

DESCRIPTION

COMPONENT SUPPLY DEVICE

Technical Field

[0001]

The present invention relates to a component supply device being capable of stably supplying components by preventing clogging of components in a storage portion.

Background Art

[0002]

Component supply devices have been used in, for example, an assembling process in a factory in order to feeding components sequentially. The component supply device is requested to have a capability of stably feeding the components without clogging even when a large number of components are charged in order to stabilize a production line. As an example of a mechanism for preventing clogging of the components, a component supply device having a structure for jetting air has already been proposed (Patent Literature 1 and Patent Literature 2).

Citation List

Patent Literature

[0003]

Patent Literature 1: JP S62-280129 A

Patent Literature 2: JP H05-40229 U

Summary of Invention

Technical Problem

[0004]

Since the components described in Patent Literature 1 and Patent Literature 2 are chip circuit components, which have relatively a light weight, it is possible to agitate the chip circuit components piled up near an outlet of a storage part using air jetting. Heavier components, however, are hard to move by the air jetting. There is a problem, therefore, that the clogging of the components near the outlet of the storage part cannot be eliminated when the components cannot be moved by air.

[0005]

The present invention has been made in view of the above problems, and an object of the present invention is to provide a component supply device being capable of stably supplying components by preventing clogging of the components in a storage portion.

Solution to Problem

[0006]

A component supply device according to the present invention includes: a hopper part ejecting components to be

supplied; a storage part feeding the components ejected from the hopper part through a component outlet while agitating the components by using an agitation member; an air jetting part disposed near the component outlet of the storage part, which jets air for moving the components piled up near the component outlet; and a control unit controlling a timing of air jetting from the air jetting part depending on a position of the agitation member.

[0007]

In addition, in the component supply device according to the present invention, the agitation member may agitate the components in the storage part by a rotation movement about a rotation shaft, the agitation member may agitate the components that have been piled up near the component outlet by using the rotating agitation member, and the control unit may control the air jetting part to jet the air at a timing of a detected arrival of the agitation member at a predetermined first position near the component outlet.

[0008]

Moreover, in the component supply device according to the present invention, the agitation member may include an opening through which the components can pass formed between a rotation center and a head portion.

[0009]

Furthermore, in the component supply device according to the present invention, the control unit may control the agitation member to rotate a predetermined number of times and then stop the rotation movement of the agitation member temporarily at a timing of a detected arrival of a head of the agitation member at a predetermined second position.

Advantageous Effects of Invention

[0010]

According to the present invention, since the agitation member can agitate components floated by the air jetting by controlling the timing of the air jetting depending on the position of the agitation member, it is possible to prevent clogging of the components near the outlet of the storage part.

Brief Description of Drawings

[0011]

Fig. 1 is a perspective view illustrating, in a simplified manner, an example of a configuration of a component supply device corresponding to at least one of the embodiments of the present invention.

Fig. 2 is an explanatory diagram illustrating, in a simplified manner, an example of an internal configuration of a hopper part in the component supply device

corresponding to at least one of the embodiments of the present invention.

Fig. 3 is an explanatory diagram for explaining an operation state of the hopper part in the component supply device corresponding to at least one of the embodiments of the present invention.

Fig. 4 is a perspective view illustrating, in a simplified manner, an example of a configuration of a storage part in the component supply device corresponding to at least one of the embodiments of the present invention.

Fig. 5 is an explanatory diagram for explaining a state of operation of the storage part in the component supply device corresponding to at least one of the embodiments of the present invention.

Fig. 6 is an explanatory diagram for explaining a state of operation of the storage part in the component supply device corresponding to at least one of the embodiments of the present invention.

Fig. 7 is an explanatory diagram for explaining a state of operation of the storage part in the component supply device corresponding to at least one of the embodiments of the present invention.

Fig. 8 is an explanatory diagram for explaining a state of operation of the storage part in the component supply

device corresponding to at least one of the embodiments of the present invention.

Fig. 9 is a flowchart illustrating an example of a flow of control of the storage part in the component supply device corresponding to at least one of the embodiments of the present invention.

Description of Embodiments

[0012]

[First Embodiment]

Hereinafter, an example of a component supply device according to a first embodiment of the present invention will be described with reference to the drawings.

[0013]

Fig. 1 is a perspective view illustrating an example of a configuration of a component supply device corresponding to at least one of the embodiments of the present invention. As illustrated in Fig. 1, a component supply device 100 includes a hopper part 10, a storage part 20, and a component supply route 30. The storage part 20 for storing components 50 includes a storage part chassis 40, and the storage part chassis 40 is fixed on a base 60 by a fixing plate 70.

[0014]

The hopper part 10 has a function of discharging the

components 50 to be supplied to the storage part 20.

Although the hopper part 10 may have any configuration as long as the components 50 can be supplied to the storage part 20, since charging of a large number of components 50 into the storage part 20 at one time may cause clogging, a configuration preventing an excessive supply amount is preferable. The component supply device may be configured such that the components 50 is charged into the storage part 20 by a certain amount by controlling the operation of the hopper part 10, or may be configured such that the components 50 is supplied from the hopper part 10 to the storage part 20 when the amount of the components 50 decreases by detecting the amount of the components 50 in the storage part 20 by some method.

[0015]

The storage part 20 has a function of feeding the components 50 through the component outlet while agitating the components 50 discharged from the hopper part by the agitation member. The storage part 20 includes a bowl part 21 for storing the components 50, and an agitation member 22 for agitating the components 50 stored in the bowl part 21. Although illustrated as a bowl part 21 having a cylindrical shape in the present example, this is an example, and the bowl part 21 may have a shape obtained by cutting a sphere whose bottom surface is curved in an arc

shape, or may have a conical bowl part 21 like a funnel when a position of the component outlet described later is formed at the center of the bowl part 21.

[0016]

In addition, the agitation member 22 is configured to agitate the components 50 in the storage part 20 by rotation movement about a rotation shaft 23, and is configured to agitate the components 50 piled up near a component outlet 25 by the agitation member 22 which rotates. In the present example, although the agitation member 22 is provided in two directions different from the rotation shaft 23 by 180° , this can be appropriately set. The agitation member 22 may be provided at only one position in the radial direction, or the agitation member 22 may be provided at three positions different by 120° . In addition, the agitation member 22 may include an opening 24 through which the components 50 can pass formed between a rotation center and a head portion. Although not illustrated, it is preferable to employ a configuration of detecting the position of the head portion of the agitation member 22. Any configuration for detecting the position of the head portion of the agitation member 22 may be employed.

[0017]

Furthermore, the component outlet 25 through which the

components are fed after moving along an inclination inside the bowl part 21 is formed. The component outlet 25 preferably has a function as a gate through which the components 50 can pass only in a predetermined direction. For example, in a case of a component having a different silhouette when turned upside down, such as a nut with a flange, it is assumed that a situation is desired in which the components aligned upwards or downwards are fed. It is, therefore, conceivable to set the component outlet 25 so that the direction that can pass through a flange portion is determined in order to cope with such situation. [0018]

In addition, the storage part 20 is provided with an air jetting part 26 for jetting air to move the components piled up near the component outlet. When a large number of components 50 are stored and piled up near the component outlet 25, the components 50 further accumulate in the storage part 20. In addition, in the case where the component outlet 25 has the function as the gate through which the components 50 can pass only in the predetermined direction as described above, since the component 50 that does not match the direction cannot pass through the component outlet 25, it may cause clogging of the components 50. Thus, air jetting is performed from the air jetting part 26 to the components 50 piled up near the

component outlet 25 to eliminate a piling up of the components 50. Timings of the air jetting will be described later in detail.

[0019]

The component supply route 30 has a function of conveying the components 50 fed from the component outlet of the storage part 20 to a supply destination position. The components 50 fed from the component outlet 25 is aligned while passing through an aligning path 31 of the component supply route 30 and fed through an end portion 32 to the supply destination position.

[0020]

Although not illustrated, the component supply device 100 includes a control unit for controlling the rotation of the agitation member 22 and controlling air jetting timings from the air jetting part 26. Details of the control will be described later.

[0021]

Fig. 2 is an explanatory diagram illustrating, in a simplified manner, an example of an internal configuration of the hopper part in the component supply device corresponding to at least one of the embodiments of the present invention. In the example illustrated in Fig. 2, the hopper part 10 includes a component feeding space 11 for holding the components 50 which are charged, a first

divider 12 and a second divider 13 that divide the component feeding space 11, and a feeding port 14 for feeding the components 50 into the storage part 20. The hopper part 10 in the example illustrated in Fig. 2 is configured to be driven and controlled so that the relationship in height between an end (hereinafter referred to as "front end") provided with the feeding port 14 and an opposite end (hereinafter referred to as "rear end") is reversed at a predetermined time interval.

[0022]

Fig. 3 is an explanatory diagram for explaining an operation state of the hopper part in the component supply device corresponding to at least one of the embodiments of the present invention. Figs. 3(A) to 3(F) illustrate an operation of the hopper part. First, as illustrated in Fig. 3(A), a large number of components 50 are charged into the component feeding space 11 at the rear end of the hopper part 10. In a state of Fig. 3(A), since the front end of the hopper part 10 is controlled to be high while the rear end is low, the hopper part 10 is inclined such that the internal components 50 move to the rear end.

[0023]

Next, Fig. 3(B) illustrates a state in which drive control is performed so that the front end of the hopper part 10 is low while the rear end is high. In the state of

Fig. 3(B), since the hopper part 10 is inclined such that the internal components 50 move to the front end, all the components 50 move to the front end. At this time, since the components 50 are dispersed and moved to the left and right by the first divider 12 bent at an angle of approximately 90° , and are held by the second divider 13, the components do not move to the feeding part 14.

[0024]

Next, Fig. 3(C) illustrates a state in the middle of performing drive control again so that the front end of the hopper part 10 is high while the rear end is low, and Fig. 3(D) illustrates a state in which the front end of the hopper part 10 is high while the rear end is low. As illustrated in Figs. 3(C) and 3(D), part of the components 50 held by the second divider 13 return to the rear end again, and the remaining components move to a portion of the first divider 12 bent at the angle of approximately 90° .

[0025]

Fig. 3(E) illustrates a state in the middle of performing drive control again so that the front end of the hopper part 10 is low while the rear end is high, and Fig. 3(F) illustrates a state in which the front end of the hopper part 10 is low while the rear end is high. As illustrated in Figs. 3(E) and 3(F), part of the components

50 remaining at the portion of the first divider 12 bent at the angle of approximately 90° return to the position of the second divider 13, and the remaining components pass between two plates of second divider 13 and are fed into the storage part 20 through the feeding port 14.

[0026]

In this manner, since the drive control is performed so that the relationship between the heights of the front end and the rear end of the hopper part 10 is reversed at the predetermined time interval, it is possible to limit the number of the components 50 fed from the feeding port 14 to the storage part 20. In addition, it is possible to adjust a feeding amount of the components 50 from the feeding port 14 by changing lengths and installation positions of the first divider 12 and the second divider 13.

[0027]

Fig. 4 is a perspective view illustrating, in a simplified manner, an example of a configuration of the storage part in the component supply device corresponding to at least one of the embodiments of the present invention. In the example shown in Fig. 4, the storage part 20 is provided with the agitation member 22 in two directions different by 180° about the rotation shaft 23 inside the bowl part 21 having cylindrical shape, and each half of the agitation member 22 has the opening 24 through

which the components 50 can pass formed between the rotation center and the head portion. Furthermore, the component outlet 25 through which the components are fed after moving along the inclination inside the bowl part 21 is formed, and the air jetting part 26 for jetting air to move the components piled up near the component outlet is provided adjacent to the component outlet 25. The component supply route 30 is connected to the component outlet 25.

[0028]

Fig. 5 to 8 are explanatory diagrams for explaining states of operation of the storage part in the component supply device corresponding to at least one of the embodiments of the present invention. The positions of the agitation member 22 and the timings of air jetting will be described with reference to Figs. 5 to 8.

[0029]

Fig. 5 illustrates a state in which the components 50 are piled up near the component outlet 25 of the storage part 20. Fig. 5 also illustrates a state in which the head portion of the agitation member 22 rotating counterclockwise is approaching the portion where the components 50 are piled up.

[0030]

Fig. 6 illustrates a state in which air is jetted from

the air jetting part 26. When the head portion of the agitation member 22 rotating counterclockwise arrives at a preset first position, control is performed so that air is jetted from the air jetting part 26. In this example, when the position where the component outlet 25 is installed is a 6 o'clock direction of the clock, around a 7 o'clock position is set as the first position. The 7 o'clock position is determined with the intention of immediately before the agitation member 22 comes into contact with the components 50 piled up near the component outlet 25. When it is detected that a head position of the agitation member 22 arrives at the 7 o'clock position, the control of jetting air from the air jetting part 26 is performed, thus the piling up components 50 are moved by the air. The agitation member 22 that continues to rotate comes into contact with these components 50 immediately after the components 50 are moved.

[0031]

Fig. 7 illustrates a state in which the components 50 near the component outlet 25 is agitated by the agitation member 22 after the air jetting. It can be said that the components 50 in the state after being moved by the air are in a state in which the close contact state between the components is eliminated and the components are easily agitated by the agitation member 22. Part of the

components 50 agitated by the agitation member 22 pass through the opening 24 and return to near the component outlet 25 again, and part thereof move from the component outlet 25 to the component supply route 30.

[0032]

Fig. 8 illustrates a state in which the head portion of the agitation member 22 arrives at a preset second position and the rotation operation is temporarily stopped. When the agitation member 22 is further rotated from the state of Fig. 7 and it is detected that the head portion of the agitation member 22 arrives at the preset second position, the rotation operation of the agitation member 22 is controlled to be temporarily stopped. In this example, when the position where the component outlet 25 is installed is the 6 o'clock direction of the clock, around the 2 o'clock position is set as the second position. The 2 o'clock position is determined with the intention that the components 50 lifted by the head portion of the agitation member 22 start to roll along the inclination of the bowl part 21. It is, therefore, not necessarily the 2 o'clock position, and it is sufficient that the agitation member 22 stops in an inclined state between the 3 o'clock position and the 12 o'clock position. Part of the components 50 lifted by the head portion of the agitation member 22 pass through the opening 24 and move toward the

component outlet 25. After temporarily stopping for a predetermined time, the rotation of the agitation member 22 is resumed. Note that the agitation member 22 may temporarily stop at the second position every time, or may temporarily stop at the second position only once every predetermined number of rotations, for example, every three rotations.

[0033]

Fig. 9 is a flowchart illustrating an example of a flow of control of the storage part in the component supply device corresponding to at least one of the embodiments of the present invention. As shown in Fig. 9, control processing in the storage part 20 is started by starting rotation processing of the agitation member 22 in the control unit of the component supply device 100 (step S101). Next, the control unit acquires a current position of the head portion of the agitation member 22 (step S102). Next, the control unit determines whether the position of the head portion of the agitation member 22 arrives at the first position (step S103). When it is determined that the position of the head portion of the agitation member 22 arrives at the first position (S103 - Y), the control unit controls the air jetting part 26 to jet air (step S104), and process proceeds to step S102. When it is determined that the position of the head portion of the agitation

member 22 does not arrive at the first position (S103 - N), the process proceeds to step S105. Next, the control unit determines whether the position of the head portion of the agitation member 22 arrives at the second position (step S105). When it is determined that the position of the head portion of the agitation member 22 arrives at the second position (S105 - Y), the control unit stops the rotation processing of the agitation member 22 at the second position for a certain period of time (step S106). Then, the control unit resumes the rotation processing of the agitation member 22 after a lapse of the certain period of time (step S107), and the process proceeds to step S102. When it is determined that the position of the head portion of the agitation member 22 does not arrive at the second position (S103 - N), the process proceeds to step S108. Finally, the control unit determines whether or not a predetermined end condition is satisfied (step S108). When it is determined that the predetermined end condition is not satisfied (S108 - N), the controller proceeds to step S102. When it is determined that the predetermined end condition is satisfied (S108 - Y), the control unit ends the control processing in the storage part 20. Examples of the predetermined end condition include a lapse of a certain period of time, the number of rotations of the agitation member 22 reaching a predetermined value, non-

detection of the components 50 in the hopper part 10 or the storage part 20, and the like.

[0034]

As described above, since the component supply device 100 according to the present invention includes: the hopper part ejecting components to be supplied; the storage part feeding the components ejected from the hopper part through the component outlet while agitating the components by using the agitation member; the air jetting part disposed near the component outlet of the storage part, which jets air for moving the components piled up near the component outlet; and the control unit controlling the timing of air jetting from the air jetting part depending on the position of the agitation member, the components floated by the air jetting can be agitated by using the agitation member by controlling the timing of the air jetting depending on the position of the agitation member, thus clogging of the components near the outlet of the storage part can be prevented.

[0035]

In particular, in a case where a shape of the component outlet 25 is provided as a gate through which components can pass only in a correct direction in order to feed components having different silhouettes when turned upside down, such as the nut with a flange, from the storage part

20, although the components 50 cannot pass through the component outlet 25 in the incorrect direction and the components 50 end up being piled up, since the components 50 floated by air jetting can be agitated by the agitation member 22 as in the present example, which urge the components 50 to change the direction and pass through the component outlet 25 in the correct direction, the piling up of the components 50 can be eliminated and the components 50 can be stably supplied.

[0036]

[Second Embodiment]

In the first embodiment, although the description has been made assuming that the air is always jetted from the air jetting part 26 when the head portion of the agitation member 22 arrives at the first position, the present invention is not limited thereto. For example, a sensor for determining whether or not the components 50 are piled up near the component outlet 25 may be provided, and control may be performed such that the air is jetted when the components 50 are piled up near the component outlet 25, and the air is not jetted when the components 50 are not piled up near the component outlet 25. As an example of the sensor, an infrared sensor can be considered. By performing such control, it is possible to perform control so that the air is jetted only when it is necessary.

Reference Signs List

[0037]

100 component supply device

10 hopper part

11 component feeding space

12 first divider

13 second divider

14 feeding port

20 storage part

21 bowl part

22 agitation member

23 rotation shaft

24 opening

25 component outlet

26 air jetting part

30 component supply route

31 aligning path

32 end portion

40 storage part chassis

50 component

60 base

70 fixing plate

CLAIMS

1. A component supply device comprising:

a hopper part ejecting components to be supplied;

a storage part feeding the components ejected from the hopper part through a component outlet while agitating the components by using an agitation member;

an air jetting part disposed near the component outlet of the storage part, the air jetting part jetting air moving the components piled up near the component outlet; and

a control unit controlling a timing of air jetting from the air jetting part depending on a position of the agitation member.

2. The component supply device according to claim 1,

wherein the agitation member agitates the components in the storage part by a rotation movement about a rotation shaft, and the agitation member agitates the components that have been piled up near the component outlet by using the agitation member which rotates, and

wherein the control unit controls the air jetting part to jet the air at a timing of a detected arrival of the agitation member at a predetermined first position near the component outlet.

3. The component supply device according to claim 2,

wherein the agitation member includes an opening through which the components can pass formed between a rotation center and a head portion.

4. The component supply device according to claim 2 or 3, wherein

the control unit controls the agitation member to rotate a predetermined number of times and then stop the rotation movement of the agitation member temporarily at a timing of a detected arrival of a head of the agitation member at a predetermined second position.