



Description

G00002

5 Feed device for conveyor belts loaded with pick and place elements

10 The invention relates to a feed device for conveyor belts loaded with pick and place elements, having at least one transport wheel and a drive device coupled to the latter.

15 Electronic components are, for example, provided arranged on conveyor belts. The conveyor belts are conventionally provided with a top layer which prevents the components falling off the conveyor belt. In order to be able to pick the components, for example arranged on the conveyor belt, and place them on a printed circuit board, the top layer must be removed, by which means the components are gradually liberated, in order to be removed from the conveyor belt and placed on a printed circuit board by means of a handling device, such as a pick and place head of a pick and place apparatus.

25 Since the components are becoming smaller and smaller and already currently have very small dimensions, it is necessary to position the conveyor belt with the components arranged thereon correspondingly accurately. For this purpose, use has hitherto been made of feed devices which, for example, first transported the conveyor belt forward, pulling off the top layer and liberating the components, and then positioned the conveyor belt accurately by means of a mechanical stop, against which the drive device had moved the transport wheel or the mechanism used to couple the drive device to the transport wheel. In this case, however, jolting movements of the conveyor belt occur, as a result of which the components can fall off the conveyor belt

before they can be removed from the conveyor belt by the pick and place head of the pick and place apparatus.

In order to prevent the components falling off the conveyor belt, hold-down apparatus for the components has been used, which held the components in the pockets in the conveyor belt until the components were removed
5 by means of a pick and place head. However, the hold-down apparatus means a great deal of mechanical expenditure, is susceptible to defects and slows down the feed cycle of the pick and place elements. Furthermore, in conventional feed devices, the jolting
10 movements of the conveyor belt are undesired, since pick and place elements can fall off the conveyor belt in spite of the hold-down apparatus.

There is therefore the need for a feed device by means
15 of which exact positioning and feeding of conveyor belts loaded with pick and place elements is simply and reliably possible.

This object is achieved by the apparatus according to
20 the independent Claim. Preferred refinements of the invention are claimed in the dependent claims.

According to the invention, a feed device for conveyor belts loaded with pick and place components is provided
25 which has at least one transport wheel and a drive device coupled to the latter. The transport wheel can be coupled to the conveyor belt in order to move it. Furthermore, the transport wheel is provided with a control mechanism whose input shaft and output shaft
30 cross. This achieves the situation where the control mechanism is self-locking, so that, by means of the control mechanism, the movement of the drive device and therefore the movement of the transport wheel which drives the conveyor belt can be controlled.

35

The control mechanism can be, for example, a worm gear mechanism or a screw gear mechanism. A worm gear mechanism of this type can have a worm gear which is

WO 02/26600

- 2a -

PCT/DE01/03640

formed on the transport wheel

and through which the output shaft runs, and a control spindle which engages in the worm gear and through which the input shaft runs.

5 Furthermore, a control apparatus can be provided by means of which the movement of the transport wheel driven by the drive device can be controlled by means of the control mechanism. The control apparatus can have a control drive which is coupled to the control
10 mechanism and from which power can be taken or power can be output via a control shaft.

The control drive can be an electrical drive. This makes it possible, by means of an electronic control
15 apparatus, to use suitable control methods for controlling the movement of the transport wheel.

The control shaft of the control drive can coincide with the input shaft of the control mechanism. For
20 example, the control shaft of the control drive can be connected directly to the control spindle of the control mechanism. This permits a reduced requirement for space for the control drive and the control mechanism.

25 Furthermore, the drive device of the transport wheel can be coupled to the transport wheel via a drive spindle which, in addition to the control spindle, engages in the worm gear of the control mechanism. A
30 further reduction in overall size is made possible by this.

By means of the control apparatus, the rotational speed and/or the power of the control drive can be controlled
35 as a function of the rotational speed and/or the power of the drive device.

The control drive can furthermore be controllable by means of the control apparatus as the drive of the

transport wheel. This makes it possible to drive the transport wheel both with the drive device of the transport wheel and with the control apparatus

via the control mechanism. In this case, higher power outputs to the transport wheel and therefore faster transport of the conveyor belt are possible than if the transport wheel were driven only by the drive unit.

5

The transport wheel can be provided with an encoder in order to register its position, and the feed device can have a sensor, by which the encoder can be sensed.

10 The drive device and the control drive are preferably constructed identically. In this way, the construction of the feed device according to the invention and its design and development are simplified and benefited.

15 The invention will be explained in more detail with reference to the drawing, in which:

Figure 1 shows a schematic plan view of a preferred embodiment of the invention, and

20 Figure 2 shows a graph which reveals a course of a voltage applied to a drive device and a control drive of the preferred embodiment of the invention as a function of the rotational speed.

25 As Figure 1 reveals, the preferred embodiment of the invention has a transport wheel 100, a control drive 200-1 and a drive device 200-2. The drive device 200-2, the control drive 200-1 and the transport wheel 100 are arranged on a base plate 300. The transport wheel 100
30 has a plurality of transport pins 105, which are formed distributed on the circumference of the transport wheel 100 and are used to engage in transport openings which are formed in the conveyor belt, which can be transported by means of the feed device according to
35 the invention.

The transport wheel 100 is also provided with a worm gear 150. A control spindle 250-1 and a drive spindle 250-2 engage in the worm gear 150. The control spindle 250-1 is connected to the control drive 200-1 via a control shaft 210-1.

A bearing 220-1 for the control shaft 210-1 is provided on the base plate 300. The drive spindle 250-2 is connected to the drive device 200-2 via an input shaft 210-2. A bearing apparatus 220-2 for the input shaft 210-2 is provided on the base plate 300.

The simultaneous engagement of the control spindle 250-1 and the drive spindle 250-2 in the worm gear 150 makes it possible to construct the feed device according to the invention with very small dimensions in the axial direction. As a result, the feed device according to the invention is particularly suitable for narrow conveyor belts.

The control drive 200-1 and the drive device 200-2 can, for example, be constructed identically, so that if required the control drive 200-1 can be used to drive the transport wheel 100 in addition to the drive device 200-2.

Figure 2 reveals a graph of an example of a course of the voltages which are applied to the control drive 200-1 and the drive device 200-2 as a function of the rotational speed. As can be seen from Figure 2, the magnitude of that voltage which is applied to the drive device 200-2 is higher by a constant difference than the magnitude of the voltage which is applied to the control drive 200-1.

This means that, as the transport wheel 100 is driven, the driving action via the drive device 200-2, the

input shaft 210-2, the drive spindle 250-2 and

the worm gear 150 is provided without play, since the drive device 200-2 is supplied with more energy than the control drive 200-1, by which means any play possibly present between the drive spindle 250-2 and the worm gear 150 or the control spindle 250-1 and the worm gear is compensated for.

However, it is also possible to use a different relation between the power and/or the rotational speed of the control drive and the power and/or the rotational speed of the drive device 200-2. For example, the control drive 200-1 and the drive device 200-2 can be supplied with the same power or operated at the same rotational speed, so that it is possible to drive the transport wheel 100 with twice the drive power.

At a changeover from drive operation to positioning operation, it is possible to switch over to the aforementioned different supply of drive device 200-2 and control drive 200-1, so that play-free positioning of the transport wheel 100 and thus of the conveyor belt which holds the components is possible.

The transport wheel 100 can be provided with an encoder 121, for example with a lined disc. The encoder 121 can be sensed by means of a sensor 122. The sensor 122 can be connected to the control apparatus, by means of which highly accurate positioning of the transport wheel 100 and therefore of a conveyor belt coupled to the latter is then possible. Furthermore, by means of the encoder 121 together with the sensor 122 and the control apparatus, it is possible to control the movement of the transport wheel 100 highly accurately in a closed control loop.

Patent Claims

1. A feed device for conveyor belts loaded with pick
5 and place components having
 - at least one transport wheel (100), which can be coupled to a conveyor belt in order to move the conveyor belt, and
 - a drive device (200-2) coupled to the transport wheel
10 (100),characterized in that
 - a control mechanism (250-1, 150) is provided on the transport wheel (100) and has an input shaft and an output shaft which cross.
15
2. The feed device as claimed in Claim 1, characterized in that the control mechanism (250-1, 150) is a worm gear mechanism, which has a worm gear (150) which is formed on the transport wheel (100) and
20 through which the output shaft runs, and a control spindle (250-1) which engages in the worm gear (150) and through which the input shaft runs.
3. The feed device as claimed in Claim 1 or 2,
25 characterized in that the movement of the transport wheel (100) driven by the drive device (200-2) can be controlled by a control apparatus that is operatively connected to the control mechanism (250-2, 150).
- 30 4. The feed device as claimed in Claim 3, the control apparatus having a control drive (200-1) which is coupled to the control mechanism (250-1, 150) and from which power can be taken or power can be output via a control shaft (210-1).
35
5. The feed device as claimed in Claim 4, the control drive (200-1) being an electric drive.

6. The feed device as claimed in either of Claims 4 and 5, characterized in that the control shaft (210-1) of the control drive (200-1) coincides with the input shaft of the control mechanism (250-1, 150).

5

7. The feed device as claimed in one of Claims 1 to 6, characterized in that the drive device (200-2) is coupled to the transport wheel (100) via a drive spindle (250-1) which engages in the worm gear (150) of the control drive (250-1, 150).

10

8. The feed device as claimed in one of Claims 3 to 7, characterized in that the control apparatus is able to control the rotational speed and/or the power of the control drive (200-1) as a function of the rotational speed and/or the power of the drive device (200-2).

15

9. The feed device as claimed in Claim 8, characterized in that the control apparatus is able to control the control drive (200-1) as the drive of the transport wheel (100).

20

10. The feed device as claimed in one of Claims 1 to 9, characterized in that the transport wheel (100) has an encoder (121) and the feed device is provided with a sensor (122) for sensing the encoder (121).

25

11. The feed device as claimed in one of Claims 4 to 10, the drive device (200-2) and the control drive (200-1) being constructed identically.

30