

[0035] The stepped surface formation mechanism 300 and the stepped surface formation mechanism drive unit 400 are accommodated in a base portion 24 of the stage 20. The stepped surface formation mechanism 300 is located at the upper portion 28 of the stage 20, and the stepped surface formation mechanism drive unit 400 is located at the lower portion of the stage 20. The stepped surface formation mechanism 300 includes the plurality of moving elements 30 moving in the vertical direction. By the stepped surface formation mechanism drive unit 400, each front end surface of the plurality of moving elements 30 moves downward as indicated by an arrow a in FIG. 1. Details of the moving elements 30 are described later.

[0036] An opening pressure switching mechanism 80 that switches the pressure of the opening 23 of the stage 20 includes a three-way valve 81 and a drive unit 82 that switches open and close of the three-way valve 81. The three-way valve 81 has three ports, the first port is connected to the base portion 24 communicating with the opening 23 of the stage 20 by a pipe 83, the second port is connected to the vacuum apparatus 140 by a pipe 84, and the third port is connected to a pipe 85 open to the atmosphere. The drive unit 82 causes the first port and the second port to communicate with each other and cuts off the third port, and sets the pressure of the opening 23 as a first pressure P_1 close to vacuum, or causes the first port and the third port to communicate with each other and cuts off the second port, and sets the pressure of the opening 23 as a second pressure P_2 close to atmospheric pressure, thereby switching the pressure of the opening 23 between the first pressure P_1 and the second pressure P_2 .

[0037] Similar to the opening pressure switching mechanism 80, the adsorption pressure switching mechanism 90 that switches the adsorption pressure of the adsorption surface 22 of the stage 20 includes a three-way valve 91 having three ports and a drive

of the groove 26 of the stage 20 or the adsorption surface 22 is atmospheric pressure, and the pressure of the opening 23 is also atmospheric pressure. In the initial state, the front end surfaces 47, 38b, and 38a of the moving elements 45, 40, and 31 are at the first position protruding from the adsorption surface 22 of the stage 20 by the height H_0 , and thus the height of the back surface 12b of the dicing sheet 12 in contact with the front end surfaces 47, 38b, and 38a is also the first position protruding from the adsorption surface 22 by the height H_0 . In addition, the back surface 12b of the dicing sheet 12 is slightly floated from the adsorption surface 22 at the peripheral edge of the opening 23, and is in close contact with the adsorption surface 22 in the region separated from the opening 23.

When the horizontal position adjustment is completed, the control unit 150 causes the collet drive unit 130 shown in FIG. 1 to descend the collet 18 onto the semiconductor die 15 and land the front surface 18a of the collet 18 on the semiconductor die 15.

[0051] FIG. 18 is a diagram showing a time variation in the height of the collet 18, the position of the columnar moving element 45, the position of the intermediate annular moving element 40, the position of the peripheral annular moving element 31, the opening pressure of the opening 23, and the air leakage amount of the collet 18 during the release action (pickup action) of level 4. As shown in (a) of FIG. 18, which shows the height of the front surface 18a of the collet 18, and shows a state in which the collet 18 is moved from a time slightly after time $t = 0$ (height H_{c1}) to time t_2 . At time t_1 during which the collet 18 is being moved, the control unit 150 causes the drive unit 102 of the suction mechanism 100 to switch the three-way valve 101 in a direction of communicating the suction hole 19 of the collet 18 and the vacuum apparatus 140. Thereby, the suction hole 19 becomes a negative pressure, and air flows into the suction hole 19 from the front surface 18a of the collet 18 (as indicated by an arrow 301 in FIG. 7), and thus the suction air flow rate (air leakage amount) detected by the flow rate sensor 106 increases from

time t1 to time t2 as shown in (f) of FIG. 18. At time t2, when the collet 18 lands on the semiconductor die 15, the semiconductor die 15 is adsorbed and fixed on the front surface 18a, and air cannot flow in from the front surface 18a. Thereby, at time t2, the air leakage amount detected by the flow rate sensor 106 starts to decrease. As shown in

5 FIG. 6, the height of the front surface 18a of the collet 18 when the collet 18 lands on the semiconductor die 15 becomes a height H_c is obtained by adding the thickness of the dicing sheet 12 and the thickness of the semiconductor die 15 to the height of the front end surfaces 47, 38b, and 38a of the moving elements 45, 40, and 31 (the height H_0 from the surface 22).

10 **[0052]** Next, at time t2 shown in FIG. 18, the control unit 150 outputs a command to switch the adsorption pressure (not shown) of the adsorption surface 22 of the stage 20 from the fourth pressure P_4 close to atmospheric pressure to the third pressure P_3 close to vacuum. According to this command, the drive unit 92 of the adsorption pressure switching mechanism 90 switches the three-way valve 91 in the direction of

15 communicating the adsorption hole 27 and the vacuum apparatus 140. Then, the air in the groove 26 is sucked out to the vacuum apparatus 140 through the adsorption hole 27 as indicated by an arrow 201 in FIG. 7, an arrow 211 in FIG. 10, an arrow 213 in FIG. 11, an arrow 221 in FIG. 13, an arrow 225 in FIG. 14, an arrow 242 in FIG. 16 and an arrow 245 in FIG. 17, the adsorption pressure becomes the third pressure P_3 close to vacuum.

20 Then, the back surface 12b of the dicing sheet 12 at the peripheral edge of the opening 23 is vacuum-sucked to the front surface of the adsorption surface 22 as indicated by an arrow 202 in FIG. 7. Because the front surfaces 47, 38b, and 38a of the moving elements 45, 40, and 31 are at the first position protruding from the adsorption surface 22 of the stage 20 by the height H_0 , a tension force F_1 obliquely downward acts on the dicing sheet

25 12. This tension force F_1 can be decomposed into a tension force F_2 that tensions the dicing sheet 12 laterally and a tension force F_3 that

t8. When the opening pressure decreases from the second pressure P_2 close to atmospheric pressure to the first pressure P_1 close to vacuum, as indicated by an arrow 216 in FIG. 12, the dicing sheet 12 located immediately above (facing) the front end surface 38a of the peripheral annular moving element 31 is tensioned downward so that the back surface 12b contacts the front end surface 38a. Thereby, as indicated by an arrow 217 in FIG. 12, a part of the semiconductor die 15 located immediately above the front end surface 38a of the semiconductor die 15 is bent and deformed downward, and separated from the front surface 18a of the collet 18, and air flows into the adsorption hole 19 of the collet 18 as indicated by an arrow 218 in FIG. 12. The amount of the air leakage flowing into the suction hole 19 is detected by the flow rate sensor 106. As shown in (f) of FIG. 18, the air leakage amount increases in a period of time t_7 to time t_8 during which the opening pressure decreases. Then, near time t_8 at which the opening pressure reaches the first pressure P_1 , the semiconductor die 15 in the region facing the front end surface 38a returns toward the front surface 18a of the collet 18 as indicated by an arrow 224 in FIG. 13. Thereby, the air leakage amount starts to decrease near time t_8 in (f) of FIG. 18, and when the semiconductor die 15 is vacuum-adsorbed to the front surface 18a of the collet 18 as shown in FIG. 13, the air leakage amount returns to almost zero. At this time, the region of the semiconductor die 15 facing the front end surface 38a is released from the front surface 12a of the dicing sheet 12. Besides, the time until the region of the semiconductor die 15 facing the front end surface 38a returns to the front surface 18a of the collet 18 as indicated by the arrow 224 in FIG. 13 after being tensioned to the dicing sheet 12 as indicated by the arrow 217 in FIG. 12 varies according to the releasability between the semiconductor die 15 and the dicing sheet 12.

[0063] Next, as shown in (e) of FIG. 18, the control unit 150 outputs a command to

38b returns toward the front surface 18a of the collet 18 as indicated by an arrow 244 in FIG. 16. Thereby, the air leakage amount starts to decrease near time t_{12} in (f) of FIG. 18, and when the semiconductor die 15 is vacuum-adsorbed to the front surface 18a of the collet 18 as shown in FIG. 16, the air leakage amount becomes almost zero. Besides, the time for returning to the front surface 18a of the collet 18 varies according to the releasability between the semiconductor die 15 and the dicing sheet 12.

[0066] Next, as shown in (e) of FIG. 18, the control unit 150 outputs a command to switch the opening pressure from the first pressure P_1 close to vacuum to the second pressure P_2 close to atmospheric pressure at time t_{13} . According to this command, the drive unit 82 of the opening pressure switching mechanism 80 switches the three-way valve 81 so as to communicate the opening 23 and the pipe 85 open to the atmosphere. Then, air flows into the opening 23 as indicated by an arrow 241 in FIG. 16 and the opening pressure increases, and thus the dicing sheet 12 is displaced upward as indicated by an arrow 243 in FIG. 16. As shown in (e) of FIG. 18, at time t_{14} , the opening pressure becomes the second pressure P_2 close to the atmospheric pressure. In this state, as shown in FIG. 16, the semiconductor die 15 of the region corresponding to the front end surface 47 of the columnar moving element 45 is attached to the dicing sheet 12, but most of the region of the semiconductor die 15 is released from the dicing sheet 12.

[0067] Next, at time t_{14} in FIG. 18, the control unit 150 outputs a command to move the front end surface 47 of the columnar movement element 45 to the second position lower than the first position (the position at which the height from the adsorption surface 22 is H_0) by the height H_1 , and a command to move the front end surface 38b of the intermediate annular moving element 40 at the second position to the third position lower than the first position (initial position) by the height H_2 (the position lower than the

moving elements 30 (the peripheral annular moving element 31, the intermediate annular moving element 40, the columnar moving element 45) are simultaneously descended from the first position to the second position or lower at time $ts1$, and the “number of moving elements descended simultaneously” is increased to three (DN1). When the semiconductor die 15 is easily released from the dicing sheet 12, the region closer to the inner side than the periphery of the semiconductor die 15 is immediately released from the dicing sheet 12 even if the plurality of moving elements 30 are simultaneously descended. Besides, when the peripheral annular moving element 31 and the intermediate annular moving element 40 are simultaneously descended and the columnar moving element 45 is descended after a predetermined time, the “number of moving elements descended simultaneously” is two. Besides, in the parameter table 159 of FIG. 19, two release parameters of the “number of moving elements descended simultaneously” and the “descending time interval between moving elements” are defined, but instead of the two release parameters, the “descending time interval between the annular moving element 31 and the intermediate annular moving element 40”, the “descending time interval between the intermediate annular moving element 40 and the columnar moving element 45”, and the “descending time interval between the intermediate annular moving element 40 and another intermediate annular moving element 41” can be defined. In this case, one or more of these descending time intervals are set to 0 in order to simultaneously descend the plurality of moving elements 30.

[0082] In addition, in the release action of level 1 in FIG. 21, the “collet waiting time” (WT1) is set to 460 ms and shortened. Then, in FIG. 21, the “pickup time” (PT1) is 570 ms, which is short.

[0083] As described above, the parameter value of each release parameters is made

[0094] For example, the releasability of the semiconductor die 15 from the dicing sheet 12 may vary even if the same type of semiconductor die 15 is continuously picked up from the same type of dicing sheet 12. By transitioning the level value applied during pickup according to the variation of releasability, the semiconductor die 15 can be stably
5 picked up without damage even if the releasability becomes poor (the releasability becomes low). On the other hand, the pickup can be performed in a shorter time when the releasability becomes good (the easiness of release becomes high).

[0095] In addition, for example, the type of the semiconductor die 15, the type of the dicing sheet 12 or the like may vary, and the optimum level value for pickup may be
10 unknown. In this case, first, level 8 of the parameter table 159 (see FIG. 19) that enables the most stable pickup is applied to perform the pickup, and the level value is gradually transitioned to level 1 (the highest speed) based on the correlation value of the specific semiconductor die 15. Thereby, the optimum level value is searched, and an optimum pickup in which stability and high speed are balanced can be realized.

[0096] Next, specific transition control for level value is described. FIG. 23 is a flowchart showing a flow of level transition control in the embodiment. In the embodiment, all the semiconductor dies 15 are treated as a specific semiconductor die 15, and there is an opportunity to transition the level value every time the semiconductor die 15 of one or more wafers is picked up. The transition of the level value includes a
15 transition from the level value applied to the current pickup (current level value) to the next level value (see FIG. 25) and a transition that does not limit the level value of the transition destination (see FIG. 26). The details are described below.

[0097] First, the control unit 150 sets a level value (current level value 161) applied during first pickup, and stores the level value in the storage unit 152. Here, the current level
20

using the current level value as a key, and each of the read threshold values TH1 and TH2 is compared with the representative correlation value; according to the comparison result, in S120 and S122, the current level value (one level value of A-1 to A-8) for the “number of switches of opening pressure during initial release” is transitioned to another level value (one level value of A-1 to A-8). Similarly, in S116 and S118, the current level value (one level value of B-1 to B-8) of the “number of switches of opening pressure during main release” and the threshold value table for the “number of switches of opening pressure during main release” are used, the threshold values TH1 and TH2 are read from the threshold value table using the current level value as a key, and each of the read threshold values TH1 and TH2 is compared with the representative correlation value; according to the comparison result, in S120 and S122, the current level value (one level value of B-1 to B-8) for the “number of switches of opening pressure during main release” is transitioned to another level value (one level value of B-1 to B-8). The same applies to other release parameters.

[0116] In this manner, the current level value is managed for each type of the release parameters, and transitioned to a low-speed level or a high-speed level for each type of the release parameters, and thus the semiconductor die 15 can be picked up by combining the parameter values of more various release parameters according to the releasability of the semiconductor die 15.

[0117] <Level transition control of another embodiment>

Next, level transition control of another embodiment is described. FIGS. 28 and 29 are flowcharts showing a flow of the level transition control in another embodiment. In this embodiment, all the semiconductor dies 15 are treated as a specific semiconductor die 15, and there is an opportunity to transition the level value every time the

WHAT IS CLAIMED IS:

1. A semiconductor die pickup system, which picks up semiconductor dies attached to the front surface of a dicing sheet from the dicing sheet, comprising:

a collet that adsorbs the semiconductor die;

5 a suction mechanism that is connected to the collet and sucks air from the front surface of the collet;

a flow rate sensor that detects a suction air flow rate of the suction mechanism;

a stage that comprises an adsorption surface for adsorbing the back surface of the dicing sheet;

10 an opening pressure switching mechanism that switches the opening pressure of an opening arranged on the adsorption surface of the stage between a first pressure close to vacuum and a second pressure close to atmospheric pressure; and

a setting part that sets a pickup parameter comprising the number of switches of the opening pressure during pickup of a semiconductor die;

15 wherein the setting part

acquires a flow rate variation which is a time variation of the suction air flow rate detected by the flow rate sensor during pickup of the semiconductor die, calculates an evaluation value obtained by evaluating the releasability for releasing the semiconductor die from the dicing sheet based on the flow rate variation, and

20 changes the pickup parameter during pickup of another semiconductor die after the semiconductor die is picked up based on the evaluation value.

2. The semiconductor die pickup system according to claim 1,

wherein the setting part

changes, based on the evaluation value, the time for holding the opening

pressure at the first pressure during pickup of the another semiconductor die.

3. The semiconductor die pickup system according to claim 1 or 2, further comprising:

5 a plurality of moving elements which is disposed at the opening and in which the front end surfaces move between a first position higher than the adsorption surface and a second position lower than the first position;

wherein during pickup of the semiconductor die, each of the plurality of moving elements is sequentially moved at a predetermined time interval, or simultaneously moved in a predetermined combination of the moving elements from the
10 first position to the second position; and

the setting part

changes the predetermined time during pickup of the another semiconductor die based on the evaluation value.

4. The semiconductor die pickup system according to claim 3,
15 wherein the setting part

changes, based on the evaluation value, the number of the moving elements moved simultaneously from the first position to the second position during pickup of the another semiconductor die.

5. The semiconductor die pickup system according to claim 3,

20 wherein during pickup of the semiconductor die, an initial release is performed in which the opening pressure is switched between the first pressure and the second pressure to release the dicing sheet sucked at the opening from the semiconductor die; and

the flow rate variation is a time variation of the suction air flow rate detected

by the flow rate sensor during the initial release.

6. The semiconductor die pickup system according to claim 5,

wherein the number of switches is the number of times for switching the opening pressure during the initial release between the first pressure and the second pressure.

7. The semiconductor die pickup system according to claim 1 or 2,

Wherein, during the another semiconductor die is released from the dicing sheet, the setting part

changes, based on the evaluation value, a waiting time from the landing of the collet on the semiconductor die to the start of the lifting of the semiconductor die.

8. The semiconductor die pickup system according to claim 1 or 2, further comprising

a storage unit that stores an expected flow rate variation which is a time variation of the suction air flow rate during pickup of the semiconductor die when the semiconductor die is satisfactorily picked up from the dicing sheet,

wherein the setting part

obtains the evaluation value based on a correlation value between the flow rate variation and the expected flow rate variation during pickup of the semiconductor die.

9. The semiconductor die pickup system according to claim 1 or 2, further

comprising

an inspection unit that performs crack inspection for the semiconductor die,

wherein the semiconductor die that has been subjected to the switching a predetermined number of times or more during pickup of the semiconductor die is targeted for crack inspection.

10. The semiconductor die pickup system according to claim 1 or 2,

wherein the setting part

acquires the flow rate variations of semiconductor dies constituting one or more wafers, obtains the evaluation values based on the respective flow rate variations,

5 and

changes the pickup parameter during pickup of the another semiconductor die based on the plurality of evaluation values.

11. The semiconductor die pickup system according to claim 1 or 2, further

comprising a storage unit that stores

10 a table of parameter values of the pickup parameters associated with each of a plurality of level values and

a current level value which is the level value of the parameter value of the pickup parameter currently applied;

wherein the parameter value of the pickup parameter is read from the table

15 using the current level value as a key, and the parameter value of the pickup parameter is applied to pick up the semiconductor die; and

the setting part

changes, based on the evaluation value, the parameter value of the pickup parameter during pickup of the another semiconductor die by transitioning the current

20 level value to another level value.

12. The semiconductor die pickup system according to claim 1 or 2,

wherein the semiconductor die in which the evaluation value is calculated is a specific semiconductor die, and

the setting part

obtains, from the evaluation values of one or more of the specific semiconductor dies, a representative die evaluation value which is a representative value of the evaluation values,

reduces the number of switches during pickup of the another semiconductor die compared with the number of switches during pickup of the specific semiconductor die when the representative die evaluation value is higher than a first predetermined value, and

increases the number of switches during pickup of the another semiconductor die compared with the number of switches during pickup of the specific semiconductor die when the representative die evaluation value is lower than a second predetermined value which is a value lower than the first predetermined value.

13. The semiconductor die pickup system according to claim 2,

wherein the semiconductor die in which the evaluation value is calculated is a specific semiconductor die, and

the setting part

obtains, from the evaluation values of one or more of the specific semiconductor dies, a representative die evaluation value which is a representative value of the evaluation values,

shortens the time for holding the opening pressure at the first pressure during pickup of the another semiconductor die compared with the time during pickup of the specific semiconductor die when the representative die evaluation value is higher than a third predetermined value, and

lengthens the time for holding the opening pressure at the first pressure during pickup of the another semiconductor die compared with the time during pickup of the

specific semiconductor die when the representative die evaluation value is lower than a fourth predetermined value which is a value lower than the third predetermined value.

14. The semiconductor die pickup system according to claim 3,

wherein the semiconductor die in which the evaluation value is calculated is a

5 specific semiconductor die, and

the setting part

obtains, from the evaluation values of one or more of the specific semiconductor dies, a representative die evaluation value which is a representative value of the evaluation values,

10 shortens the predetermined time during pickup of the another semiconductor die compared with the predetermined time during pickup of the specific semiconductor die when the representative die evaluation value is higher than a fifth predetermined value, and

lengthens the predetermined time during pickup of the another semiconductor die compared with the predetermined time during pickup of the specific semiconductor die when the representative die evaluation value is lower than a sixth predetermined value which is a value lower than the fifth predetermined value.

15 The semiconductor die pickup system according to claim 4,

wherein the semiconductor die in which the evaluation value is calculated is a

20 specific semiconductor die, and

the setting part

obtains, from the evaluation values of one or more of the specific semiconductor dies, a representative die evaluation value which is a representative value of the evaluation values,

increases the number of the moving elements moved simultaneously from the first position to the second position during pickup of the another semiconductor die compared with the number of the moving elements during pickup of the specific semiconductor die when the representative die evaluation value is higher than a seventh
5 predetermined value, and

reduces the number of the moving elements moved simultaneously from the first position to the second position during pickup of the another semiconductor die compared with the number of the moving elements during pickup of the specific semiconductor die when the representative die evaluation value is lower than an eighth
10 predetermined value which is a value lower than the seventh predetermined value.

16. The semiconductor die pickup system according to claim 7,

wherein the semiconductor die in which the evaluation value is calculated is a specific semiconductor die, and

the setting part

15 obtains, from the evaluation values of one or more of the specific semiconductor dies, a representative die evaluation value which is a representative value of the evaluation values,

shortens the waiting time during pickup of the another semiconductor die compared with the waiting time during pickup of the specific semiconductor die when
20 the representative die evaluation value is higher than a ninth predetermined value, and

lengthens the waiting time during pickup of the another semiconductor die compared with the waiting time during pickup of the specific semiconductor die when the representative die evaluation value is lower than a tenth predetermined value which is a value lower than the ninth predetermined value.

17. The semiconductor die pickup system according to claim 1 or 2,

wherein the semiconductor die in which the evaluation value is calculated is a specific semiconductor die, and

the setting part

5 compares each of the evaluation values of one or more of the specific semiconductor dies with an eleventh predetermined value, to obtain the number of easy release detections which is the number of the evaluation values higher than the eleventh predetermined value,

compares each of the evaluation values of one or more of the specific
10 semiconductor dies with a twelfth predetermined value which is a value lower than the eleventh predetermined value, to obtain the number of difficult release detections which is the number of the evaluation values lower than the twelfth predetermined value, and

changes, based on the number of easy release detections and the number of difficult release detections, the number of switches during pickup of the another
15 semiconductor die after pickup of the specific semiconductor die.

18. The semiconductor die pickup system according to claim 2,

wherein the semiconductor die in which the evaluation value is calculated is a specific semiconductor die, and

the setting part

20 compares each of the evaluation values of one or more of the specific semiconductor dies with an eleventh predetermined value, to obtain the number of easy release detections which is the number of the evaluation values higher than the eleventh predetermined value,

compares each of the evaluation values of one or more of the specific

semiconductor dies with a twelfth predetermined value which is a value lower than the eleventh predetermined value, to obtain the number of difficult release detections which is the number of the evaluation values lower than the twelfth predetermined value, and

changes, based on the number of easy release detections and the number of difficult release detections, the time for holding the opening pressure at the first pressure during pickup of the another semiconductor die after pickup of the specific semiconductor die.

19. The semiconductor die pickup system according to claim 3,
wherein the semiconductor die in which the evaluation value is calculated is a specific semiconductor die, and

the setting part
compares each of the evaluation values of one or more of the specific semiconductor dies with an eleventh predetermined value, to obtain the number of easy release detections which is the number of the evaluation values higher than the eleventh predetermined value,

compares each of the evaluation values of one or more of the specific semiconductor dies with a twelfth predetermined value which is a value lower than the eleventh predetermined value, to obtain the number of difficult release detections which is the number of the evaluation values lower than the twelfth predetermined value, and
changes, based on the number of easy release detections and the number of difficult release detections, the predetermined time during pickup of the another semiconductor die after pickup of the specific semiconductor die.

20. The semiconductor die pickup system according to claim 4,
wherein the semiconductor die in which the evaluation value is calculated is a

specific semiconductor die, and

the setting part

compares each of the evaluation values of one or more of the specific semiconductor dies with an eleventh predetermined value, to obtain the number of easy
5 release detections which is the number of the evaluation values higher than the eleventh predetermined value,

compares each of the evaluation values of one or more of the specific semiconductor dies with a twelfth predetermined value which is a value lower than the eleventh predetermined value, to obtain the number of difficult release detections which
10 is the number of the evaluation values lower than the twelfth predetermined value, and

changes, based on the number of easy release detections and the number of difficult release detections, the number of the moving elements during pickup of the another semiconductor die after pickup of the specific semiconductor die.

21. The semiconductor die pickup system according to claim 7,

15 wherein the semiconductor die in which the evaluation value is calculated is a specific semiconductor die, and

the setting part

compares each of the evaluation values of one or more of the specific semiconductor dies with an eleventh predetermined value, to obtain the number of easy
20 release detections which is the number of the evaluation values higher than the eleventh predetermined value,

compares each of the evaluation values of one or more of the specific semiconductor dies with a twelfth predetermined value which is a value lower than the eleventh predetermined value, to obtain the number of difficult release detections which

is the number of the evaluation values lower than the twelfth predetermined value, and changes, based on the number of easy release detections and the number of difficult release detections, the waiting time during pickup of the another semiconductor die after pickup of the specific semiconductor die.