PICK AND PLACE APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a pick and place apparatus, and more particularly, to a pick and place apparatus that independently performs pickup by a servomotor, thereby improving the reliability and productivity of the apparatus through the simplification of the structure thereof.

2. Description of the Related Art

In general, a pick and place system is used to accurately mount, transfer, or sort parts.

Specifically, a matrix type printed circuit board having a plurality of rows is used in a semiconductor package, and a sawing process is performed on the semiconductor package after a molding process. Then, a process for picking up each of the packages and then storing the packages in a tray, or a process for sorting inferior packages is performed in the pick and place system.

The pick and place system includes a transfer table for holding the packages and a pickup device for separating the packages from the transfer table, as main components.

In particular, the pickup device includes pickup units that are arranged in several rows in order to pick up a plurality of packages, and each of the pickup units includes an independent driving part in order to selectively pick up the package.

That is, each of the pickup units includes a picker that uses vacuum pressure in order to hold the package, and a driving part that moves the picker upward and downward. The driving part includes a pinion that is fixed to a rotating shaft of a servomotor, and a rack that is formed on the picker. Accordingly, while the servomotor is driven, each of the pickup units is moved upward and downward and holds the package by using vacuum pressure.

As a result, each of the pickup units includes one driving part. For this reason, independent driving parts cause the weight of the system to be increased and the manufacturing productivity thereof to deteriorate.

Further, each of the driving parts includes a member for preventing backlash. The backlash is engagement tolerance that is formed between gears (rack and pinion) and required to drive the gears, and means clearance between the teeth of the gears. The backlash prevents the lifting distance of the picker from being accurately controlled, and

causes positional errors in the pick and place system.

The complexity and large weight of the system are problems to be solved. A pick & place system for semiconductor manufacturing equipment (Korean Patent application No. 10-2003-0015632) has been proposed as a conventional pick-and place system to solve the above-mentioned problems.

As shown in FIG. 1A, according to the pick & place system, the number of servomotors of all of pickup units 3 can be reduced in half by using racks 1 and pinions 2 that are moved in pairs.

However, since each pair of the rack and the pinion should be provided with an independent servomotor 4, it is difficult to solve the above-mentioned problems caused by the servomotors.

In addition, the number of the servomotors 4 is reduced, but double pickup time is required for the stroke driving of one pair of the rack and the pinion. Therefore, double time is required for performing a pickup process. Further, it is possible to obtain advantages caused by the servomotors, but it is not possible to obtain advantages in process time that is an important factor in processes.

Further, as shown in FIG. 1B, vacuum lines 6 are formed in the guide pins 5 that are rails for securing the lifting paths of the pickup units 3, and the racks are allowed to always be engaged with pinions by using the suction forces thereof, thereby preventing backlash.

However, the vacuum lines for the above-mentioned backlash prevention units cause the complexity of the apparatus. That is, peripheral devices that control the vacuum lines and maintain the sealing of the vacuum lines are required, and it is also difficult to form the vacuum lines.

For this reason, the complexity of the structure is not satisfactorily solved by the conventional system. Further, since causing the reliability and productivity of the system to deteriorate, the complexity has been a problem to be solved.

Meanwhile, another problem of a general pick and place apparatus is that a bumper for controlling the positional error of a picker causes another positional error.

That is, the lifting distance of chip picker caused by the rack-pinion driving should be controlled in consideration of various disturbances. Accordingly, the lifting distance is not a determined distance, and is set

within an allowable range. In particular, if the chip picker is excessively moved downward so as to pass by the pickup finish position, the picker applies excessive pressure to the package, so that the package may be damaged. For this reason, a bumper needs to be provided.

Therefore, the moving distance of the picker may vary within the allowable range, and the picker is provided with a bumper that reduces the excessive pressure by using a spring.

In this case, the bumper clearance of the picker should be formed only in a vertical direction, and the picker should not be twisted (rotated). The reason for this is that the edges of the package are damaged if the picked-up chip (package) is rotated when the picker transfers the package to the tray.

Accordingly, the moving distance of the picker may vary by using a key way or the like in order to allow the picker to move only in a vertical direction. Since repeated pickup causes clearance, the twist or looseness of the picker occurs. As a result, troubles occur in processes.

SUMMARY OF THE INVENTION

The present invention has been solve the above-

mentioned problems, and it is an object of the present invention to provide simple pickup units that independently perform pickup by only one servomotor and a pick and place apparatus in which elastic forces required to fix the pickup units also prevent the backlash, the units that are provided to independently drive the pickup units also serve as bumpers, and a bumper clearance is provided outside rails, thereby simplifying the structure thereof improving the reliability and productivity thereof.

According to an aspect of the present invention, a lifting frame is moved upward and downward by one servomotor, a plurality of pickup units that is independently separated from one another is provided to the lifting frame, and the pickup units and the lifting frame are connected to each other by electromagnetic clutches so that the pickup units are selectively united with the lifting frame by intermitting electric power applied to the electromagnetic clutches. Therefore, the pickup units are selectively moved upward and downward by only one servomotor.

In this case, the pickup units are provided on a support block through elastic springs so as to be maintained at initial elevated positions, and the elastic forces of the elastic springs are applied in a direction opposite to the

downward movement of the pickup units. For this reason, the elastic springs also serve as backlash prevention members for preventing backlash from occurring between racks and pinions. Therefore, even though a separate device for preventing backlash is not added, the elastic springs also prevent backlash from occurring between racks and pinions. As a result, the apparatus is further simplified.

In addition, each of the uniting units using electromagnetic clutches includes a solenoid, and a uniting core that is inserted into the solenoid and separated from the solenoid. Since the uniting units are provided between a lifting unit and the pickup units, the separation of the uniting core that is allowed to some extent during the operation of the solenoid can provide a bumper with respect to the moving distance of the pickup unit.

Accordingly, since the bumper clearance is excluded from the picker and is formed outside the pickup unit, the picker is satisfactorily and firmly fixed to the lower support frame of the pickup unit. As a result, it is possible to prevent troubles from occurring in processes due to the twist or looseness of the picker.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a conventional pick and place system;

FIG. 2 is a view showing the external appearance of a pick and place apparatus according to an embodiment of the present invention;

FIG. 3 is a conceptual view illustrating a lifting unit of the pick and place apparatus according to the embodiment of the present invention;

FIG. 4 is a conceptual view illustrating pickup units of the pick and place apparatus according to the embodiment of the present invention;

FIG. 5 is a view illustrating that the lifting unit shown in FIG. 3 and the pickup units shown in FIG. 4 are assembled to each other;

FIG. 6 is a conceptual view illustrating the operation of the pick and place apparatus according to the embodiment of the present invention; and

FIG. 7 is a cross-sectional view illustrating the operation of the pick and place apparatus according to the embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The most preferred embodiment of the present invention

will be described in detail below to allow those skilled in the art, to which the invention pertains, to easily carry out the invention. The object, advantages, other objects, and characteristics of the present invention will become apparent through the following description of the preferred embodiment.

An embodiment to be disclosed in this specification is the most preferred embodiment that is selected from various embodiments of the present invention to allow those skilled in the art to easily understand the present invention. The scope and sprit of the present invention are not limited to the embodiment. Further, various changes and modifications of the embodiment can be made without departing from the scope and spirit of the invention, and other equivalent embodiments can be made.

FIG. 2 is a view showing the external appearance of a pick and place apparatus according to an embodiment of the present invention, and FIGS. 3 to 6 are enlarged conceptual views of the pick and place apparatus shown in FIG. 2. FIGS. 3 to 6 schematically show the pick and place apparatus for the purpose of the clear understanding and description of the present invention. In FIGS. 3 to 6, peripheral components are omitted, and a distance between units or the

operation thereof is exaggerated to some extent.

Specifically, FIG. 3 is a conceptual view illustrating a lifting unit of the pick and place apparatus according to the embodiment of the present invention, and FIG. 4 is a conceptual view illustrating pickup units of the pick and place apparatus according to the embodiment of the present invention.

Further, FIG. 5 is a view illustrating that the lifting unit shown in FIG. 3 and the pickup units shown in FIG. 4 are assembled to each other. FIG. 6 is a conceptual view illustrating the operation of the pick and place apparatus according to the embodiment of the present invention. FIG. 7 is a cross-sectional view illustrating the operation of the pick and place apparatus according to the embodiment of the present invention.

The pick and place apparatus according to the embodiment of the present invention includes a support block 12, pickup units 18, a lifting unit 24, and uniting units 26. The support block 12 is provided in a stationary frame 10 of a pick and place system, and provides a stationary structure. The pickup units 18 slide through the support block 12 so as to be moved upward and downward. Each of the pickup units includes an elastic spring 14 that is provided on the

support block to maintain an elevated position of the pickup unit moved upward from the support block 12, and a picker 16 that picks up an object such as a package. The lifting unit 24 includes a lifting frame 20 and a servomotor 22. The lifting frame 20 is provided to cross the pickup units 18 arranged in one line. The servomotor 22 is fixed to the stationary frame 10, and moves the lifting frame 20 upward and downward by using racks and pinions. The uniting units 26 selectively unite the pickup units 18 with the lifting frame 20 by intermitting electric power so that the pickup units 18 are selectively moved upward and downward in synchronization with the upward and downward movement of the lifting unit 24.

Specifically, each of the pickup units 18 of the above-mentioned components includes an upper support frame 28 provided in a direction crossing the lifting frame 20, and movable rails 30 are fixed to both ends of the upper support frame 28. Further, one of the movable rails is provided with a picker 16 and a vacuum line 32 connected to the picker. Furthermore, each of the movable rails 30 passes through the support block 12 via an outer rail 34, which slides on the outer circumferential surface of the movable rail, so that a moving path of the movable rail is secured.

In addition, a lower support frame 36 is fixed to lower ends of the movable rails. (See FIG. 4)

Meanwhile, rack blocks 38, which each have a rack, are provided at both ends of the lifting frame 20 of the lifting unit 24. The rack blocks 38 are connected to the support block 12 by lifting rails 40 so that the lifting paths thereof are secured. Each of the rack blocks 38 is engaged with a pinion block 42 in which a pinion is formed, and the pinion blocks are connected to each other by a rotating shaft 44. One of the pinion blocks 42 is connected to the servomotor 22. (See FIG. 3)

More particularly, the lifting rails 40 are composed of sliding bars, and a pair of lifting rails 40 is provided at each of both ends of the lifting frame 20. Outer rails 34 are provided in the support block 12 so that the lifting paths of the lifting rails 40 are secured.

Meanwhile, the upper surface of the lifting frame of the lifting unit comes in contact with the lower surfaces of the upper support frames of the pickup units due to the uniting units. Accordingly, bumper pads 52 are provided on the lifting frame 20 so as to absorb the impact caused by the collision between the upper support frames 28 and the lifting frame.

Further, each of the uniting units 26, which selectively unite the pickup units 18 with the lifting frame 20, includes a uniting core 46 and a solenoid 48. The uniting core 46 is fixed to the lifting frame 20. The solenoid 48 is fixed to the upper support frame 28 of each pickup unit, and selectively united with the uniting core 46 by intermitting electric power. (See FIGS. 3, 4, and 6)

The uniting unit has the structure the uniting core slides in the solenoid. Accordingly, a bumper clearance is formed on the moving path along which the picker is moved downward by the rack and the pinion.

The picker is moved downward due to the operation of the uniting unit. In this case, if the picker is excessively moved downward and excessively presses a package (chip), the uniting core 46 slides so as to be separated from the solenoid 48. For this reason, a bumper, which is formed of a clearance and a spring provided in a conventional picker, is substituted with the uniting unit.

That is, the uniting unit 26 is a bumper. When the lifting unit 24 is moved downward even at a pickup finish position where the picker 16 finishes picking up an object, the bumper allows the lifting unit 24 to be moved downward while the separation of the uniting core 46 from the

solenoid 48 causes the picker 16 to be maintained at the pickup finish position.

Further, since the bumper is provided not in the picker 16 but in the uniting unit 26, that is, the bumper clearance is excluded from the picker and is formed outside the pickup unit 18, the picker 16 is firmly fixed to the lower support frame 36 of the pickup unit 18. As a result, the rotation or twist of the picker 16 is prevented, and it is possible to prevent troubles from occurring in processes due to the rotation or twist of the picker. That is, the bumper is a member for preventing the picker from being rotated, and the uniting unit 26 allows the lifting unit 24 to be moved downward while maintaining the picker 16 at the pickup finish position. Furthermore, the bumper is provided outside the pickup unit 18 in order to integrally fix the picker to the pickup unit 18.

Meanwhile, the stationary frame 10 is provided with an alignment bar 50 that comes in contact with the upper support frames and a receiving groove 51 that receives the solenoids 48 in order to align the pickup units 18.

Further, brackets 56 are fixed to the stationary frame 10, and the alignment bar 50 is hinge-connected to the brackets so as to be rotated. Further, alignment springs 58

are provided between the brackets 56 and the alignment bar 50. (See FIG. 4)

Accordingly, for example, when the servomotor is driven from the uppermost position, which is a pickup standby position, to a pickup position, the alignment bar presses the pickup units downward due to the elastic forces of the alignment springs and aligns the pickup units at the pickup positions.

Meanwhile, the alignment bar 50 and the pickup units 18 come in contact with each other due to the elastic springs 14 of the pickup units, and each of the elastic springs 14 has a separate function other than a function to maintain the pickup unit at the elevated position.

That is, the elastic forces of the elastic springs serve as elastic forces that allow the rack and the pinion to always come in contact with each other during the rack-pinion driving, so that the elastic springs also prevent backlash.

Accordingly, each of the elastic springs 14 is used as a backlash prevention member that prevents the backlash of the racks and the pinions of the lifting unit from occurring when the pickup units are united with the lifting unit by the uniting units 26.

As described above, the present invention provides simple pickup units that independently perform pickup by only one servomotor 22, and a pick and place apparatus in which elastic forces required to fix the pickup units also prevent the backlash, thereby improving the reliability and productivity of the apparatus through the simplification of the structure thereof.

FIG. 2 is a view showing the external appearance of a pick and place apparatus to which all of the devices and units are assembled, and shows that the lifting unit 24, the pickup units 18, and the uniting units 26 are assembled to one another. The lifting unit 24 includes a relatively long lifting frame 20, which is included in a pick and place system and is moved upward and downward by one servomotor 22 in the stationary frame 10 in order to secure a stationary structure of the apparatus. The pickup units 18 are independently provided so as to be separated from the lifting frame 20, and the elevated positions of the pickup units 18 moved upward from the support block 12 are maintained by the elastic springs 14. Each of the uniting units 26 includes a solenoid 48 that is an electromagnetic clutch. Each of the solenoids selectively unites each of the pickup units 18 with the lifting frame 20 by

intermitting electric power.

Pneumatic devices that are provided to independently supply vacuum pressure to the pickers 16, and position sensors (not shown) that are used to control the positions of the pickers to pickup standby positions or the pickup positions, and the like are applied like in the conventional apparatus. Accordingly, the detailed description thereof will be omitted in this specification.

Further, the servomotor 22 has been directly connected to the pinion block so as to perform the rack-pinion driving in the drawings, but a pulley driving method using a timing belt may be applied. When the pulley driving method is applied, the servomotor 22 can be received in the stationary frame 10 serving as a case. Accordingly, it is possible to make the structure compact.

The components of the pick and place apparatus according to the embodiment of the present invention will be described in more detail below. As shown in FIGS. 2 and 3, the lifting unit 24 includes rack blocks 38, which have racks, provided at both ends of the lifting frame 20. Further, the lifting frame 20 is connected to the support block 12, which provides a reference position in the stationary structure, by using the lifting rails 40 so that

a lifting path is secured.

For this purpose, each of the lifting rails 40 is composed of a bar type rail, and the support block 12 is provided with the outer rails 34 through which lifting rails 40 pass and slide. Each of the outer rails may be provided with a bearing.

Meanwhile, each of the rack blocks 38 is engaged with the pinion block 42, and the pinion blocks are connected to each other by the rotating shaft 44. One of the pinion blocks 42 is connected to the servomotor 22, and the servomotor 22 is fixed to and supported by the stationary frame 10. In this case, the rotating shaft 44 passes through the sidewalls of the stationary frame 10 and the support block 12 through bearings (not shown).

The lifting frame 20 is fixed to the rack blocks 38 in a direction crossing so as to cross the stationary frame, and the uniting cores 46 of the uniting units 26 are fixed to the lifting frame 20 so as to protrude from the lifting frame.

Further, for example, a ring shaped bumper pad 52 is provided around each of the uniting cores 46. The bumper pads 52 are provided to absorb the impact, which is caused by the collision between the upper surface of the lifting

frame 20 and the lower surfaces of the upper support frames, during the operation of the uniting units.

When the servomotor 22 is driven, the pinion blocks 42 connected to each other by the rotating shaft 44 are rotated. Accordingly, the rack blocks 38 are linearly moved upward and downward, so that the lifting frame 20 fixed to the rack blocks and the uniting cores 46 are moved upward and downward.

Particularly, as shown in FIGS. 4 and 5, each of the pickup units 18 includes the upper support frame 28 provided in the direction crossing the lifting frame 20, and the solenoids 48 where which the uniting cores 46 are freely inserted and separated are fixed to the upper support frame.

When electric power applied to the solenoids is intermitted, each of the solenoids 48 allows the uniting core 46 to be freely inserted thereinto and separated therefrom. When electric power is applied to the solenoids, each of the uniting cores 46 is united with the solenoid 48. As a result, the upper support frame 28 and the lifting frame 20 are attached to each other.

The movable rails 30 used as sliding members are fixed to both ends of each of the upper support frames 28, and one of the movable rails 30 is provided with the picker 16 and

the vacuum line 32 connected to the picker. The vacuum line 32 is connected to the pneumatic device 54.

Further, the support block 12 is provided with the outer rails 34 that secure the lifting paths of the movable rails 30, and the movable rails 30 are accurately moved upward and downward while being supported by the support block 12. (See FIG. 6)

In this case, the elastic springs 14 are fitted to the movable rails 30, and the elastic springs 14 are provided on the support block 12 so as to apply elastic forces to the upper support frames 28.

The lower support frame 36 is fixed to lower ends of the movable rails, which pass through the support block 12, so that the lower ends of the movable rails are connected to each other. Accordingly, the movable rails 30 are firmly fixed by the upper support frame and the lower support frame, so that the upper and lower support frames and the movable rails form rectangular structure.

Meanwhile, the alignment bar 50 is disposed on the upper support frames 28, and the alignment bar is connected to the stationary frame. Since the pickup units 18 are independently provided to the support block 12 through the elastic springs 14, the alignment bar is provided to align

the pickup units 18.

In addition, the pickup process may be divided into a pickup standby position and a pickup position. In general, the pickup standby may be performed at the uppermost position. When being moved downward to the pickup position, the alignment bar moves the pickup units 18 downward so that the pickup units are positioned at the pickup positions.

For this purpose, the alignment bar 50 is hinge-connected to the brackets 56, which are fixed to the stationary frame, in order to move the pickup units 18 to pickup positions. The alignment springs 58, which apply load for moving the pickup units downward about the brackets to the pickup positions, are provided to both ends of the alignment bar 50.

In this case, as shown in the drawings, hinge shafts are connected to both ends of the alignment bar 50, and a through hole through which the hinge shaft passes is formed in each of the brackets 56, so that the above-mentioned hinge connection is achieved.

Accordingly, as shown in FIG. 5, the stationary frame 10 are provided with the support block 12, the pickup units that are independently moved upward and downward with respect to the support block, and the lifting unit that

includes the lifting frame 20 crossing the pickup units. The lifting frame 20 and the upper support frames of the pickup units are connected to each other by the uniting units 26.

Accordingly, as shown in FIGS. 6 and 7, when pickup begins to start, the servomotor is driven, so that the pinion blocks 42 and the rack blocks 38 are driven. As a result, the lifting frame 20 is moved upward and downward. In this case, when electric power is not applied to the solenoids 48, each of the uniting cores 46 is freely inserted into the solenoid and separated from the solenoid. For this reason, the pickup units 18 are maintained at the elevated positions by the elastic springs 14. (See FIG. 7A)

In contrast, when electric power is applied to the solenoids 48, the solenoid is united with the uniting core 46 by a magnetic force. When the solenoids 48 and the uniting cores 46 are united with each other, the upper support frames 28 of the pickup units are united with each other and the movable rails 30 fixed to the upper support frames 28 are moved together with the lifting frame 20 while sliding through the outer rails 34 in the support block 12. (See FIG. 7B)

The electric power applied to the solenoids 48 is

intermitted by a control unit (not shown) and relay switches. In addition, the control unit operates the vacuum lines 32 of the pickup units to which electric power is applied, and performs pickup by the pickers 16.

Meanwhile, when the pickup units 18 are moved downward by the uniting units 26, the elastic springs 14 continuously generate elastic forces against the downward movement of the pickup units 18. The elastic forces cause the racks and the pinions to be always engaged with each other during the rack-pinion driving, and prevent backlash.

In addition, the solenoids 48 and the uniting cores 46 provide bumpers that absorb impact caused by the lifting unit 24 during the pickup of the pickers 16. That is, when each of the pickers 16 is excessively moved along the moving path and the lifting unit thus applies load onto the surface of the chip, repulsive forces of the elastic springs 14 become larger than union forces generated between the uniting cores 46 and the solenoids 48.

Therefore, when the lifting frame 20 provided with the uniting cores 46 is initially moved downward while the union forces are maintained between the uniting cores 46 and the solenoids 48, the lifting frame 20 attached to the solenoids

48 is also moved downward and the pickup units 18 are also moved downward.

While the pickers 16 are moved downward to a predetermined pickup finish position together with the lifting frame 20, the elastic springs 14 are compressed. For this reason, the repulsive forces of the elastic springs 14 are increased against the lifting frame 20.

If the lifting frame 20 continues to be moved downward and passes the predetermined pickup finish position, so that the repulsive forces of the elastic springs 14 become larger than the union forces generated between the uniting cores 46 and the solenoids 48, the uniting cores 46 are separated from the solenoids 48. Accordingly, even though the lifting frame 20 continues to be moved downward, the solenoids 48 are not moved downward any more.

The above-mentioned operation is experimentally determined in consideration of the union force caused by the amount of the current flowing in the solenoid 48, for example, the values of a voltage and current applied to the solenoids and the repulsive force of the elastic spring 14 caused by the compression, and may be satisfactorily achieved.

Accordingly, the structure of the picker 16 is more

simplified. In particular, a variable member and a bumper, which are provided in the picker in order to cope with the bumper clearance, do not need to be provided. In more particular, since the picker is fixed to the pickup unit, the rotation or twist of the picker is prevented.

That is, as described above, the picker should be provided with a bumper for absorbing impact that is generated from the lifting unit. According to the embodiment of the present invention, the uniting unit 26 that includes the solenoid 48 and the uniting core 46 copes with the bumper clearance of the picker 16.

Since the uniting units 26 are provided between the pickup units 18 and the lifting unit 24, the bumper is provided outside the pickup unit 18. For this reason, the picker 16 can be fixed to the rectangular structure that is formed by the upper and lower support frames 28 and 36. Further, since the moving path of the picker is secured by the movable rails, the twist of the picker can be prevented.

As described above, according to the embodiment of the present invention, a plurality of pickup units is selectively moved upward and downward by using only one servomotor. Therefore, the apparatus has the simple structure.

The simplification of the structure of the apparatus causes the number of parts to be reduced, thereby reducing the volume and weight of the apparatus and improving the reliability of the apparatus. Further, the productivity in manufacturing the apparatus is improved. Furthermore, since requiring a small space, the compact apparatus is advantageous in processes.

In addition, the elastic spring that is used to fix the pickup unit is also used to prevent backlash. Accordingly, a separate device for preventing backlash does not need to be added, which makes it possible to further make the apparatus simple.

Further, since the solenoid and the uniting core of the uniting unit form the structure for coping with the bumper clearance when the package is picked up, a separate device for coping with the bumper clearance does not need to be added.

Furthermore, the picker does not need to include a bumper therein and the bumper is provided outside the pickup unit, so that the picker can be firmly fixed to the lower support frame provided on the path of the movable rail. Therefore, it is possible to prevent troubles from occurring in processes due to the rotation or twist of the picker.

WHAT IS CLAIMED IS:

1. A pick and place apparatus comprising:

a support block that is provided in a stationary frame of a pick and place system and provides a stationary structure;

pickup units that slide through the support block so as to be moved upward and downward, each of the pickup units including movable rails that are provided with a picker holding a package at one end of the movable rail;

a lifting unit including a lifting frame that is united with the pickup units, a servomotor that drives the lifting frame, and a power transmission unit that transmits power of the servomotor to the lifting frame so as to move the lifting frame upward and downward; and

uniting units controlling the union between the pickup units and the lifting frame by using electromagnetic forces so that the pickup units are selectively moved upward and downward during the upward and downward movement of the lifting frame united with the pickup units.

2. The pick and place apparatus according to claim 1, wherein each of the pickup units includes:

an upper support frame that is fixed to upper portions

of the movable rails and provided above the lifting frame; and

a lower support frame that is fixed to lower portions of the movable rails, so as to have the shape of a framework.

3. The pick and place apparatus according to claim 1 or 2,

wherein the power transmission unit includes:

rack blocks extending below the lifting frame, having racks, and guided so as to be moved upward and downward through the support block; and

pinion blocks connected to the servomotor and having pinions that are engaged with the racks to transmit the power of the servomotor to the racks.

4. The pick and place apparatus according to claim 3, further comprising:

lifting rails that are provided outside the rack blocks, respectively, so as to slide upward and downward through the support block.

5. The pick and place apparatus according to claim 2,

wherein each of the uniting units include:

a uniting core that is fixed to the lifting frame; and

a solenoid that is fixed to the upper support frame and united with the uniting core.

6. The pick and place apparatus according to claim 5, further comprising:

elastic springs that are provided around the movable rails, respectively, one end of each of the elastic springs being supported by the support block and the other thereof being supported by the upper support frame,

wherein the backlash between the racks of the rack blocks and the pinions of the pinion blocks is prevented from occurring.

7. The pick and place apparatus according to claim 6,

wherein union forces generated between the uniting cores and the solenoids of the uniting units are set to be smaller than repulsive forces of the elastic springs when the pickup units pass pickup positions.

8. The pick and place apparatus according to claim 2, further comprising:

an alignment bar that is hinge-connected to an upper

portion of the stationary frame so as to be rotated with respect to the stationary frame; and

alignment springs that are provided between the stationary frame and the alignment bar,

wherein the alignment bar pushes down the upper support frame by the alignment spring at a pickup standby position of the pickup unit.

9. The pick and place apparatus according to claim 2, further comprising:

bumper pads that are provided on the lifting frame so as to absorb impact between the lifting frame and the upper support frames.