12***a*, **12***b*, **12***c*, **12***d*, the card **14** and lines **16** to the test apparatus **4**, where the signals can then be evaluated.

[**0101**] Thereby the test system **1**, which includes, among other things, the test apparatus **4**, the card **14** and the sockets **12***a*, **12***b*, **12***c*, **12***d*, can perform a conventional test procedure, for instance a conventional "burn-in" test (or several similar tests in succession), in which and/or in the course of which for instance the functionality of the semiconductor components **3***a*, **3***b*, **3***c*, **3***d* can be evaluated (for instance while or after the semiconductor components are being or have been subjected to the above-mentioned extreme conditions in the above "oven **15** or the apparatus **15** for a relatively long period of time (for instance for more than 30 minutes, and/or more than one hour)).

What is claimed is:

1. A mechanism for loading a socket with a semiconductor component, comprising a device for opening the socket.

2. The mechanism according to claim 1, wherein contacts provided at the socket are opened by the device for opening the socket.

3. The mechanism according to claim 1, wherein the device for opening the socket is an attachment to the mechanism which is provided with a corresponding tapered plane.

4. The mechanism according to claim 1, wherein the device is designed such that when the mechanism is moved toward the socket, contacts provided at the socket are opened by the device.

5. The mechanism according to claim 1, further comprising an aligning device that aligns the mechanism in relation to the socket.

6. The mechanism according to claim 5, wherein the aligning device has a tapered plane.

7. The mechanism according to claim 6, wherein the aligning device has a conical section.

8. The mechanism according to claim 7, wherein the aligning device is a recess provided at the mechanism.

9. The mechanism according to claim 5, wherein the socket comprises a further alignment facilitating mechanism.

10. The mechanism according to claim 5, wherein the aligning device attached to the mechanism is additionally used for aligning the mechanism in relation to a precision alignment device.

11. A socket for semiconductor components, comprising a base element and contacts to be opened by a semiconductor component loading mechanism for loading the socket.

12. The socket according to claim 11, wherein a mechanical device is provided for opening the socket.

13. The socket according to claim 11, further comprising a facility for aligning the semiconductor component loading mechanism in relation to the socket.

14. The socket according to claim 13, wherein the facility is a recess provided at the socket.

15. The socket according to claim 13, wherein, to align the mechanism in relation to the socket, the mechanism is provided with a device, working in conjunction with the alignment facility provided at the socket.

16. A process for loading a socket with a corresponding semiconductor component, comprising opening contacts in the socket with a socket loading mechanism.

17. The process according to claim 16, wherein the socket loading mechanism has a tapered plane.

18. The process according to claim 16, wherein the socket loading mechanism moves toward the contacts in the socket, which are opened by the socket loading mechanism.

19. The process according to claim 16, further comprising aligning the socket loading mechanism in relation to the socket.

20. The process according to claim 19, wherein the aligning is achieved by means of an alignment device provided on the socket loading mechanism.

21. The process according to claim 20, wherein the alignment device has a tapered plane.

22. The process according to claim 20, wherein, to align the socket loading mechanism in relation to the socket, a facility provided in the socket that works in conjunction with the alignment device provided at the mechanism.

23. The process according to claim 22, further comprising:

moving the loading socket mechanism toward the socket; and

inserting the attachment provided at the mechanism into the recess provided at the socket.

24. The process according to claim 23, further comprising aligning the mechanism in relation to a precision alignment device with assistance of the alignment device provided at the mechanism.

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