

Description

Method and device for transmitting data between a pick-
and-place machine and a feeding unit, a pick-and-place
5 machine and a feeding unit

The invention relates to a method for transmitting data
between a pick-and-place machine and a feeding unit and
to a device for transmitting data between a pick-and-
10 place machine and at least one feeding unit according
to the precharacterizing clause of patent claim 5 and
also to a feeding unit for a pick-and-place machine
according to the precharacterizing clause of patent
claim 7 and to a pick-and-place machine.

15 In a pick-and-place machine, components are removed
from feeding units with the aid of a holding device,
are moved by means of the holding device to a
predetermined position above a substrate and deposited
20 there. Different feeding units are provided for
different types of component. The feeding units with
the components are set against the pick-and-place
machine in a predetermined position, so that the
holding device of the pick-and-place machine can remove
25 the components from the feeding units. The driving of
the feeding units, for example by what are known as
"tape feeders", takes place via a wire-bound connection
between the control device of the pick-and-place
machine and the control device of the feeding unit. As
30 soon as a component has been picked by the holding
device, the control device of the pick-and-place
machine issues the command to the control device of the
feeding unit to advance the belt filled with components
further by one position. To ensure the fastest
35 possible changing of the feeding units, plugs are
provided in a fixed grid pattern on the pick-and-place
machine for these wire-bound connections. The width of
the feeding units must be based on this pattern, with

the result that, particularly in the case of new, smaller components, an increase in the variety of components on the pick-and-place machine is prevented,

even though the smaller size of the components should actually make this possible.

5 It is therefore the object of the invention to provide a method and a device with which it is ensured that feeding units can be set against a pick-and-place machine as far as possible without any grid pattern.

10 The object is achieved according to the invention by a method and a device of the type stated at the beginning with the characterizing features of patent claims [lacuna] and 5 and also a feeding unit with the features of claim 7 and a pick-and-place machine with the features of claim 8.

15 The data transmission by optical means between the pick-and-place machine and the feeding unit makes it possible for the optical transmitters and receivers assigned to the feeding units to be arranged at any
20 desired position of the optical waveguide. By dispensing with the fixed grid pattern in this way, it is ensured that future changed component dimensions are flexibly allowed for on the pick-and-place machine.

25 According to claim 2, it is provided in an advantageous way that a plurality of feeding units can be coupled onto one optical waveguide. This results in a particularly flexible construction of the feeding units on the pick-and-place machine.

30 The method is made particularly simple, according to claim 3, by the transmitters transmitting their data simultaneously to all the receivers.

35 The CAN (Controller Area Network) method, known from the automobile sector, according to claim 4 is particularly suitable for the simultaneous transmission of the data of all the receivers.

The invention is explained in more detail by means of an exemplary embodiment with reference to the single figure of the drawing.

The figure shows here a schematic view of a pick-and-place machine with coupled-on feeding units. In this case, a pick-and-place machine 1 with a first control device 2, onto which a first feeding unit 3 with a second control device 4 is coupled, is schematically represented. The feeding unit 3 serves the purpose of providing components of one component type, which are deposited by a holding device, not represented, of the pick-and-place machine 1 in a predetermined position on substrates, likewise not represented. The second control device 4 serves the purpose of providing further components after one component has being picked out of the feeding unit 3. In the case of what is known as a "tape feeder", a belt for example, in which there are pockets with components, is advanced by clicking it on one position. In the case of another known feeding unit, known as a "waffle-pack changer", the second control device 4 serves the purpose of exchanging the trays, as they are known. A tray is understood in this case as meaning a horizontally arranged surface on which a plurality of components are arranged in a two-dimensional array alongside one another. The communication between the first control device 2 of the pick-and-place machine 1 and the second control device 4 of the feeding unit 3 has previously been accomplished in a wire-bound manner. According to the invention, a first optical transmitter 5 and a first optical receiver 6 are assigned and connected to the first control device 2 and communicate with a second optical transmitter 7 and a second optical receiver 8, which are connected to the second control device 4.

The communication takes place in this case via an optical waveguide 10, which is assigned to the pick-and-place machines 1 and into which the optical transmitters launch the data to be transmitted, and the optical receivers 6, 8 receive the data. The optical

waveguide 10 may in this case be designed for example as a planar waveguide, on the side faces of which the transmitters 5, 7 and receivers 6, 8 are arranged. The communication with a further feeding unit 11, which
5 comprises a further control device 12 and, connected to the latter, a

further optical transmitter 13 and a further optical receiver 14, also takes place in a corresponding way. The use of an optical waveguide 10 allows the two feeding units 3, 11 to be positioned as desired along the direction of displacement 15. As a result, the feeding units 3, 11 can be coupled onto the pick-and-place machine 1 without any grid pattern. This allows feeding units 3, 11 of any desired width to be produced and coupled onto a pick-and-place machine 1.

10

The transmission of the data can in this case take place simultaneously from one of the transmitters 5, 7, 13 to all the receivers 6, 8, 14. Such a method is known for example from the automobile sector as the CAN (Controller Area Network) method. The maximum transmission rate in this case is defined as 1 megabit/second. The access method of CAN is best described by CSMA/CA. CSMA/CA stands for Carrier Sense Multiple Access with Collision Avoidance. The difference from the known CSMA/CD (with Collision Detection) is that, in the event of a collision, a user receives the transmission correction, whereas in the case of CSMA/CD all the users withdraw from the bus and only attempt renewed access later. With this method, CAN has multimaster capability. That is to say that a plurality of transmitters can request the bus simultaneously. If this causes a collision, because different transmitters arbitrate (request) the bus at the same time, the transmitter with the higher priority is given bus access.

30

To allow this access method to be implemented, the following basic preconditions must apply:

- All users operate on the Listen While Talk principle.

That is to say that they are constantly listening to the line even while they are writing.

35

- 4a -

- If a plurality of users write simultaneously, there is a logical zero on the bus, even if only one of the users writes a zero.
 - Each user must have its known unique identification.
- 5 This is used at the same time as priority

(the smaller the identification, the greater the priority).

- If the bus is free, a user can request the bus by writing a start bit to the bus. It then begins to write its identification, and consequently its priority, bit by bit to the bus. The other users synchronize themselves with the start bit. If another user would like to request the bus, it also writes its identification, and consequently its priority, to the bus in sync with the first user. If, when writing a one, a user detects that the value zero is read back by the bus, it must conclude from this that another user of higher priority has overwritten it. It then must not make any other write access attempts to the bus. Rather, it must wait until the message has ended (evident from an EOF byte (End of Frame)). Only then can the user attempt again to arbitrate the bus.
- 20 If the CAN method is implemented by optical means, the light is always on in the zero state and therefore always surpasses the recessive level (light off).



Patent claims

1. A method for transmitting data between at least one
first control device (2), which is assigned to a
pick-and-place machine (1), and a second control
device (4), which is assigned to a feeding unit (3)
for the pick-and-place machine (1), in which
- data to be sent are transmitted electrically from
the sending control device (2, 4) to an optical
transmitter (5, 7) assigned to the sending
control device,
- the optical transmitter (5, 7) launches the data
into an optical waveguide (10),
- an optical receiver (6, 8), assigned to the
receiving control device, receives the data from
the optical waveguide (10) and transmits it to
the receiving control device (2, 4).
2. The method for transmitting data as claimed in
claim 1, characterized in that at least one further
feeding unit (11) with a further control device
(12), a further optical transmitter (13) and a
further optical receiver (14), which are connected
to the further control device (12), are provided
and in that the further optical transmitter (13)
launches its signals into the optical waveguide
(10) and the further optical receiver (14) receives
signals from the optical waveguide (10).
3. The method for transmitting data as claimed in one
of claims 1 or 2, characterized in that each
optical transmitter (5, 7, 13) transmits its
signals simultaneously to all the receivers (6, 8,
14).
4. The method for transmitting data as claimed in
claim 3, characterized



in that the CAN (Controller Area Network) method is used for the data transmission.

5. A device for transmitting data between a pick-and-place machine (1) and at least one feeding unit (3) with a first control device (2), which is assigned to the pick-and-place machine (1), with a second control device (4), which is assigned to the at least one feeding unit (3), characterized in that the first control device (2) is connected to a first optical transmitter (5) and a first optical receiver (6), in that the second control device (4) is connected to a second optical transmitter (7) and a second optical receiver (8) and in that the optical receivers (6, 8) and the optical transmitters (5, 7) are connected to one another via an optical waveguide (10).
6. The device for transmitting data as claimed in claim 5, characterized in that a further feeding unit (11) is provided, which has a further control device (10) and, connected to it, a further optical transmitter (13) and a further optical receiver (14) and in that the further optical transmitter (13) and the further optical receiver (14) are connected via the optical waveguide (10) to the first and second optical transmitters (5, 7) and receivers (6, 8).
7. A feeding unit (3, 11) for a pick-and-place machine (1) with a second control device (4), characterized in that the feeding unit (2, 11) has an optical transmitter (7, 13) and an optical receiver (8, 14), which are connected to the control device (4, 12) and



in that the optical transmitter (7, 13) and the optical receiver (8, 14) are arranged in such a way that they can be coupled onto an optical waveguide (10) arranged on the pick-and-place machine (1).

5

8. A pick-and-place machine (1) with a control device (2), with an optical transmitter (5) and an optical receiver (6), which are connected to the control device (2), and with an optical waveguide (10),
10 into which the optical transmitter (5) sends its signals and from which the optical receiver (6) receives signals, the optical waveguide (10) being arranged in such a way that further optical transmitters (7, 13) and optical receivers (8, 14)
15 of at least one feeding unit (3, 11) can be coupled on.

20

9. The pick-and-place machine (1) as claimed in claim 8, characterized in that the optical waveguide (10) is arranged in such a way that optical transmitters (7, 13) and optical receivers (8, 14) of a plurality of feeding units (3, 11) can be coupled on without any grid pattern.