

**Description**

The invention relates to a method of feeding electric and/or electronic elements packed in tapes to given positions and for transferring the elements from these positions by means of transfer members each comprising a tube-shaped part which is moved until it contacts one side of the relevant element during removal, after which the relevant element is pressed out of the relevant position while being held between the tube-shaped part and a lifting pin which acts on the other side of the element, after which the element is held by the transfer member, the elements being fed one after the other to each of the positions along feed paths.

A method of the kind forming the subject of the present inventions is disclosed in FR-A-2295569. Such methods are used for the feeding and positioning of elements on substrates. The elements of the desired kind are presented in given positions from their package or while still in their package, after which they are picked up by a transfer member which deposits the relevant elements on the substrate in the correct positions. It is very important that the elements are always presented in the same position to be picked up by the transfer member.

A machine for feeding electric and/or electronic component packed in tapes and mounting these elements on substrates is disclosed in EP-A-16368.

It is an object of the invention to provide a method and device for feeding and transferring the elements in which substantially precludes any deviation from the correct positions of the elements during the feeding and transfer operations.

The method according to the invention is characterized in that the elements are intermittently fed to the given positions along feed channels which enclose the relevant elements on all sides except in the transport direction, each of the channels comprising a removal opening at the area of the respective position and each of the removal openings being partly closed by a movable closure member which is moved to open the opening fully only after the respective tube-shaped part has contacted the element.

In the method according to the invention, the elements are guided during feeding so that any deviation from the correct positions of the elements is precluded. Subsequently, the elements are each picked up in the transfer position by two pins so as to be pressed upwards, possibly out of their package. Thereafter, the element is held by the transfer member. Consequently, should an element become stuck in the respective feed channel or in the package for some reason, the pins will ensure that this element will be smoothly moved in the direction of the transfer member.

When the tube-shaped part approaches the element, there is a risk of the element jumping towards the pin-shaped part due to electrostatic charging, so that a change of position of the element is liable to occur. In order to counteract this

possibility, each of the removal openings is partly closed by a movable closure member which is moved to open the opening fully only after the respective tube-shaped part has contacted the element.

If the transfer members are constructed as suction tubes, the tubes may first be used as the tube-shaped parts, the vacuum being created only after removal of the relevant element from its position in the respective feed channel.

The invention also relates to a device according to the prior art portion of Claim 3 which device enables elements to be very quickly fed to and a picked-up by a transfer member in a reliable and accurate manner.

The device according to the invention is characterized in that it comprises feed channels in which the elements in their tapes can be transported so that they are enclosed on all sides, a removal opening being provided at the end of each channel, the device furthermore comprising for each channel one of the transfer members each of which is situated opposite the relevant removal opening at said first position, said lifting pin being provided for each feed channel and being situated approximately on the centre line of the removal opening, each of the removal openings being partly closed by means of a movable closure member which fully opens the respective removal opening only when the respective pin-shaped part bears on the relevant element.

In a further embodiment, the closure member is formed by a plate-shaped part which bridges all the removal openings and which comprises for each opening a slit-shaped cut-out through which the relevant tube-shaped part can be brought into contact with the relevant element.

In order to permit the handling of elements of slightly varying thickness, the bottom of each of the feed channels in a further embodiment is resilient.

In a further embodiment, the device according to the invention comprises a number of parallel feed channels and a number of stepping pins which are arranged adjacent one another and each of which is movable into and out of a respective one of the channels in a reciprocating manner and, when projecting into the channel, is displaceable in the longitudinal direction of the channel over a distance corresponding to the center-to-center distance between the openings in the tapes, the device furthermore comprising a corresponding number of centring pins each of which is arranged behind a corresponding one of the stepping pins in the direction of transport of the tapes and is movable into and out of the respective channel in a reciprocating manner after completion of the transport stroke of the respective stepping pin.

The device permits the stepwise transport of a number of tapes arranged very close to one another. The transport can be effected very quickly and with great accuracy. The various elements will thus always be accurately presented in the same position each time, which is a require-

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ment for accurate picking-up by the transfer members.

Each of the stepping pins in a further preferred embodiment of the device according to the invention is resiliently connected to an associated first reciprocable rod for movement therewith in a direction extending transversely of the feed channel, the ends of all the first rods which are remote from the stepping pins bearing against a drive member, and each of the stepping pins being pivotably connected to an associated transport lever which extends to the front and rear sides of the relevant stepping pin with respect to the direction of movement of the tapes and which is pivotably connected on one side of the pin to a fixed part of the device and on the other side to one end of an associated second reciprocable rod, the other ends of all the second rods bearing against a further drive member.

Thus, a device is obtained which has a very small width, viewed transversely of the transport direction. In fact, the drive members required for a tape need be no wider than the tape. Considering that a customary tape has a width of 8 mm, it will be clear how little space is occupied by the drive members in the transverse direction. Moreover, the operation is such that the first drive member simultaneously lifts all the first rods, each of the stepping pins then engaging in one of the transport holes in the relevant tape. Subsequently, the further drive member moves all the second rods so that the transport levers all pivot about their pivots on the fixed part of the device. As a result of this motion, each of the stepping pins is moved in such a way that its end which engages in the respective transport hole performs a stroke which corresponds to the centre-to-centre distance between the openings in the relevant tape which contain the elements. Consequently, the tapes are advanced through the centre-centre distance between two elements and the next element in each of the tapes is situated underneath the respective removal opening.

In order to enable the transport movement of one or more of the stepping pins to be temporarily stopped, in a further embodiment of the device according to the invention there is provided for each transport lever a locking device which can be operated to block the movement of the relevant lever when no tape transport is desired.

In order to ensure that the elements in all the tapes are situated exactly underneath the relevant removal opening, a further preferred embodiment comprises, in addition to each first and each second rod, a third reciprocable rod, one end of which supports a centring pin and the other end of which bears against a common drive element, each of the third rods being resiliently pressed against a guide which is preferably formed by two balls which are accommodated in a fixed part of the device at a distance from one another.

The tapes emerging from the feed channels may have a considerable length which may give rise to storage problems. To mitigate these problems, at the end of each feed channel there may

be arranged a blade which is movable across the exit of the channel by a drive means. This blade cuts the tape into small pieces, so that storage is no longer a problem.

In a preferred embodiment of the device according to the invention, the portions of the upper sides of the feed channels which are situated at the entrances of the channels are formed by a plate-like element which extends substantially as far as the area of the upper sides of the channels at which the openings for the removal of the elements are situated, and which comprises a slightly rounded nose portion at this area by means of which any cover foil present on the tapes can be removed from the tapes.

Said plate-like element with the nose portion may form part of a holder for the storage, transport and feeding of tapes to the feed channels, said holder comprising a frame in which a number of tape reels can be rotatably suspended and which comprises means whereby the holder can be coupled to means of the device, the frame also being constructed to support a number of foil-peeling reels in a resilient manner such that the coupling of the holder to the device places the reels in frictional contact with a drive roller on the device.

Thus, a large number of reels can be simultaneously coupled to the device by means of the holder. The stepping pins then directly engage in the transport holes of the relevant tapes and any cover foils present on the tapes are wound onto the foil-peeling reels.

The time required for replacing the reels is thus minimized.

The invention will be described in detail herein after with reference to the drawings.

Figs. 1a, b, c, d diagrammatically illustrate the steps involved in the feeding and transfer of an element.

Figures 2 and 3 show diagrammatically a multiple device for the positioning of electric and/or electronic elements on a substrate.

Figure 4 is a cross-sectional view of a device for the simultaneous feeding of a plurality of elements to a given position.

Figure 5 shows a part of the device of Figure 4 on an enlarged scale.

Figures 1a, b, c, d illustrate diagrammatically the picking-up of an element by a transfer member. Figure 1a shows how the elements 200, which are accommodated in a package and transport tape 201, are transported in a feed channel 202 to a removal opening 203. During the transport, the upper foil 204 is peeled off the tape. Over the removal opening 203 there is arranged a transfer member 205 which comprises a pin-shaped part 206 which is capable of performing a reciprocating movement. Underneath the tape there is arranged a lifting needle 207 which is situated substantially on the centre line of the removal opening. The movement sequence is such that first the pin-shaped part 206 is lowered until it contacts the element 200 (Figure 1b). Subsequently, the lifting needle 207 moves upwards,

taking with it the element 200 and the pin-shaped part 206 (Figure 1c). Subsequently, the element 200 is held by the transfer member 205 and is ready for further transport and positioning on the substrate. During its upwards movement, the needle 207 can puncture the lower foil 208 of the tape. It is also possible to use a tape whose lower foil is already perforated. Even though the foregoing description concerns the feeding of elements packed in a tape, it is equally possible to supply the elements loosely to the feed channel. Because the feed channel encloses the elements on all sides, their orientation in the channel is exactly defined whether they are in a packed or unpacked condition, and this orientation will be maintained during the entire process.

The reference numeral 1 in Figure 2 denotes a substrate, for example, a printed circuit board, the lower side of which has already been provided with conventional elements 2 whose lead-outs are positioned in holes in the substrate. A large number of further elements which are very small and which do not comprise lead-outs have to be provided on the upper side of the substrate. The dimensions of this kind of element, commonly referred to as a "chip" are of the order of  $3.2 \times 1.6$  mm and they must be very accurately positioned on the substrate at a very small distance from one another.

The substrate 1 is supported by a substrate carrier 3.

The elements to be positioned are packed in tapes 6 which comprises transport holes, the elements being loosely accommodated in openings in the tape, the openings being closed on the lower side by a lower foil and on the upper side by a cover foil.

A number of such tapes is carried on reels 4 in a holder 5. The number of reels present in the holder 5 depends on the circumstances. Thirty-two is the customary number in this respect, the reels then being rotatably mounted in the holder 5 at two levels.

The holder 5 comprises on both sides a projecting plate 100 provided with a hole 101 which is capable of cooperating with a pin 102 on the feed device 7. The holder 5 comprises at the bottom two supports 103 with which the holder bears against the feed device.

The tapes 6 each extend from the respective reel 4 to a device for feeding the tape to a given position. The present embodiment comprises thirty-two of such devices, so that during each cycle thirty-two elements are presented. These elements are removed from the tape by a transfer mechanism 8 which for each removal position, of which there are thirty-two in the present embodiment, comprises essentially a reciprocable arm 9 with a suction tube 10.

Figure 4 is a detailed cross-sectional view of the feed device 7. For each tape 6 the device comprises a feed channel 11, only one of the feed channels being visible.

The bottom of the feed channel 11 is formed by two resilient members 13 and 15. These members

prevent jamming due to small thickness variations of the tape and also enable the device to handle tapes of different thickness.

The bottom member 13 comprises an opening through which a stepping pin 17 can be introduced into the feed channel. The stepping pin 17 is connected through a spring 19 to a first rod 20 which is pressed by a spring (not shown) against a first drive bar 21 which drives all thirty-two first rods.

The stepping pin 17 is pivotably and slidably connected to a stepping lever 23 which on one side of the stepping pin is pivotably connected, at 25, to the frame 27 of the device. On the other side of the stepping pin, at 29, the stepping lever is pivotably connected to a second rod 31 which is pressed by a spring (not shown) against a second drive bar 33 which co-operates with all the second rods of the device.

The resilient bottom member 15 comprises two openings through which a centring pin 25 and an ejector pin 37 can be moved into the feed channel.

The centring pin 35 is rigidly connected to one end of a third rod 39, the other end of which is coupled to a third drive bar 41 which co-operates with all the third rods of the device.

The third rod 39 is pressed by a circular spring 43 against a guide which is formed by two balls 45 and 47 which are supported in the frame of the device.

The third rod 39 is connected to the ejector pin 37 via a weak spring 49.

The channel 11 opens into a waste duct 51 for the empty tapes. The long length of these empty tapes may sometimes cause problems. To mitigate these problems, the device comprises a blade 53 which can be moved across the exit of the channel 11 by a drive 55, thus cutting the empty tapes into small pieces which can readily be discharged from the channel 51.

Part of the upper side of the feed channel 11 is formed by a plate-like nose portion 57 which forms part of the holder 5 for the tapes.

A further part 59 of the upper side of the channel comprises a slit-shaped opening 61 which is bridged by two flat bars 62 and 63 which are arranged one above the other. Each of these bars comprises as many holes as there are removal positions. The bars are slidable with respect to one another so that the holes in the two bars either register with one another and are therefore open or do not register and are consequently closed. When the holes are open, the relevant elements can be removed from the tapes. When the holes are closed, the elements cannot leave their positions, although the holes in the bars are shaped so that at each removal position a small central opening remains through which the respective suction tube can be positioned on the respective element. It is only after the positioning of the suction tube that the hole is further opened, so that the relevant element can be removed.

When the device is put into operation, a tape has to be fed to the feed channel 11; because the device always has a multiple construction, custo-

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marily a 32-fold construction, thirty-two tapes have to be fed simultaneously. This can be done in various ways. In order to permit the rapid replacement of tapes, however, it is advantageous to use a tape holder 5 in which thirty-two reels 4 can be rotatably suspended and which can be coupled to the device via suitable means 100, 101, 102.

The tape holder 5 comprises the nose portion 57 which also forms part of the upper side of each feed channel 11 and over which any cover foil provided on the tape, for example, the cover foil 65, can be peeled off via a slit 67. This is shown on an enlarged scale in Figure 5, which also shows the cover foil 65 being wound onto a reel 69 which is supported on the tape holder by leaf springs 71. The coupling of the tape holder to the feed device brings all the reels 69 into frictional contact with a drive roller 81 which forms part of the feed device 7.

When the tape holder 5 is coupled to the feed device 7, the tapes are situated so far below the nose portion 57 that at least one transport hole is present between the stepping pin 17 and the tip of the nose portion.

The stepping pins are resiliently connected to their rods 20, so that when the tape holder 5 is coupled to the feed device, the pins, which are directed upwards, are pressed down except where by chance a pin encounters a transport hole.

When the machine is started, the rods 31 will be moved downwards by downward movement of the drive bar 33, the stepping levers 23 then pivoting about their respective pivots 25. Consequently, the stepping pins 17 perform a stroke to the right which corresponds to the distance between the centres of the transport holes, which usually amounts to 4 mm.

During this movement, each stepping pin engages in a transport hole and transports the respective tape so that at the end of this stroke all the tapes register and an opening of each tape is situated underneath a removal position.

Subsequently, the centring pins and the ejector pins are simultaneously raised.

The centring pin 35 centres the tape via a transport hole which is situated near the removal position. Subsequently, the ejector pin 37 contacts the lower side of the tape. The ejector pin 37 then briefly stops whilst the drive continues, the spring 49 thus being compressed approximately 2 mm.

The suction tube 10 must have reached the elements from above before that.

The ejector pins 37 then move further upwards, during which movement they first pierce the lower foil or the bottom of the tape. Subsequently, the ejector pins press the relevant elements with the suction tubes resting thereon upwards over a given distance. Subsequently, the rod 39 with the centring pin and the ejector pin is moved downwards again, so that the next cycle may commence.

The driving of the bars 21, 33 and 41 can be effected by means of an electric motor which drives

a shaft with three cam discs.

Each of the cam discs drives one of the bars 21, 33 and 41 which extends underneath all thirty-two feed channels.

Should one of the suction tubes have failed to lift an element for some reason, the transfer mechanism 8 will still attempt to position an element in the relevant position. However, all the suction tubes first complete their stroke, after which only the tape concerned must be shifted one position further in order to present the missing element.

The feed device then again performs a complete stroke during which, however, the stepping movements of all the stepping pins are blocked except the stepping pin associated with the tape with the missing element. This blocking operation is effected by means of an electromagnet 73 which introduces a wedge 75 between an extension 77 of the stepping lever 23 and a stationary part of the device. As a result, the stepping pins 17 of the devices whose stepping levers are blocked will not perform the transport stroke and only the tape associated with the suction tube which missed an element during the previous stroke will be transported.

In order to ensure that elements cannot leave the tapes at the area of the removal positions due to vibrations, shocks or static charging, the removal positions are closed at the upper side by the two bars 62, 63. The bars 62, 63 extend across all thirty-two removal positions and each bar comprises thirty-two holes which are large enough to allow the relevant elements to pass through them. The bars 62, 63 are slidable in the longitudinal direction. In the open condition the holes in the two bars register with one another over the relevant elements, so that the elements can be removed from the tapes. In the closed condition, the holes are not completely closed; in each case a small opening remains in the centre through which the respective suction tube can still pass. The holes are fully opened only when the suction tubes bear on the elements.

Instead of the described construction a cover plate can be used which comprises a number of cut-outs which are open at one side and through which the suction tube can be pressed against an element, after which the plate can be moved to one side in order fully to open the removal opening.

The bottom members 13 and 15 are resilient in order to ensure that tapes having a variety of thicknesses can be accurately located, so that elements cannot escape from the tape.

The dimension of a single feed channel in the transverse direction is very small, namely only approximately 10 mm.

## Claims

1. A method of feeding electric and/or electronic elements packed in tapes to given positions and for transferring the elements from these positions by means of transfer members each comprising a

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marily a 32-fold construction, thirty-two tapes have to be fed simultaneously. This can be done in various ways. In order to permit the rapid replacement of tapes, however, it is advantageous to use a tape holder 5 in which thirty-two reels 4 can be rotatably suspended and which can be coupled to the device via suitable means 100, 101, 102.

The tape holder 5 comprises the nose portion 57 which also forms part of the upper side of each feed channel 11 and over which any cover foil provided on the tape, for example, the cover foil 65, can be peeled off via a slit 67. This is shown on an enlarged scale in Figure 5, which also shows the cover foil 65 being wound onto a reel 69 which is supported on the tape holder by leaf springs 71. The coupling of the tape holder to the feed device brings all the reels 69 into frictional contact with a drive roller 81 which forms part of the feed device 7.

When the tape holder 5 is coupled to the feed device 7, the tapes are situated so far below the nose portion 57 that at least one transport hole is present between the stepping pin 17 and the tip of the nose portion.

The stepping pins are resiliently connected to their rods 20, so that when the tape holder 5 is coupled to the feed device, the pins, which are directed upwards, are pressed down except where by chance a pin encounters a transport hole.

When the machine is started, the rods 31 will be moved downwards by downward movement of the drive bar 33, the stepping levers 23 then pivoting about their respective pivots 25. Consequently, the stepping pins 17 perform a stroke to the right which corresponds to the distance between the centres of the transport holes, which usually amounts to 4 mm.

During this movement, each stepping pin engages in a transport hole and transports the respective tape so that at the end of this stroke all the tapes register and an opening of each tape is situated underneath a removal position.

Subsequently, the centring pins and the ejector pins are simultaneously raised.

The centring pin 35 centres the tape via a transport hole which is situated near the removal position. Subsequently, the ejector pin 37 contacts the lower side of the tape. The ejector pin 37 then briefly stops whilst the drive continues, the spring 49 thus being compressed approximately 2 mm.

The suction tube 10 must have reached the elements from above before that.

The ejector pins 37 then move further upwards, during which movement they first pierce the lower foil or the bottom of the tape. Subsequently, the ejector pins press the relevant elements with the suction tubes resting thereon upwards over a given distance. Subsequently, the rod 39 with the centring pin and the ejector pin is moved downwards again, so that the next cycle may commence.

The driving of the bars 21, 33 and 41 can be effected by means of an electric motor which drives

a shaft with three cam discs.

Each of the cam discs drives one of the bars 21, 33 and 41 which extends underneath all thirty-two feed channels.

Should one of the suction tubes have failed to lift an element for some reason, the transfer mechanism 8 will still attempt to position an element in the relevant position. However, all the suction tubes first complete their stroke, after which only the tape concerned must be shifted one position further in order to present the missing element.

The feed device then again performs a complete stroke during which, however, the stepping movements of all the stepping pins are blocked except the stepping pin associated with the tape with the missing element. This blocking operation is effected by means of an electromagnet 73 which introduces a wedge 75 between an extension 77 of the stepping lever 23 and a stationary part of the device. As a result, the stepping pins 17 of the devices whose stepping levers are blocked will not perform the transport stroke and only the tape associated with the suction tube which missed an element during the previous stroke will be transported.

In order to ensure that elements cannot leave the tapes at the area of the removal positions due to vibrations, shocks or static charging, the removal positions are closed at the upper side by the two bars 62, 63. The bars 62, 63 extend across all thirty-two removal positions and each bar comprises thirty-two holes which are large enough to allow the relevant elements to pass through them. The bars 62, 63 are slidable in the longitudinal direction. In the open condition the holes in the two bars register with one another over the relevant elements, so that the elements can be removed from the tapes. In the closed condition, the holes are not completely closed; in each case a small opening remains in the centre through which the respective suction tube can still pass. The holes are fully opened only when the suction tubes bear on the elements.

Instead of the described construction a cover plate can be used which comprises a number of cut-outs which are open at one side and through which the suction tube can be pressed against an element, after which the plate can be moved to one side in order fully to open the removal opening.

The bottom members 13 and 15 are resilient in order to ensure that tapes having a variety of thicknesses can be accurately located, so that elements cannot escape from the tape.

The dimension of a single feed channel in the transverse direction is very small, namely only approximately 10 mm.

## Claims

1. A method of feeding electric and/or electronic elements packed in tapes to given positions and for transferring the elements from these positions by means of transfer members each comprising a



tube-shaped part which is moved until it contacts one side of the relevant element during removal, after which the relevant element is pressed out of the relevant position while being held between the tube-shaped part and a lifting pin which acts on the other side of the element, after which the element is held by the transfer member, the elements being fed one after the other to each of the positions along feed paths, characterized in that the elements are intermittently fed to the given positions along feed channels which enclose the relevant elements on all sides except in the transport direction, each of the channels comprising a removal opening at the area of the respective position and each of the removal openings being partly closed by a movable closure member which is moved to open the opening fully only after the respective tube-shaped part has contacted the element.

2. A method as claimed in Claim 1, in which each of the tube-shaped part is constructed as a suction tube, characterized in that the suction tube is first used without vacuum and, the vacuum being created only after the relevant element has been pressed out of its position in the respective feed channel.

3. A device for performing the method claimed in Claim 1, comprising means for feeding electric and/or electronic elements packed in tapes to first given positions and transfer members for transferring the elements from these first positions to a second position on a substrate said transfer members each comprising a tube-shaped part, the device further comprising a lifting pin situated underneath the tape for removing the element from the said first positions, characterized in that the device comprises feed channels (202, 11) in which the elements (200) in their tapes can be transported so that they are enclosed on all sides, a removal opening (61) being provided at the end of each channel, the device furthermore comprising for each channel one of the transfer members (205, 206; 10) each of which is situated opposite the relevant removal opening (103, 61) at said first position, said lifting pin (207; 37) being provided for each feed channel and being situated approximately on the centre line of the respective removal openings (103, 61), each of the removal openings being partly closed by means of a movable closure member (62, 63) which fully opens the respective removal opening only when the respective tube-shaped part (205, 206; 10) bears on the relevant element.

4. A device as claimed in Claim 3, characterized in that the closure member is formed by a plate-shaped part which bridges all the removal openings (61) and which comprises for each opening a slit-shaped cut-out through which the relevant tube-shaped part can be brought into contact with the relevant element.

5. A device as claimed in any of Claims 3 or 4, characterized in that the bottom of each of the feed channels (11) is resilient (13, 15).

6. A device as claimed in any of Claims 3 or 5, characterized in that the device comprises a

number of parallel feed channels (11) and a number of stepping pins (17) which are arranged adjacent one another and each of which is movable into and out of a respective one of the channels (11) in a reciprocating manner and, when projecting into a channel, is displaceable in the longitudinal direction of the channel (11) over a distance corresponding to the centre-to-centre distance between the openings in the tapes (6), the device furthermore comprising a corresponding number of centring pins (35) each of which is arranged behind a corresponding one of the stepping pins (17) in the direction of transport of the tapes and is movable into and out of the respective feed channel (11) in a reciprocating manner after completion of the transport stroke of the respective stepping pin.

7. A device as claimed in Claim 6, characterized in that each of the stepping pins (17) is resiliently connected to an associated first reciprocable rod (20) for movement therewith in a direction extending transversely of the feed channel (11), the ends of all the first rods (20) which are remote from the stepping pins (17) bearing against a first drive member (21), and each of the stepping pins (17) being pivotably connected to an associated transport lever (23) which extends to the front and rear sides of the relevant stepping pin with respect to the direction of movement of the tapes and which is pivotably connected (25) on one side of the pin to a fixed part (27) of the device and on the other side to one end of an associated second reciprocable rod (31), the other ends of all the second rods bearing against a second drive member (33).

8. A device as claimed in Claim 7, characterized in that for each transport lever (23) there is provided a locking device (75) which can be operated to block the movement of the relevant lever when no tape transport is desired.

9. A device as claimed in Claim 6, 7 or 8, characterized in that in addition to each first (20) and second rod (31) there is provided a third reciprocable rod (39), one end of which supports a centring pin (35) and the other end of which bears against a third drive member (41), each of the third rods (39) being resiliently pressed against a guide which is preferably formed by two balls (45, 47) which are accommodated in a fixed part of the device at a distance from one another.

10. A device as claimed in any of Claims 3 to 9, characterized in that the portions of the upper sides of the feed channels which are situated at the entrances of the channels are formed by a plate-like element (57) which extends substantially as far as the area of the upper sides of the channels (11) at which the openings (61) for the removal of the elements are situated, and which comprises a slightly rounded nose portion (67) at this area by means of which any cover foil (65) present on the tapes can be removed from the tapes.

11. A device as claimed in Claim 10, characterized in that said plate-like element (57) with the nose portion (67) forms part of a holder (5) for the



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storage, transport and feeding of tapes to the feed channels (11), said holder comprising a frame in which a number of tape reels (4) can be rotatably suspended and which comprises means (100, 102, 103) whereby the holder can be coupled to the feed device (7), the frame also being constructed to support a number of foil-peeling reels (69) in a resilient manner (71) such that the coupling of the holder (5) to the device (7) places the reels in frictional contact with a drive roller (81) on the device.

#### Revendications

1. Procédé pour amener des éléments électriques et/ou électroniques emballés dans des bandes à des positions données et pour transmettre les éléments à partir de ces positions à l'aide d'organes de transmission comportant chacun une partie en forme de tube, qui est déplacée jusqu'à ce qu'il entre en contact avec un côté de l'élément en question pendant le déplacement, après quoi l'élément en question est sorti par pression de sa position en question tout, en étant maintenu entre la partie en forme de tube et une broche de levage, qui agit sur l'autre côté de l'élément, après quoi l'élément est maintenu par un organe de transmission, les éléments étant amenés l'un après l'autre à chacune des positions le long de trajets d'amenée, caractérisé en ce que les éléments sont amenés par intermittence aux positions données suivant des canaux d'amenée qui entourent les éléments en question de tous côtés à l'exception de la direction de transport, chacun des canaux présentant un orifice d'enlèvement à l'endroit de la position respective et chacun des orifices d'enlèvement étant partiellement fermée par un organe de fermeture mobile, qui est déplacé pour n'ouvrir l'ouverture complètement qu'après que la partie en forme de tube respective est entrée en contact avec l'élément.

2. Procédé selon la revendication 1, dans lequel chaque partie en forme de tube est réalisée comme tube d'aspiration, caractérisé en ce que le tube d'aspiration est alors utilisé sans vide, le vide n'étant créé qu'après que l'élément en question n'a sorti par pressage sa position dans le canal d'amenée respectif.

3. Dispositif permettant la mise en oeuvre du procédé selon la revendication 1, comportant des moyens pour l'amenée d'éléments électriques et/ou électroniques emballés en bandes à des premières positions données et des organes de reprise pour reprendre les éléments à partir de ces premières positions vers une seconde position sur un substrat, lesdits organes de reprise comportant chacun une partie en forme de tube, le dispositif comportant davantage une broche de levage située au-dessous de la bande pour déplacer les éléments desdites premières positions, caractérisé en ce que le dispositif comporte des canaux d'amenée (202, 11), dans lesquels les éléments (200) peuvent être transportés dans leurs bandes de façon à être entourés de tous côtés, un orifice d'enlèvement (61) étant appliqué à la fin de

chaque canal, le dispositif comportant en outre pour chaque canal l'un des organes de reprise (205, 206; 10), dont chacun est situé vis-à-vis de l'orifice d'enlèvement en question (103, 61) dans ladite première position, ladite broche de levage (207, 37) étant appliquée pour chaque canal d'amenée et étant située environ sur l'axe de l'orifice d'enlèvement (103, 63) chacun des orifices d'enlèvement étant partiellement fermé à l'aide d'un organe de fermeture mobile (62, 63) qui n'ouvre l'ouverture d'enlèvement respectivement complètement que lorsque la partie en forme de broche respective s'applique contre l'élément en question.

4. Dispositif selon la revendication 3, caractérisé en ce que l'organe de fermeture est fermé par une partie en forme de plaque qui enjambe tous les orifices d'enlèvement (61) et qui comporte pour chaque orifice un évidement en forme de fente par lequel la partie en forme de tube en question peut être portée en contact avec l'élément en question.

5. Dispositif selon l'une des revendications 3 ou 4, caractérisé en ce que le fond de chacun des canaux d'amenée 11 est élastique (13, 15).

6. Dispositif selon l'une des revendications 3 ou 5, caractérisé en ce que l'invention comporte plusieurs canaux d'amenée parallèles (11) et plusieurs broches de déplacement (17) qui sont disposées, l'une à côté de l'autre, et dont chacune peut être déplacée de façon à entrer dans et sortir de l'un des canaux (11) d'une façon réciproque et qui, dans le cas d'introduction dans le canal, peut être déplacée dans la direction longitudinale du canal (11) sur une distance correspondant à la distance centre à centre comprise entre les ouvertures dans les bandes, le dispositif comportant en outre les ouvertures dans les bandes (6), le dispositif comportant en outre un nombre correspondant de broches de centrage (35), dont chacune est disposée derrière une broche correspondante des broches de déplacement (17) dans la direction de transport des bandes et peut être déplacée de façon à entrer dans et à sortir du canal d'amenée respectif (11) d'une façon réciproque après que les broches de déplacement ont effectué leur course de transport.

7. Dispositif selon la revendication 6, caractérisé en ce que chacune des broches de déplacement (17) est connectée élastiquement à une première tige correspondante (2) animée de mouvements de montée et de descente pour le déplacement dans une direction s'étendant transversalement au canal d'amenée (11), les extrémités de toutes les premières tiges (20) opposées aux broches de déplacement (17) s'appliquant contre un organe d'entraînement (21) et chacune des broches de déplacement (17) étant reliée de façon à pouvoir pivoter à un levier de transport correspondant (23) qui s'étend aux faces avant et arrière de la broche de déplacement en question par rapport à la direction de déplacement des bandes et qui est relié, de façon à pouvoir pivoter, (25) d'un côté de la broche à une partie fixe (27) du dispositif et de l'autre côté, à une extrémité d'une seconde tige correspondante (31) animée



de mouvements de montée et de descente, les autres extrémités de toutes les secondes tiges s'appliquant contre un autre organe d'entraînement (33).

8. Dispositif selon la revendication 7, caractérisé en ce que pour chaque levier de transport (23) est prévu un dispositif de verrouillage (75), qui peut être manoeuvré pour arrêter les mouvements du levier en question dans le cas où aucun transport n'est désiré.

9. Dispositif selon la revendication 6 ou 8, caractérisé en ce qu'outre chaque première (20) et seconde tige (31) est prévue une troisième tige (39) animée de mouvements de montée et de descente, dont une extrémité supporte une broche de centrage (35) et dont l'autre extrémité s'applique contre un troisième organe d'entraînement (41), chaque troisième tige (39) étant pressée élastiquement contre un guide qui est de préférence formé par deux boules (45, 47), qui sont logées dans une partie fixe du dispositif à quelque distance l'une de l'autre.

10. Dispositif selon l'une des revendications 3 à 9, caractérisé en ce que les parties des faces supérieures des canaux d'amenée situées aux entrées des canaux sont formées par un élément en forme de plaque (57), qui s'étend pratiquement jusqu'à la région des faces supérieures des canaux (11) dans laquelle se situent les orifices (61) pour l'enlèvement des éléments et qui comportent une partie en forme de nez légèrement arrondie (67) dans cette région à l'aide de laquelle une feuille de recouvrement (65) présente sur les bandes peut être enlevée des bandes.

11. Dispositif selon la revendication 10, caractérisé en ce que ledit élément en forme de plaque (57) avec la partie en forme de nez (67) fait partie d'un support (5) pour le stockage, le transport et l'amenée des bandes aux canaux d'amenée (11), ledit support comportant un châssis dans lequel peuvent être suspendus, de façon à pouvoir tourner, plusieurs treuils de bande (4) et qui comporte des moyens (100, 102, 103) permettant d'accoupler le support au dispositif d'amenée (7), le châssis étant réalisé de façon à supporter plusieurs treuils de pelage de feuille (69) d'une façon élastique (71) de façon que l'accouplement du support (5) au dispositif (7) mette les treuils en contact de frottement avec un rouleau d'entraînement (81) sur le dispositif.

#### Patentansprüche

1. Verfahren zum Zuführen elektrischer und/oder elektronischer Elemente, die zu Streifen verpackt sind, zu bestimmten Positionen und zum Übertragen der Elemente aus diesen Positionen durch Übertragungselemente, die je einen rohrförmigen Teil aufweisen, der bewegt wird bis dieser Teil eine Seite des betreffenden Elementes während der Entfernung kontaktiert, wonach das betreffende Element aus der betreffenden Position wird, während es zwischen dem rohrförmigen Teil und einem Hebestift festgehalten wird, der aus der anderen Seite des Elementes

einwirkt, wonach das Element durch das Übertragungselement festgehalten wird, wobei die Elemente nacheinander zu jeder der Positionen längs Zuführungsbahnen geführt werden, dadurch gekennzeichnet, dass die Elemente über Zuführungskanäle intermittierend den bestimmten Positionen zugeführt werden, wobei diese Kanäle die betreffenden Elementen allseitig, mit Ausnahme in der Transportrichtung, einschliessen, wobei jeder der Kanäle eine entfernungsöffnung im Bereich der betreffenden Position hat und jede der Entfernungsöffnungen durch ein bewegliches Schliesselement teilweise abgeschlossen ist, wobei dieses Schliesselement bewegt wird um Öffnung völlig nur nachdem der betreffenden rohrförmige Teil das Element kontaktiert hat.

2. Verfahren nach Anspruch 1, wobei jeder der rohrförmigen Teile als Saugrohr ausgebildet ist, dadurch gekennzeichnet, dass das Saugrohr zunächst ohne Vakuum verwendet wird und das Vakuum nur nachdem das betreffende Element aus der Position in den betreffenden Zuführungskanal gedrückt ist, hervorgerufen wird.

3. Vorrichtung zum Durchführen des Verfahrens nach Anspruch 1 mit Mitteln zum Zuführen elektrischer und/oder elektronischer Elemente, die zu Streifen verpackt sind zu ersten bestimmten Positionen und mit Übertragungsmitteln zum Übertragen der Elemente aus diesen ersten Positionen in eine zweite Position auf einem Träger, wobei die genannten Übertragungselemente je einen rohrförmigen Teil aufweisen, wobei die Vorrichtung weiterhin einen Hebestift aufweist, der unterhalb des Streifens liegt zum Entfernen der Elemente aus den genannten ersten Positionen, dadurch gekennzeichnet, dass die Vorrichtung Zuführungskanäle (202, 11) aufweist, in denen die Elemente (200) in ihren Streifen derart transportiert werden können, dass sie allseitig eingeschlossen sind, wobei eine Entfernungsöffnung (61) am Ende jedes Kanals vorgesehen ist, wobei die Vorrichtung weiterhin für jeden Kanal eines der Übertragungselemente (205, 206; 10) aufweist, von denen jedes gegenüber der betreffenden Entfernungsöffnung (103, 61) bei der genannten ersten Position liegt, wobei der genannte Hebestift (207; 37) für jeden Zuführungskanal vorgesehen ist und in der Nähe der Mittellinie der betreffenden Entfernungsöffnung (103, 61) liegt, wobei jede der Entfernungsöffnungen mittels eines beweglichen Schliesselementes (62, 63) teilweise geschlossen ist, wobei dieses Schliesselement die betreffende Entfernungsöffnung völlig öffnet und zwar nur, wenn der betreffende rohrförmige Teil (205, 206; 10) an dem betreffenden Element anliegt.

4. Vorrichtung nach Anspruch 3, dadurch gekennzeichnet, dass das Schliesselement durch einen plattenförmigen Teil gebildet wird, der alle Entfernungsöffnungen (61) überbrückt und der für jede Öffnung eine schlitzförmige Teil mit den betreffenden Element in Kontakt gebracht werden kann.

5. Vorrichtung nach einem der Ansprüche 3 oder 4, dadurch gekennzeichnet, dass der Boden



jedes der Zuführungskanäle (11) federnd (13, 15) ausgebildet ist.

6. Vorrichtung nach einem der Ansprüche 3 oder 5, dadurch gekennzeichnet, dass die Vorrichtung eine Anzahl paralleler Zuführungskanäle (11) und eine Anzahl Aufsetztstife (17) aufweist, die nebeneinander angeordnet sind und die je in und aus den betreffenden Kanälen (11) in einer hin- und hergehenden Bewegung beweglich sind und wenn sie sich in dem betreffenden Kanal befinden über einen Abstand entsprechend dem Mittenabstand zwischen den Öffnungen in den Streifen (6) in der Längsrichtung des Kanals (11) verschiebbar sind, wobei die Vorrichtung weiterhin eine entsprechende Anzahl Zentrierstifte (35) aufweist, die je hinter einem betreffenden Aufsetztstift (17) in der Transportrichtung der Streifen vorgesehen sind und in sowie aus dem betreffenden Zuführungskanal (11) mit einer hin- und hergehenden Bewegung beweglich sind und zwar nach Vollendung des Transporthubes des betreffenden Aufsetztstiftes.

7. Vorrichtung nach Anspruch 6, dadurch gekennzeichnet, dass jeder der Aufsetztstifte (17) federn mit einer zugeordneten ersten hin- und hergehenden Stange (20) zum Bewegen mit demselben in einer Richtung quer zu dem Zuführungskanal (11) verbunden ist, wobei die Enden all dieser ersten Stangen (20), die in einem Abstand von den Aufsetztstiften (17) liegen, an einem ersten Antriebselement (21) anliegen und jeder der Aufsetztstifte (17) mit einem zugeordneten Transporthebel (23) drehbar verbunden ist, wobei dieser Hebel sich zu der Vorderseite und der Rückseite des betreffenden Aufsetztstiftes in bezug auf der Bewegungsrichtung der Streifen erstreckt und der auf einer Seite des Stiftes mit einem ortsfesten Teil (27) der Vorrichtung drehbar verbunden ist und auf der anderen Seite mit einem Ende einer zugeordneten zweiten hin- und herbeweglichen Stange (31), wobei die anderen Enden all dieser zweiten Stange an einem zweiten Antriebselement (33) anliegen.

8. Vorrichtung nach Anspruch 7, dadurch ge-

kennzeichnet, dass für jeden Transporthebel (23) eine Verriegelungsvorrichtung (75) vorgesehen ist, welche die Bewegung des betreffenden Hebels blockieren kann, wenn kein Streifentransport gewünscht ist.

9. Vorrichtung nach Anspruch 6, 7 oder 8 dadurch gekennzeichnet, dass es ausser jeder ersten (20) und zweiten Stange (31) eine dritte hin- und hergehende Stange (39) gibt, wobei ein Ende dieser Stange einen Zentrierstift (35) aufweist und das andere Ende an einem dritten Antriebselement (41) anliegt, wobei jede der dritten Stange (39) federn gegen eine Führung gedrückt ist, die vorzugsweise durch zwei Kugeln (45, 47) gebildet ist, die in einem ortsfesten Teil der Vorrichtung in einem Abstand voneinander liegen.

10. Vorrichtung nach einem der Ansprüche 3 bis 9 dadurch gekennzeichnet, dass die Teile der oberen Seiten der Führungskanäle, die an den Eingängen der Kanäle liegen, durch ein plattenförmiges Element (57) gebildet sind, das sich im wesentlichen entsprechend dem Gebiet der oberen Seiten der Kanäle (11), wo die Öffnungen (61) zum Entfernen der Elementen liegen, erstreckt und das einen einergemassen abgerundeten Nasenteil (67) in diesem Gebiet aufweist, durch den eine etwaige Abdeckfolie (65) auf den Streifen von diesen Streifen entfernt werden kann.

11. Vorrichtung nach Anspruch 10, dadurch gekennzeichnet, dass das genannte plattenförmige Element (57) mit dem Nasenteil (67) einen Teil einer Halterung (5) bildet zum Speichern, Transportieren und Zuführen von Streifen zu den Zuführungskanälen (11), wobei die genannte Halterung einen Rahmen aufweist, in dem eine Anzahl Streifenspulen (4) drehend aufgehängt sein kann und Mittel aufweist (100, 102, 103), durch welche die Halterung mit der Zuführungsvorrichtung (7) gekuppelt werden kann, wobei der Rahmen ebenfalls eine Anzahl Folienschälspulen (69) auf federn Weise (71) trägt und zwar derart, dass die Kupplung der Halterung (5) mit der Vorrichtung (7) die Spulen mit einer Antriebsrolle (81) auf der Vorrichtung in einen Reibenkontakt bringt.

