

MULTI-STAGE JACK-UP STRUCTURE AND DIE-BONDING APPARATUS

FIELD

[0001] The present application relates to the technical field of die bonding, and in particular to a multi-stage jack-up structure and a die-bonding apparatus.

BACKGROUND

[0002] Die bonding refers to a process where the die is bonded to a designated region on a lead frame by adhesives to form thermal path or electrical path, to prepare for subsequent wire bonding. The die is attached onto a base film before bonded to the frame. A suction-nuzzle structure and a jack-up structure are generally provided for die bonding. The jack-up structure jacks up the die to separate it from the base film preliminarily, then the suction-nuzzle structure sucks up the die to fully remove it from the base film.

[0003] In the prior art, the jack-up structure usually has an air cylinder, as well as a jack-up block that is connected to the telescopic end of the cylinder. The base film is pushed up locally from bottom to top by the jack-up block driven by the air cylinder, to push up the corresponding die, so that the die is separated preliminarily from the base film. This jack-up structure is generally suitable for thick dies. For a thinner die which is usually fragile, if the above jack-up structure is used to push up the die, when the base film is being jacked up, the die which is fragile itself may easily be broken since the edge of the die is relatively far from the jack-up structure; if the area of the jack-up structure is enlarged, the die may not be fully removed.

[0004] Therefore, a jack-up structure is to be provided, to solve the problem that thin dies can be easily broken when being separated from the base film.

SUMMARY

[0005] An object of the present application is to provide a multi-stage jack-up structure and a die-bonding apparatus, to solve the problem that thin dies can be easily broken when being separated from the base film.

[0006] For achieving the object, the following technical solutions are provided according to

the present application.

[0007] A multi-stage jack-up structure includes a housing and a jacking unit, where

a first jack-up avoidance hole is provided in the housing along a first direction, a first jack-up chamber in communication with the first jack-up avoidance hole is formed inside the housing, and a first limiting portion is provided in a protruding manner on a wall of the first jack-up chamber;

a terminal jack-up assembly is mounted on a jacking end of the jacking unit, the terminal jack-up assembly extends into the first jack-up chamber along the first direction, and the jacking unit is configured to drive the terminal jack-up assembly to pass through the first jack-up avoidance hole;

a first jack-up assembly is sleeved outside the terminal jack-up assembly, where a first spring unit is arranged between the first jack-up assembly and the terminal jack-up assembly, and in the first direction, one end of the first spring unit abuts against the terminal jack-up assembly, and the other end abuts against the first jack-up assembly; and

after the terminal jack-up assembly moves a first distance in the first direction, the first jack-up assembly abuts against the first limiting portion, and the first spring unit is in a compressed state.

[0008] In an embodiment, a second jack-up avoidance hole is provided in the first jack-up assembly along the first direction, a second jack-up chamber in communication with the second jack-up avoidance hole is provided inside the first jack-up assembly, and a second limiting portion is provided on the first jack-up assembly;

a second jack-up assembly is further sleeved outside the terminal jack-up assembly, where the second jack-up assembly is located inside the second jack-up chamber, and is slidable in the second jack-up chamber along the first direction; and

a second spring unit is arranged between the second jack-up assembly and the terminal jack-up assembly, and in the first direction, one end of the second spring unit abuts against the terminal jack-up assembly, and the other end abuts against the second jack-up assembly; and where

after the second jack-up assembly moves a second distance in the first direction, the second jack-up assembly abuts against the second limiting portion, and the second spring unit

is in a compressed state.

[0009] In an embodiment, the first limiting portion is provided in a protruding manner on the wall of the first jack-up chamber;

the first jack-up assembly includes a first jack-up block, where the second jack-up avoidance hole is provided in the first jack-up block, the second jack-up chamber is formed inside the first jack-up block, and a first clamping ring unit is sleeved on the first jack-up block; and

after the terminal jack-up assembly moves the first distance in the first direction, the first clamping ring unit abuts against the first limiting portion.

[0010] In an embodiment, the second limiting portion is a second clamping ring unit, where the second clamping ring unit is arranged at a side of the first clamping ring unit away from the second jack-up avoidance hole; and

after the second jack-up assembly moves the second distance in the first direction, the second jack-up assembly abuts against the second clamping ring unit, and the second spring unit is in the compressed state.

[0011] In an embodiment, the second jack-up assembly includes a second jack-up block, and a third jack-up avoidance hole is provided at a position of the second jack-up block corresponding to the terminal jack-up assembly; where

a connecting rod is fixed to the second jack-up block, the connecting rod extends along a direction away from the third jack-up avoidance hole, and a limiting rod is mounted to the connecting rod; and

after the second jack-up assembly moves the second distance in the first direction, the limiting rod abuts against the second clamping ring unit.

[0012] In an embodiment, a guide groove is provided on a wall of the second jack-up chamber at a position corresponding to the second jack-up block, a guide sleeve is mounted in the guide groove, and the second jack-up block is slidably connected to the guide sleeve.

[0013] In an embodiment, the first jack-up block includes a first outer wall and a second outer wall, where the first clamping ring unit and the second clamping ring unit are sleeved on the first outer wall, and the second outer wall and the first limiting portion are arranged to

face each other; and

the second outer wall extends outward more than the first outer wall.

[0014] In an embodiment, a contour of the first jack-up avoidance hole, a contour of the second jack-up avoidance hole, and a contour of the third jack-up avoidance hole are rectangular.

[0015] A die-bonding apparatus is provided, which includes a feeding structure and the multi-stage jack-up structure according to any one of above solutions.

[0016] Compared with the prior art, the present application has the following beneficial effects.

[0017] With the multi-stage jack-up structure and the die-bonding apparatus provided in the present application, in the process of separation of the die from the base film, the terminal jack-up assembly and the first jack-up assembly are driven by the jacking unit to pass through the first jack-up avoidance hole in the first direction, and after the terminal jack-up assembly and the first jack-up assembly move the first distance synchronously in the first direction, the first jack-up assembly is stopped by the first limiting portion, so that the first spring unit is in a compressed state. Then the terminal jack-up assembly driven by the jacking unit keeps moving in the first direction to pass through the first jack-up avoidance hole, while the first jack-up assembly is stopped, so that the terminal jack-up assembly moves upward with respect to the first jack-up assembly, to complete separation of the die from the base film. In the above process, firstly the first jack-up assembly and the terminal jack-up assembly moves up synchronously, in this case, a total contact area between the two assemblies and the base film is referred to as a first area; then the terminal jack-up assembly moves up alone, in this case, a contact area between the terminal jack-up assembly and the base film is smaller than the first area, so that the die can be separated from the base film in a multi-stage manner. The separation of the die from the base film includes at least two stages, when the terminal jack-up assembly and the first jack-up assembly move up synchronously, the first area is large, hence most area of the die is supported by the jack-up structure, i.e. the edge of the die is close to the jack-up structure, preventing the die from being broken; then, the terminal jack-up assembly moves up alone, whereby the other part of the base film, other than the part being in contact with the terminal jack-up assembly, can be separated from the die, so that the die is pushed up. The multi-stage jack-up structure and the die-bonding apparatus according to the

present application can effectively protect the die from being broken on the premise that the separation process of the die from the base film is ensured to be completed.

BRIEF DESCRIPTION OF THE DRAWINGS

5 **[0018]** In order to illustrate embodiments of the present application more clearly, drawings referred to describe the embodiments will be briefly described hereinafter. Apparently, the drawings in the following description are only some examples of the present application, and for those skilled in the art, other drawings may be obtained based on these drawings without any creative efforts.

10 **[0019]** The structures, proportions, sizes, etc. shown in the drawings of this specification are only used to coordinate with the content disclosed in the specification for the understanding and reading of those skilled in the art, and are not used to limit the conditions under which the present application can be implemented. Any structural modifications, changes in proportions or adjustments in size shall still fall within the scope of the technology disclosed in the
15 present application as long as they do not affect the effectiveness and purpose of the present invention.

[0020] FIG. 1 is a schematic view showing the overall structure of a multi-stage jack-up structure according to an embodiment of the present application;

[0021] FIG. 2 is a partially enlarged schematic view showing the structure of a portion A in
20 FIG. 1;

[0022] FIG. 3 is a first cross-sectional schematic view of a multi-stage jack-up structure according to an embodiment of the present application;

[0023] FIG. 4 is a partially enlarged schematic view showing the structure of a portion B in FIG. 3;

25 **[0024]** FIG. 5 is a second cross-sectional schematic view of a multi-stage jack-up structure according to an embodiment of the present application;

[0025] FIG. 6 is a third cross-sectional schematic view of a multi-stage jack-up structure according to an embodiment of the present application;

[0026] FIG. 7 is a fourth cross-sectional schematic view of a multi-stage jack-up structure

according to an embodiment of the present application; and

[0027] FIG. 8 is a partially enlarged schematic view showing the structure of a portion C in FIG. 7.

[0028] Reference numerals:

5	10	housing,	11	first jack-up avoidance hole,
	12	first jack-up chamber,	13	first limiting portion,
	20	first jack-up assembly,	21	second jack-up avoidance hole,
	22	first jack-up chamber,	23	second limiting portion,
	24	first jack-up block,	241	first outer wall,
10	242	second outer wall,	25	first clamping ring unit,
	26	guide groove,	27	guide sleeve,
	30	second jack-up assembly,	31	third jack-up avoidance hole,
	33	second jack-up block,	34	connecting rod,
	35	limiting rod,	40	terminal jack-up assembly,
15	41	first spring base,	42	second spring base,
	43	third jack-up block,	50	jacking unit,
	51	motor,	52	cam,
	53	driven wheel,	61	first spring unit,
	62	second spring unit.		

20

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0029] In order to make the purposes, features, and advantages of the present application more obvious and understandable, technical solutions in the embodiments of the present invention will be clearly and completely described below in conjunction with the accompanying drawings in the embodiments of the present application. Obviously, the
25 embodiments described below are merely some, but not all, of the embodiments of the present application. Based on the embodiments of the present application, all other embodiments

obtained by those skilled in the art without creative efforts fall within the scope of protection of the present application.

5 **[0030]** In the description of the present application, it should be understood that the orientation or positional relationship indicated by the terms "upper", "lower", "top", "bottom", "inner", "outer", etc. are based on those shown in the accompanying drawings, and are merely for the convenience of describing the present application and simplifying the description. It does not indicate or imply that the apparatus or element referred to must have a specific orientation, or be constructed and operated in a specific orientation, and therefore should be understood as a limitation to the present application. To be clear, when a component is said to
10 be "connected" to another component, it may be directly connected to the other component or there may be an intermediate component present at the same time.

[0031] The technical solutions of the present application are further described below with reference to the accompanying drawings and through specific embodiments.

15 **[0032]** Please refer to FIG. 1 to FIG. 8, where FIG. 1 is a schematic view showing the overall structure of the multi-stage jack-up structure according to an embodiment of the present application; FIG. 2 is a partially enlarged schematic view showing the structure of a portion A in FIG. 1; FIG. 3 is a first cross-sectional schematic view of a multi-stage jack-up structure according to an embodiment of the present application; FIG. 4 is a partially enlarged schematic view showing the structure of a portion B in FIG. 3; FIG. 5 is a second
20 cross-sectional schematic view of the multi-stage jack-up structure according to an embodiment of the present application; FIG. 6 is a third cross-sectional schematic view of the multi-stage jack-up structure according to an embodiment of the present application; FIG. 7 is a fourth cross-sectional schematic view of a multi-stage jack-up structure according to an embodiment of the present application; and FIG. 8 is a partially enlarged schematic view
25 showing the structure of a portion C in FIG. 7.

First Embodiment

30 **[0033]** A multi-stage jack-up structure according to this embodiment is applicable to a die-bonding apparatus, to push up the base film, so as to make the die be separated from the base film. By optimizing the multi-stage jack-up structure, when a thin die is separated from the base film, there's an appropriate distance between the edge of the die and the jack-up structure, which prevents situations that the die being broken due to a too large distance

between the edge of the die and the jack-up structure, or incomplete separation of the die due to a too small distance between the edge of the die and the jack-up structure.

[0034] Referring to FIG. 1 to FIG. 4, the multi-stage jack-up structure in this embodiment includes a housing 10 and a jacking unit 50, where a first jack-up avoidance hole 11 is provided in the housing 10 along a first direction, a first jack-up chamber 12 in communication with the first jack-up avoidance hole 11 is formed inside the housing 10, a first limiting portion 13 is provided in a protruding manner on a wall of the first jack-up chamber 12. A terminal jack-up assembly 40 is mounted on a jacking end of the jacking unit 50, the terminal jack-up assembly 40 extends into the first jack-up chamber 12 in the first direction, and can be driven by the jacking unit 50 to pass through the first jack-up avoidance hole 11. The jacking unit 50 includes a motor 51, a rotating shaft of the motor 51 is connected to a cam 52, where the cam 52 drives a driven wheel 53 to move up and down when rotating. The terminal jack-up assembly 40 is connected to the driven wheel 53, and can move upwards in the first direction and pass through the first jack-up avoidance hole 11 to push up the base film.

[0035] A first jack-up assembly 20 is sleeved outside the terminal jack-up assembly 40. A first spring unit 61 is arranged between the first jack-up assembly 20 and the terminal jack-up assembly 40, and the terminal jack-up assembly 40 is provided with a first spring base 41 to support the first spring unit 61. In the first direction, one end of the first spring unit 61 abuts against the terminal jack-up assembly 40, and the other end of the first spring unit 61 abuts against the first jack-up assembly 20. After the terminal jack-up assembly 40 moves a first distance in the first direction, the first jack-up assembly 20 abuts against the first limiting portion 13, where the first spring unit 61 is in a compressed state. It needs to be understood that the first jack-up assembly 20 moves synchronously with the terminal jack-up assembly 40 until the first jack-up assembly 20 abuts against the first limiting portion 13 and is stopped from moving upward, and then the terminal jack-up assembly 40 keeps moving upward against the spring force of the first spring unit 61, so that the terminal jack-up assembly 40 moves upward with respect to the first jack-up assembly 20.

[0036] Specifically, in the process of separation of the die from the base film, the terminal jack-up assembly 40 and the first jack-up assembly 20 are driven by the jacking unit 50 to pass through the first jack-up avoidance hole 11 in the first direction, and after the terminal

jack-up assembly 40 and the first jack-up assembly 20 move the first distance synchronously in the first direction, as shown in FIG. 5, the first jack-up assembly 20 is stopped by the first limiting portion 13, so that the first spring unit 61 is in a compressed state. Then the terminal jack-up assembly 40 driven by the jacking unit 50 keeps moving in the first direction to pass through the first jack-up avoidance hole 11, while the first jack-up assembly 20 is stopped, so that the terminal jack-up assembly 40 moves upward with respect to the first jack-up assembly 20, to complete separation of the die from the base film. In the above process, firstly the first jack-up assembly 20 and the terminal jack-up assembly 40 moves up synchronously, in this case, a total contact area between the two assemblies and the base film is referred to as a first area; then the terminal jack-up assembly 40 moves up alone, in this case, a contact area between the terminal jack-up assembly 40 and the base film is smaller than the first area, so that the die can be separated from the base film in a multi-stage manner. The separation of the die from the base film includes at least two stages, when the terminal jack-up assembly 40 and the first jack-up assembly 20 move up synchronously, the first area is large, hence most area of the die is supported by the jack-up structure, i.e. the edge of the die is close to the jack-up structure, preventing the die from being broken; then the terminal jack-up assembly 40 moves up alone, whereby the other part of the base film, other than the part being in contact with the terminal jack-up assembly, can be separated from the die, so that the die is pushed up. The multi-stage jack-up structure and the die-bonding apparatus according to the present application can effectively protect the die from being broken on the premise that the separation process of the die from the base film is ensured to be completed.

[0037] Further, a second jack-up avoidance hole 21 is provided in the first jack-up assembly 20 in the first direction, a second jack-up chamber 22 in communication with the second jack-up avoidance hole 21 is formed inside the first jack-up assembly 20, and a second limiting portion 23 is provided on the first jack-up assembly 20. A second jack-up assembly 30 is sleeved outside the terminal jack-up assembly 40, the second jack-up assembly 30 is located inside the second jack-up chamber 22, and can slide inside the second jack-up chamber 22 along the first direction. A second spring unit 62 is arranged between the second jack-up assembly 30 and the terminal jack-up assembly 40, and the terminal jack-up assembly 40 is provided with a second spring base 42 to support the second spring unit 62. In the first direction, one end of the second spring unit 62 abuts against the terminal jack-up assembly 40, and the other end of the second spring unit 62 abuts against the second jack-up assembly 30.

After the second jack-up assembly 30 moves a second distance in the first direction, the second jack-up assembly 30 abuts against the second limiting portion 23, where the second spring unit 62 is in a compressed state.

[0038] For example, as the terminal jack-up assembly 40 moving the first distance in the first direction, since the first jack-up assembly 20 does not abut against the first limiting portion 13, and the second jack-up assembly 30 does not abut against the second limiting portion 23, the first jack-up assembly 20 and the second jack-up assembly 30 move synchronously with the terminal jack-up assembly 40. Then, the first jack-up assembly 20 is stopped by the first limiting portion 13, while the terminal jack-up assembly 40 keeps moving upwards, since the second jack-up assembly 30 does not abut against the second limiting portion 23 as shown in FIG. 6, the second jack-up assembly 30 moves synchronously with the terminal jack-up assembly 40. After the second jack-up assembly 30 and the terminal jack-up assembly 40 move the second distance in the first direction from the initial position, the second jack-up assembly 30 abuts against the second limiting portion 23 as shown in FIG. 7. Then the terminal jack-up assembly 40 keeps moving upward against the spring force of the second spring unit 62, while the second jack-up assembly 30 is stopped, so that the terminal jack-up assembly 40 moves upward with respect to the second jack-up assembly 30, to pass through the second jack-up avoidance hole 21. Eventually, as shown in FIG. 8, a third jack-up block 43 of the terminal jack-up assembly 40 is higher than a second jack-up block 33, and the second jack-up block 33 is higher than a first jack-up block 24, forming a triangle structure on the whole, which is beneficial to the separation of the die from the base film without being broken.

[0039] In this embodiment, with reference to FIG. 4 to FIG. 6, the first limiting portion 13 is provided in a protruding manner on the wall of the first jack-up chamber 12, i.e. the first limiting portion 13 is equivalent to a stepped channel formed on the wall. The first jack-up assembly 20 includes the first jack-up block 24, where the second jack-up avoidance hole 21 is provided in the first jack-up block 24. The second jack-up chamber 22 is formed inside the first jack-up block 24, and a first clamping ring unit 25 is sleeved outside the first jack-up block 24. After the terminal jack-up assembly 40 moves the first distance in the first direction, the first clamping ring unit 25 abuts against the first limiting portion 13.

[0040] Further, the second limiting portion 23 is a second clamping ring unit, which is

arranged at a side of the first clamping ring unit 25 that is away from the second jack-up avoidance hole 21. After the second jack-up assembly 30 moves the second distance in the first direction, the second jack-up assembly 30 abuts against the second clamping ring unit, where the second spring unit 62 is in a compressed state. Understandably, the first clamping ring unit 25 and the second clamping ring unit are both arranged around the first jack-up block 24, in this way, the first jack-up block 24 may function as a common reference for the two clamping ring units, ensuring a good accuracy between the two clamping ring units, as well as a good accuracy of the second jack-up block 33 protruding from the second jack-up avoidance hole 21, and further ensuring a good positional accuracy between the second jack-up block 33 and the first jack-up block 24.

[0041] Further, referring to FIG. 7, the second jack-up assembly 30 includes the second jack-up block 33, where a third jack-up avoidance hole 31 is provided at a position of the second jack-up block 33 corresponding to the terminal jack-up assembly 40. A connecting rod 34 is fixed to the second jack-up block 33, and extends along a direction away from the third jack-up avoidance hole 31. A limiting rod 35 is mounted to the connecting rod 34. After the second jack-up assembly 30 moves the second distance in the first direction, the limiting rod 35 abuts against the second clamping ring unit. By the above arrangement, the space between the wall of the first jack-up chamber 12 and the first jack-up block 24 is effectively utilized, making the structure more compact. Moreover, the second limiting portion may be slidably connected to the first jack-up chamber 12, to increase the stability when the second jack-up assembly 30 is moving.

[0042] Further, referring to FIGS. 5 to 7, a guide groove 26 is provided on a wall of the second jack-up chamber 22 at a position corresponding to the second jack-up block 33. A guide sleeve 27 is mounted inside the guide groove 26, and the second jack-up block is slidably connected to the guide sleeve 27. With the arrangement of the guide groove 26 and the guide sleeve 27, the second jack-up block 33 can move smoothly and stably with respect to the first jack-up block 24.

[0043] Further, as shown in FIG. 5, the first jack-up block 24 includes a first outer wall 241 and a second outer wall 242, where the first clamping ring unit 25 and the second clamping ring unit are sleeved on the first outer wall 241, and the second outer wall 242 and the first limiting portion 13 are arranged to face each other. The second outer wall 242 extends

outward more than the first outer wall 241. Understandably, the first jack-up block 24 includes the second outer wall 242 on the upper end and the first outer wall 241 on the lower end, where the first outer wall 241 is connected to the wall of the first jack-up chamber 12 via the first clamping ring unit 25 and the second clamping ring unit, and the second outer wall 242 is spaced apart from the first limiting portion 13. The second outer wall 242 extends outward more than the first outer wall 241, and is provided with the guide groove 26 at an inner side thereof. In other words, the whole wall of the first jack-up block 24 is Z-shaped, with a uniform thickness and high stability; moreover, the upper end (the second outer wall 242) extends outwards, while the lower end (the first outer wall 241) is sunken inwards, which takes full advantage of the space inside the jack-up structure, thereby making the whole structure more compact.

[0044] In this embodiment, as shown in FIG. 2, the contour of the first jack-up avoidance hole 11, the contour of the second jack-up avoidance hole 21, and the contour of the third jack-up avoidance hole 31 is rectangular.

[0045] In summary, the multi-stage jack-up structure according to this embodiment can effectively prevent the die from being broken during separation from the base film, and has the advantages of compact structure and high stability.

Second Embodiment

[0046] A die-bonding apparatus according to this embodiment includes a feeding structure and the multi-stage jack-up structure described in the first embodiment. The feeding structure refers to a structure that is able to convey the base film to the multi-stage jack-up structure. The base film conveyed to the multi-stage jack-up structure can be pushed up by the multi-stage jack-up structure, so that the die is separated from the base film. The specific structure and the technical effects of the multi-stage jack-up structure are described in the first embodiment, since the die-bonding apparatus in this embodiment includes the above jack-up structure, it also has the similar technical effects.

[0047] In conclusion, the die-bonding apparatus according to this embodiment can effectively prevent the die from being broken when being separated from the base film, and has the advantages of compact structure and high stability.

[0048] The above embodiments are only intended to describe the technical solutions of the

present application, and not for limiting the scope of the application. Although the application has been described in detail with reference to the above embodiments, it shall be understood by those of ordinary skill in the art that the technical solutions described in the above embodiments may be modified or some technical features thereof may be substituted by
5 equivalents, such modifications and substitutions do not depart from the scope of the technical solutions of the embodiments of the present application

CLAIMS

1. A multi-stage jack-up structure, comprising a housing (10) and a jacking unit (50), wherein

5 a first jack-up avoidance hole (11) is provided in the housing (10) along a first direction, a first jack-up chamber (12) in communication with the first jack-up avoidance hole (11) is formed inside the housing (10), and a first limiting portion (13) is provided in a protruding manner on a wall of the first jack-up chamber (12);

10 a terminal jack-up assembly (40) is mounted on a jacking end of the jacking unit (50), the terminal jack-up assembly (40) extends into the first jack-up chamber (12) along the first direction, and the jacking unit (50) is configured to drive the terminal jack-up assembly (40) to pass through the first jack-up avoidance hole (11);

15 a first jack-up assembly (20) is sleeved outside the terminal jack-up assembly (40), wherein a first spring unit (61) is arranged between the first jack-up assembly (20) and the terminal jack-up assembly (40), and in the first direction, one end of the first spring unit (61) abuts against the terminal jack-up assembly (40), and the other end of the first spring unit (61) abuts against the first jack-up assembly (20); and wherein

20 after the terminal jack-up assembly (40) moves a first distance in the first direction, the first jack-up assembly (20) abuts against the first limiting portion (13), and the first spring unit (61) is in a compressed state; and wherein

a second jack-up avoidance hole (21) is provided in the first jack-up assembly (20) along the first direction, a second jack-up chamber (22) in communication with the second jack-up avoidance hole (21) is provided inside the first jack-up assembly (20), and a second limiting portion (23) is provided on the first jack-up assembly (20);

25 a second jack-up assembly (30) is further sleeved outside the terminal jack-up assembly (40), wherein the second jack-up assembly (30) is located inside the second jack-up chamber (22), and is slidable in the second jack-up chamber (22) along the first direction;

a second spring unit (62) is arranged between the second jack-up assembly (30) and the terminal jack-up assembly (40), and in the first direction, one end of the second spring unit

(62) abuts against the terminal jack-up assembly (40), and the other end of the second spring unit (62) abuts against the second jack-up assembly (30); and wherein

after the second jack-up assembly (30) moves a second distance in the first direction, the second jack-up assembly (30) abuts against the second limiting portion (23), and the second
5 spring unit (62) is in a compressed state.

2. The multi-stage jack-up structure according to claim 1, wherein

the first jack-up assembly (20) comprises a first jack-up block (24), wherein the second jack-up avoidance hole (21) is provided in the first jack-up block (24), the second jack-up
10 chamber (22) is formed inside the first jack-up block (24), and a first clamping ring unit (25) is sleeved on the first jack-up block (24); and

after the terminal jack-up assembly (40) moves the first distance in the first direction, the first clamping ring unit (25) abuts against the first limiting portion (13).

15 3. The multi-stage jack-up structure according to claim 2, wherein

the second limiting portion (23) is a second clamping ring unit, wherein the second clamping ring unit is arranged at a side of the first clamping ring unit (25) away from the second jack-up avoidance hole (21); and

after the second jack-up assembly (30) moves the second distance in the first direction,
20 the second jack-up assembly (30) abuts against the second clamping ring unit, and the second spring unit (62) is in the compressed state.

4. The multi-stage jack-up structure according to claim 3, wherein

the second jack-up assembly (30) comprises a second jack-up block (33), and a third
25 jack-up avoidance hole (31) is provided at a position of the second jack-up block (33) corresponding to the terminal jack-up assembly (40);

a connecting rod (34) is fixed to the second jack-up block (33), the connecting rod (34) extends along a direction away from the third jack-up avoidance hole (31), and a limiting rod (35) is mounted to the connecting rod (34); and

5 after the second jack-up assembly (30) moves the second distance in the first direction, the limiting rod (35) abuts against the second clamping ring unit.

5. The multi-stage jack-up structure according to claim 4, wherein a guide groove (26) is provided on a wall of the second jack-up chamber (22) at a position corresponding to the second jack-up block (33), a guide sleeve (27) is mounted inside the guide groove (26), and
10 the second jack-up block (33) is slidably connected to the guide sleeve (27).

6. The multi-stage jack-up structure according to claim 5, wherein

the first jack-up block (24) comprises a first outer wall (241) and a second outer wall (242), wherein the first clamping ring unit (25) and the second clamping ring unit are sleeved
15 on the first outer wall (241), and the second outer wall (242) and the first limiting portion (13) are arranged to face each other; and

the second outer wall (242) extends outward more than the first outer wall (241).

7. The multi-stage jack-up structure according to claim 6, wherein a contour of the first
20 jack-up avoidance hole (11), a contour of the second jack-up avoidance hole (21), and a contour of the third jack-up avoidance hole (31) are rectangular.

8. A die-bonding apparatus, comprising a feeding structure and the multi-stage jack-up structure according to any one of claims 1 to 7.

25