

Title of Invention - PROCESSING EQUIPMENT

FIELD

[0001] The disclosure relates to processing equipment, and more
5 particularly to processing equipment with a conveying function.

BACKGROUND

[0002] Conventional processing equipment includes a plurality of
workstations and a conveyor device. The conveyor device is adapted for conveying
a workpiece along a processing path that passes through the workstations, so that
10 the workpiece is processed by the workstations as it passes therethrough.

[0003] Configurations of the workstations are determined by a
manufacturing process of the workpiece, and cannot be adjusted. As a result, the
conventional processing equipment can only process a single type of workpiece
with a specific manufacturing process; in other words, the conventional processing
15 equipment is unable to conduct other manufacturing processes to process other
types of workpieces. Hence, the conventional processing equipment is unable to
conduct small-quantity productions that involve various types of workpieces.

SUMMARY

[0004] Therefore, an object of the disclosure is to provide a processing equipment that can alleviate at least one of the drawbacks of the prior art.

[0005] According to the disclosure, the processing equipment is adapted for processing at least one workpiece. The processing equipment includes a plurality of workstations and a conveyor device. The plurality of workstations have different functions, and are adapted for processing the at least one workpiece. The conveyor device has a first conveyor route and a second conveyor route. The first conveyor route passes through at least a portion of the plurality of workstations. The second conveyor route passes through at least a portion of the plurality of workstations partially different from the at least a portion of the plurality of workstations through which the first conveyor route passes. The conveyor device is adapted for conveying the at least one workpiece along a selected one of the first conveyor route and the second conveyor route.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Other features and advantages of the disclosure will become apparent in the following detailed description of the embodiment(s) with reference to the accompanying drawings. It is noted that various features may not be drawn to scale.

[0007] Figure 1 is a perspective view illustrating a first embodiment of a processing equipment according to the disclosure.

[0008] Figure 2 is a top view of the first embodiment, illustrating a positional relationship between a frame, a plurality of workstations, and a conveyor device.

[0009] Figure 3 is a fragmentary top view of the first embodiment, which omits the workstations.

[0010] Figure 4 is a fragmentary sectional view of the first embodiment taken along line IV-IV in Figure 3.

10 [0011] Figure 5 is a fragmentary side view of the first embodiment.

[0012] Figure 6 is another fragmentary top view of the first embodiment.

[0013] Figure 7 is still another fragmentary top view of the first embodiment.

[0014] Figure 8 is another top view of the first embodiment, illustrating the conveyor device conveying a workpiece along a first conveyor route.

15 [0015] Figure 9 is similar to Figure 8, but illustrates the conveyor device conveying a workpiece along a second conveyor route.

[0016] Figure 10 is a schematic top view of a second embodiment of the processing equipment according to the disclosure.

DETAILED DESCRIPTION

[0017] Before the disclosure is described in greater detail, it should be noted that where considered appropriate, reference numerals or terminal portions of reference numerals have been repeated among the figures to indicate
5 corresponding or analogous elements, which may optionally have similar characteristics.

[0018] It should be noted herein that for clarity of description, spatially relative terms such as “top,” “bottom,” “upper,” “lower,” “on,” “above,” “over,” “downwardly,” “upwardly” and the like may be used throughout the disclosure while
10 making reference to the features as illustrated in the drawings. The features may be oriented differently (e.g., rotated 90 degrees or at other orientations) and the spatially relative terms used herein may be interpreted accordingly.

[0019] Referring to Figures 1 and 2, a first embodiment of a processing equipment 100 according to the disclosure is adapted for processing at least one
15 workpiece 10. The processing equipment 100 includes a frame 1, a plurality of workstations 21-26, and a conveyor device 3.

[0020] Referring to Figure 1, it should be noted that, in the following description, a first horizontal direction (X) is a front-rear direction, a second

horizontal direction (Y) perpendicular to the first horizontal direction (X) is a left-right direction, and a height direction (Z) perpendicular to the first horizontal direction (X) and the second horizontal direction (Y) is a top-bottom direction.

[0021] The workstations 21-26 are disposed on a top surface of the frame 1, have different functions, and are adapted for processing the at least one workpiece 10. The conveyor device 3 is disposed on the top surface of the frame 1, and has a first conveyor route (P1) (see Figure 8) and a second conveyor route (P2) (see Figure 9). The first conveyor route (P1) passes through at least a portion of the workstations 21-26, and the second conveyor route (P2) passes through at least a portion of the workstations 21-26 partially different from the at least a portion of the workstations 21-26 through which the first conveyor route (P1) passes. The conveyor device 3 is adapted for conveying the at least one workpiece 10 along a selected one of the first conveyor route (P1) and the second conveyor route (P2).

[0022] Through the first conveyor route (P1) and the second conveyor route (P2), the processing equipment 100 can process the at least one workpiece 10 through two different manufacturing processes. Specifically, after choosing one of the first conveyor route (P1) and the second conveyor route (P2) according to

manufacturing requirements of the at least one workpiece 10, the conveyer device 3 conveys the at least one workpiece 10 along the chosen conveyor route, so that the at least one workpiece 10 is processed by the workstations 21-26 through which the chosen conveyor route passes. Hence, the processing equipment 100 can process workpieces with different manufacturing requirements, thereby achieving small-quantity production that involves workpieces with various manufacturing requirements.

[0023] Referring to Figures 2 and 3, the frame 1 has a front end 11 and a rear end 12. The front end 11 is spaced apart from the rear end 12 in the first horizontal direction (X). In this embodiment, a number of the workstations 21-26 is six, but may be changed in other embodiments as needed. The workstations 21-26 include a first workstation 21, a second workstation 22, a third workstation 23, a fourth workstation 24, a fifth workstation 25 and a sixth workstation 26. The conveyor device 3 is adapted to be electrically connected to an electronic control device (not shown). The conveyor device 3 includes at least one carrier rack 4, a plurality of first transfer mechanisms 5, and a plurality of second transfer mechanisms 6. The at least one carrier rack 4 includes a plurality of carrier racks 4. Each of the carrier racks 4 is adapted for receiving different kinds of workpieces.

In this embodiment, the plurality of carrier racks 4 include two carrier racks 4, and the at least one workpiece 10 includes two different kinds of workpieces 10, 10'. It should be noted that, the numbers of the carrier racks 4 and the workpieces 10, 10' may be changed as needed in other embodiments, and may be numbers other than

5 two. The first transfer mechanisms 5 are spaced apart from each other in the second horizontal direction (Y), and cooperatively pass through each of the workstations 21-26. Each of the first transfer mechanisms 5 has a transfer axis that extends in the first horizontal direction (X), and is operable for conveying the carrier racks 4 along the transfer axis so that the workpieces 10, 10' received by the carrier

10 racks 4 can be conveyed to the workstations 21-26 for processing. In this embodiment, the first transfer mechanisms 5 includes two first transfer mechanisms 5, but in other embodiments, the number of the first transfer mechanisms 5 may be a number greater than two, and may be changed as needed.

The second transfer mechanisms 6 are spaced apart from each other in the first

15 horizontal direction (X) and disposed between the first transfer mechanisms 5. Each of the second transfer mechanisms 6 has a lengthwise axis extending in the first horizontal direction (X), and a widthwise axis extending in the second horizontal direction (Y). Each of the plurality of second transfer mechanisms 6 is

operable for conveying the carrier racks 4 along the lengthwise axis and the widthwise axis between the first transfer mechanisms 5. In this embodiment, the plurality of second transfer mechanisms 6 include three second transfer mechanisms 6. It should be noted that, the number of the second transfer mechanisms 6 can be changed as needed in other embodiments, and may be a number other than three.

[0024] Specifically, each of the first transfer mechanisms 5 includes two conveyor assemblies 51 that are spaced apart from each other in the first horizontal direction (X). For each of the first transfer mechanisms 5, each of the conveyor assemblies 51 extends along the transfer axis and through at least one of the workstations 21-26, and is operable for driving the carrier racks 4 to move along the transfer axis. It should be noted that, in other embodiments, a number of the conveyor assemblies 51 may be changed as needed, and may be a number greater than two. For each of the first transfer mechanisms 5, a length of one of the conveyor assemblies 51 in the first horizontal direction (X) is longer than a length of another one of the conveyor assemblies 51 in the first horizontal direction (X). For one of the first transfer mechanisms 5, the one of the conveyor assemblies 51 extends through the first workstation 21 and the second workstation 22, and the

another one of the conveyor assemblies 51 extends through the third workstation 23. For another one of the first transfer mechanisms 5, the one of the conveyor assemblies 51 extends through the fifth workstation 25 and the sixth workstation 26, and the another one of the conveyor assemblies 51 extends through the fourth workstation 24.

[0025] Referring to Figures 3 to 5, each of the conveyor assemblies 51 includes a first base seat 511, a first stator 512, and a first guide rail 513. The first base seat 511 is disposed on the top surface of the frame 1. The first stator 512 is disposed on the first base seat 511, and extends in the first horizontal direction (X). The first guide rail 513 is disposed on the first base seat 511, extends in the first horizontal direction (X), and is spaced apart from the first stator 512 in the second horizontal direction (Y). Each of the carrier racks 4 includes two rack bodies 41, a load plate 42, a plurality of sliders 43, and two rotors 44. In this embodiment, the sliders 43 include two sliders 43. The rack bodies 41 are spaced apart from each other in the first horizontal direction (X) and are engageable with the first stator 512 of each of the conveyor assemblies 51. The load plate 42 is disposed on top ends of the rack bodies 41, and is adapted to receive the workpieces 10,10'. The sliders 43 are respectively disposed on bottom ends of the rack bodies 41, are

opposite to the load plate 42, and are slidably engageable with the first guide rails 513 of the conveyor assemblies 51. For each of the conveyor assemblies 51, the first stator 512 is engageable with the rotors 44 to form a first linear motor operable for driving the carrier racks 4 to move along the transfer axis. By virtue of the configurations of the sliders 43 and the first guide rails 513, the carrier racks 4 are limited to move along the transfer axis of each of the first transfer mechanisms 5, and movement of the carrier racks 4 is smoother.

[0026] One of the second transfer mechanisms 6 is disposed between the conveyor assemblies 51 of each of the first transfer mechanisms 5. Another one of the second transfer mechanisms 6 is disposed at a side of the first transfer mechanisms 5 that is proximate to the front end 11 and spaced apart from the one of the second transfer mechanisms 6 in the first horizontal direction (X). A remaining one of the second transfer mechanisms 6 is disposed at another side of the first transfer mechanisms 5 that is proximate to the rear end 12 and opposite to the another one of the second transfer mechanisms 6. Each of the second transfer mechanisms 6 includes a linear motor 61 extending along the widthwise axis, and a transfer assembly 62 extending along the lengthwise axis. For each of the second transfer mechanisms 6, the linear motor 61 is disposed on the top

surface of the frame 1, is connected to the transfer assembly 62, and is operable for moving the transfer assembly 62 along the widthwise axis. A structure of each of the transfer assemblies 62 is similar to a structure of each of the conveyor assemblies 51. For each of the second transfer mechanisms 6, the transfer assembly 62 is operable for moving the carrier racks 4 along the lengthwise axis.

The transfer assembly 62 of each of the second transfer mechanisms 6 includes a second base seat 621, a second stator 622, and a second guide rail 623. The second base seat 621 is disposed on the linear motor 61. The second stator 622 is disposed on the second base seat 621, and extends in the first horizontal direction (X). The second guide rail 623 is disposed on the second base seat 621, extends in the first horizontal direction (X), and is spaced apart from the second stator 622 in the second horizontal direction (Y). The rack bodies 41 are engageable with the second stators 622 of the transfer assemblies 62. The sliders 43 are slidably engageable with the second guide rails 623 of the transfer assemblies 62. For each of the transfer assemblies 62, the second stator 622 is engageable with the rotors 44 to form a second linear motor operable for driving the carrier racks 4 to move along the lengthwise axis. By virtue of the engagement between the sliders 43 and the second guide rails 623, the carrier racks 4 are

limited to move along the lengthwise axis of each of the second transfer mechanisms 6, and movement of the carrier racks 4 are smoother.

[0027] Referring to Figures 5 to 7, the linear motor 61 of each of the second transfer mechanisms 6 is operable for moving the transfer assembly 62 along the widthwise axis to a transferring position where the lengthwise axis of the second transfer mechanism 6 is aligned with the transfer axis of one of the first transfer mechanisms 5 (see Figures 6 and 7), thereby allowing operation of the transfer assembly 62 to move the carrier racks 4 to one of the conveyor assemblies 51 of the one of the first transfer mechanisms 5, or allowing the transfer assembly 62 to receive the carrier racks 4 from one of the conveyor assemblies 51 of the one of the first transfer mechanisms 5.

[0028] Referring to Figure 3, the linear motor 61 of the another one of the second transfer mechanisms 6 is operable for moving the transfer assembly 62 along the widthwise axis to a loading position where the carrier racks 4 are adapted to be proximate to a transfer device (not shown). When the transfer assembly 62 is at the loading position, the transfer device places the workpieces 10, 10' onto the carrier racks 4, or removes the workpieces 10, 10' from the carrier racks 4.

[0029] An operation procedure of the processing equipment 100 is as

follows.

[0030] Referring to Figures 2, 8, and 9, in order to process the different kinds of workpieces 10, 10', an operator picks a processing procedure including several processing steps for each of the workpieces 10, 10', and plans the first
5 transfer route (P1) (see Figure 8) and the second transfer route (P2) (see Figure 9) respectively in accordance to the processing procedures with the electronic control device, such that the workpieces 10, 10' are processed in accordance to the respective processing procedures when being respectively conveyed along the first transfer route (P1) and the second transfer route (P2). The first transfer route
10 (P1) is defined by the conveyor assemblies 51 of the first transfer mechanisms 5 and the second transfer mechanisms 6. The second transfer route (P2) is defined by a portion of the conveyor assemblies 51 of the first transfer mechanisms 5 and a portion of the second transfer mechanisms 6. When the workpiece 10 is conveyed along the first transfer route (P1), the workpiece 10 passes through the first
15 workstation 21, the second workstation 22, the third workstation 23, the fourth workstation 24, the fifth workstation 25, and the sixth workstation 26 in sequence to be processed in accordance to the processing steps thereof. When the workpiece 10' is conveyed along the second transfer route (P2), the workpiece 10'

passes through the first workstation 21, the second workstation 22, the fourth workstation 24, the fifth workstation 25, and the sixth workstation 26 in sequence to be processed in accordance to the processing steps thereof.

[0031] It should be noted that, in other embodiments, the portion of the workstations 21-26 through which the first conveyor route (P1) passes and sequence in which the workpiece 10 passes through the portion of the workstations 21-26 may be changed, and the portion of the workstations 21-26 through which the second conveyor route (P2) passes and sequence in which the workpiece 10' passes through the portion of the workstations 21-26 may be changed. Moreover, in other embodiments, the conveyor device 3 may have other conveyor routes other than the first conveyor route (P1) and the second conveyor route (P2). It should be noted that, a number of the conveyor routes of the conveyor device 3 may be a number greater than two, and may be changed as needed.

[0032] Referring to Figures 3, 5 and 8, the processing steps of the processing procedure of the workpiece 10 is as follows. First, the linear motor 61 of the another one of the second transferring mechanisms 6 moves the transfer assembly 62 of the another one of the second transferring mechanisms 6 to the loading position, and the load plate 42 of one of the carrier racks 4 receives the

workpiece 10 from the transfer device (see Figure 3). Then, the linear motor 61 of the another one of the second transferring mechanisms 6 moves the transfer assembly 62 of the another one of the second transferring mechanisms 6 rightwards to a transferring position (see Figure 8) such that the transfer assembly 62 of the another one of the second transferring mechanisms 6 is aligned with the one of the conveyor assemblies 51 of the one of the first transfer mechanisms 5; in other words, at this time, the lengthwise axis of the another one of the second transfer mechanisms 6 is aligned with the transfer axis of the one of the first transfer mechanisms 5. Then, when the rotors 44 of one of the carrier racks 4 are engaged with the second stator 622 of the another one of the second transferring mechanisms 6, an electromagnetic force therebetween drives the one of the carrier racks 4 to move rearwards along the first transfer route (P1) and to the one of the conveyor assemblies 51 of the one of the first transfer mechanisms 5.

[0033] The rotors 44 of one of the carrier racks 4 are then engaged with the first stator 512 of the one of the conveyor assemblies 51 of the one of the first transfer mechanisms 5, and an electromagnetic force therebetween drives the one of the carrier racks 4 to move rearwards along the first transfer route (P1) and to the first workstation 21. After the one of the carrier racks 4 is moved to the first

workstation 21, the one of the conveyor assemblies 51 stops movement of the one of the carrier racks 4, and the workpiece 10 is processed by the first workstation 21. After processing, the one of the conveyor assemblies 51 moves the one of the carrier racks 4 along the first transfer route (P1) to the second workstation 22. After

5 the one of the carrier racks 4 is moved to the second workstation 22, the one of the conveyor assemblies 51 stops movement of the one of the carrier racks 4, and the workpiece 10 is processed by the second workstation 22. After processing, the one of the conveyor assemblies 51 moves the one of the carrier racks 4 along the first transfer route (P1), the transfer assembly 62 of the one of the second transfer

10 mechanisms 6 is moved to the transferring position, and the transfer assembly 62 of the one of the second transfer mechanisms 6 receives the one of the carrier racks 4 from the one of the conveyor assemblies 51 of the one of the first transfer mechanisms 5. The transfer assembly 62 of the one of the second transfer mechanisms 6 then moves the one of the carrier racks 4 along the first transfer

15 route (P1) to move the one of the carrier racks 4 to the another one of the conveyor assemblies 51 of the one of the first transfer mechanisms 5. Then, the another one of the conveyor assemblies 51 of the one of the first transfer mechanisms 5 moves the one of the carrier racks 4 along the first transfer route (P1) to the third

workstation 23. After the one of the carrier racks 4 is moved to the third workstation 23, the another one of the conveyor assemblies 51 of the one of the first transfer mechanisms 5 stops movement of the one of the carrier racks 4, and the workpiece 10 is processed by the third workstation 23. After processing, the another one of the conveyor assemblies 51 moves the one of the carrier racks 4 along the first transfer route (P1) towards the transfer assembly 62 of the remaining one of the second transfer mechanisms 6, the transfer assembly 62 of the remaining one of the second transfer mechanisms 6 is moved to the transferring position, and the transfer assembly 62 of the remaining one of the second transfer mechanisms 6 receives the one of the carrier racks 4 from the one of the conveyor assemblies 51 of the one of the first transfer mechanisms 5.

[0034] The transfer assembly 62 of the remaining one of the second transfer mechanisms 6 is moved leftwards in the second horizontal direction (Y) to another transferring position where the lengthwise axis thereof is aligned with the transfer axis of the another one of the conveyor assemblies 51 of the another one of the first transfer mechanisms 5. Then, the transfer assembly 62 of the remaining one of the second transfer mechanisms 6 moves the one of the carrier racks 4 forwards along the first transfer route (P1) to the another one of the conveyor

assemblies 51 of the another one of the first transfer mechanisms 5. The conveyer assemblies 51 of the another one of the first transfer mechanisms 5 then moves the one of the carrier racks 4 forwards along the transfer axis, and along the first transferring route (P1) to the fourth workstation 24. After the one of the carrier racks 4 is moved to the fourth workstation 24, the another one of the conveyer assemblies 51 of the another one of the first transfer mechanisms 5 stops movement of the one of the carrier racks 4, and the workpiece 10 is processed by the fourth workstation 24. Then, after processing, the transfer assembly 62 of the one of the second transfer mechanisms 6 is moved to another transferring position, and the another one of the conveyor assemblies 51 moves the one of the carrier racks 4 along the first transfer route (P1) to the transfer assembly 62 of the one of the second transfer mechanisms 6. The transfer assembly 62 of the one of the second transfer mechanisms 6 moves the one of the carrier racks 4 forwards along the first transfer route (P1) to the one of the conveyor assemblies 51 of the another one of the first transfer mechanisms 5.

[0035] Then, the one of the conveyor assemblies 51 of the another one of the first transfer mechanisms 5 moves the one of the carrier racks 4 forwards along the first transfer route (P1) to the fifth workstation 25. After the one of the carrier

racks 4 is moved to the fifth workstation 25, the one of the conveyer assemblies
 51 of the another one of the first transfer mechanisms 5 stops driving the one of
 the carrier racks 4 to move, and the workpiece 10 is processed by the fifth
 workstation 25. After processing, the one of the conveyor assemblies 51 of the
 5 another one of the first transfer mechanisms 5 moves the one of the carrier racks
 4 along the first transfer route (P1) to the sixth workstation 26. After the one of the
 carrier racks 4 is moved to the sixth workstation 26, the one of the conveyer
 assemblies 51 of the another one of the first transfer mechanisms 5 stops
 movement of the one of the carrier racks 4, and the workpiece 10 is processed by
 10 the workstation 26. Then, the transfer assembly 62 of the another one of the second
 transfer mechanisms 6 is moved leftwards to another transferring position to
 receive the one of the carrier racks 4. Finally, the linear motor 61 of the another
 one of the second transfer mechanisms 6 moves the transfer assembly 62 of the
 another one of the second transfer mechanisms 6 rightwards to the loading position
 15 (see Figure 3), and the transfer device removes the workpiece 10 that has been
 processed from the load plate 42 of the one of the carrier racks 4, thereby finishing
 the processing procedure of the workpiece 10.

[0036] Referring to Figure 9, the processing steps of the processing

procedure of the workpiece 10' is similar to those of the processing procedure of the workpiece 10, but the workpiece 10' is conveyed along the second transfer route (P2). The workpiece 10' is disposed on another carrier rack 4. The difference between the processing procedure of the workpiece 10 and the processing
5 procedure of the workpiece 10' resides in that, after the workpiece 10' has been processed by the first workstation 21 and the second workstation 22, and the another carrier rack 4 has been received by the transfer assembly 62 of the one of the second transfer mechanisms 6, the transfer assembly 62 of the one of the second transfer mechanisms 6 is then moved leftwards to the another transferring
10 position, so as to move the another one of the carrier racks 4 rearwards to the another one of the conveyor assemblies 51 of the another one of the first transfer mechanisms 5. Then, the workpiece 10' is processed by the workstation 24. After processing, the another one of the conveyor assemblies 51 of the another one of the first transfer mechanisms 5 moves the another one of the carrier racks 4 along
15 the second transfer route (P2) to the fifth workstation 25, and then to the sixth workstation 26 for the workpiece 10' to be processed. Finally, the linear motor 61 of the another one of the second transfer mechanisms 6 moves the transfer assembly 62 of the another one of the second transfer mechanisms 6 rightwards

to the loading position, and the transfer device removes the workpiece 10' from the load plate 42 of the another one of the carrier racks 4 to finish the processing procedure of the workpiece 10'.

[0037] In this embodiment, the processing equipment 100 receives the workpiece 10 from the transfer device, followed by receiving the workpiece 10', such that the conveyor device 3 conveys the workpieces 10, 10' respectively along the first transfer route (P1) and the second transfer route (P2) at substantially the same time. That is to say, after the one of the carrier racks 4 receives the workpiece 10 from the transfer device, the another one of the carrier racks 4 receives the workpiece 10' from the transfer device right after the workpiece 10 is conveyed along the first transfer route (P1) to the workstation 21. Hence, the processing procedure of the workpiece 10 and the processing procedure of the workpiece 10' are conducted at substantially the same time by the processing equipment 100, which fulfills the requirement for small-quantity production that involves workpieces with various manufacturing requirements, and lowers production cost of the workpieces 10, 10'. Hence, there is no need to develop different processing equipment for different workpieces to achieve small-quantity production, which saves development costs.

[0038] Furthermore, by having the first transfer route (P1) and the second transfer route (P2) planned according to the processing steps of the processing procedures of the workpieces 10, 10', the workpieces 10, 10' are conveyed and processed by the processing equipment 100 according to the processing procedures of the workpieces 10, 10'. Hence, the processing equipment 100 is very versatile.

[0039] Moreover, the first linear motors, the second linear motors, and the linear motors 61 allow the rotors 44 of the carrier racks 4 to be moved at high speed, positioned precisely at a plurality of different positions, and moved forwards and rearwards along the widthwise axes, the lengthwise axes, and the transfer axes. Hence, the carrier racks 4 have high movement speed, high precision positioning, and high versatility in routes that the carrier racks 4 can take, thereby increasing production speed and efficiency of the processing equipment 100.

[0040] Referring to Figure 3, a variation of the first embodiment is similar to the first embodiment, but two transfer devices are respectively adjacent to the front end 11 and the rear end 12 of the frame 1. When the transfer assembly 62 of the another one of the second transfer mechanisms 6 is at the loading position, the carrier racks 4 receive the workpieces 10, 10' from the transfer device adjacent to

the front end 11, and when the workpieces 10, 10' have been fully processed, the carrier racks 4 are moved to the transfer assembly 62 of the remaining one of the second transfer mechanisms 6, the transfer assembly 62 of the remaining one of the second transfer mechanisms 6 is moved to the loading position, and the transfer device adjacent to the rear end 12 retrieves the finished workpieces 10, 10' from the carrier racks 4. Hence, the processing equipment 100 has versatile means of receiving and outputting the workpieces 10, 10'.

[0041] Referring to Figures 6 and 7, another variation of the first embodiment is similar to the first embodiment, but the workpieces 10, 10' are disposed onto or retrieved from the carrier racks 4 by the transfer device when the transfer assembly 62 of the one of the second transfer mechanisms 6 is in the transferring position (see Figure 6) or in the another transferring position (see Figure 7), thereby increasing means of receiving and removal of the workpieces 10, 10'.

[0042] Another variation of the first embodiment is similar to the first embodiment, but the transfer device is disposed adjacent to the rear end 12 of the frame 1, and the workpieces 10, 10' are received by or retrieved from the carrier racks 4 by the transfer device when the transfer assembly 62 of the remaining one

of the second transfer mechanisms 6 is in the loading position (see Figure 3), thereby increasing means for receiving and outputting the workpieces 10, 10'.

[0043] Another variation of the first embodiment is similar to the first embodiment, but the remaining one of the second transfer mechanisms 6 is omitted.

5 The one of the second transfer mechanisms 6 is disposed between the conveyor assemblies 51 of each of the first transfer mechanisms 5. The another one of the second transfer mechanisms 6 is disposed at a side of the first transfer mechanisms 5, spaced apart from the one of the second transfer mechanisms 6 in the first horizontal direction (X), and is proximate to the front end 11 of the frame

10 1. In this variant, when the workpiece 10 is conveyed along the first transfer route (P1), the workpiece 10 passes through the first workstation 21, the second workstation 22, the third workstation 23, the fourth workstation 24, the fifth workstation 25, and the sixth workstation 26 in sequence, and is processed in accordance to the processing steps thereof. When the workpiece 10' is conveyed

15 along the second transfer route (P2), the workpiece 10' passes through the first workstation 21, the second workstation 22, the fifth workstation 25, and the sixth workstation 26 in sequence, and is processed in accordance to the processing steps thereof.

[0044] Referring to Figure 10, a second embodiment of the processing equipment 100 according to the disclosure is similar to the first embodiment, but the configurations of the conveyor device 3 and the workstations 21-26 are different.

[0045] In the second embodiment, the number of the first transfer mechanisms 5 is three. For each of the first transfer mechanisms 5, the lengths of the conveyor assemblies 51 in the first horizontal direction (X) are the same. The conveyor assemblies 51 of the first transfer mechanisms 5 respectively extend through the workstations 21-26. In this embodiment, the workpiece 10 is conveyed along the first transfer route (P1); that is, the workpiece 10 passes through the first workstation 21, the second workstation 22, the fourth workstation 24, and the third workstation 23 in sequence, and is processed in accordance to the processing steps thereof. When the workpiece 10' is conveyed along the second transfer route (P2), the workpiece 10' passes through the third workstation 23, the fourth workstation 24, the sixth workstation 26, and the fifth workstation 25 in sequence, and is processed in accordance to the processing steps thereof.

[0046] In conclusion, the processing equipment 100 can process workpieces 10, 10' through at least two different processing procedures by conveying the workpieces 10, 10' respectively along the first transfer route (P1)

and the second transfer route (P2). Since the first transfer route (P1) and the second transfer route (P2) are planned according to the processing steps of the workpieces 10, 10', the workpieces 10, 10' are processed by the workstations 21-26 in order. Furthermore, the processing equipment 100 can process different workpieces in small quantities at substantially the same time, and has lower production cost compared to the conventional processing equipment. Hence, the objective of the disclosure is achieved.

[0047] In the description above, for the purposes of explanation, numerous specific details have been set forth in order to provide a thorough understanding of the embodiment(s). It will be apparent, however, to one skilled in the art, that one or more other embodiments may be practiced without some of these specific details. It should also be appreciated that reference throughout this specification to "one embodiment," "an embodiment," an embodiment with an indication of an ordinal number and so forth means that a particular feature, structure, or characteristic may be included in the practice of the disclosure. It should be further appreciated that in the description, various features are sometimes grouped together in a single embodiment, figure, or description thereof for the purpose of streamlining the disclosure and aiding in the understanding of various inventive

aspects; such does not mean that every one of these features needs to be practiced with the presence of all the other features. In other words, in any described embodiment, when implementation of one or more features or specific details does not affect implementation of another one or more features or specific details, said one or more features may be singled out and practiced alone without said another one or more features or specific details. It should be further noted that one or more features or specific details from one embodiment may be practiced together with one or more features or specific details from another embodiment, where appropriate, in the practice of the disclosure.

[0048] While the disclosure has been described in connection with what is(are) considered the exemplary embodiment(s), it is understood that this disclosure is not limited to the disclosed embodiment(s) but is intended to cover various arrangements included within the spirit and scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.

CLAIMS:

1. A processing equipment adapted for processing at least one workpiece, said processing equipment comprising:

5 a plurality of workstations that have different functions, and that are adapted for processing the at least one workpiece; and

a conveyor device that has a first conveyor route and a second conveyor route, said first conveyor route passing through at least a portion of said plurality of workstations, said second conveyor route passing through at least a portion of said plurality of workstations partially different from said at least a portion of said plurality of workstations through which said first conveyor route passes, said 10 conveyor device being adapted for conveying the at least one workpiece along a selected one of said first conveyor route and said second conveyor route.

2. The processing equipment as claimed in claim 1, wherein:

said conveyor device includes

15 at least one carrier rack adapted for receiving the at least one workpiece,

a plurality of first transfer mechanisms, each of said plurality of first transfer mechanisms having a transfer axis that extends in a first horizontal direction, and being operable for conveying said at least one carrier rack along the

transfer axis, said plurality of first transfer mechanisms being spaced apart from each other in a second horizontal direction that is perpendicular to the first horizontal direction, and cooperatively passing through each of said plurality of workstations, and

5 a plurality of second transfer mechanisms spaced apart from each other in the first horizontal direction and disposed between said plurality of first transfer mechanisms, each of said plurality of second transfer mechanisms having a lengthwise axis extending in the first horizontal direction, and a widthwise axis extending in the second horizontal direction, each of said plurality of second
10 transfer mechanisms being operable for conveying said at least one carrier rack along the lengthwise axis and the widthwise axis between said plurality of first transfer mechanisms.

3. The processing equipment as claimed in claim 2, wherein:

 each of said plurality of first transfer mechanisms includes two conveyor
15 assemblies that are spaced apart from each other in the first horizontal direction;

 for each of said plurality of first transfer mechanisms, each of said conveyor assemblies extends along the transfer axis and through at least one of said plurality of workstations, and is operable for driving said at least one carrier rack to move

along the transfer axis; and

said plurality of second transfer mechanisms includes two second transfer mechanisms, one of said second transfer mechanisms being disposed between said conveyor assemblies of each of said plurality of first transfer mechanisms, another one of said second transfer mechanisms being disposed at a side of said plurality of first transfer mechanisms and spaced apart from said one of said second transfer mechanisms in the first horizontal direction.

4. The processing equipment as claimed in claim 2, wherein:

each of said plurality of first transfer mechanisms includes two conveyor assemblies that are spaced apart from each other in the first horizontal direction;

for each of said plurality of first transfer mechanisms, each of said conveyor assemblies extends along the transfer axis and through at least one of said plurality of workstations, and is operable for driving said at least one carrier rack to move along the transfer axis; and

said plurality of second transfer mechanisms includes three second transfer mechanisms, one of said second transfer mechanisms being disposed between said conveyor assemblies of each of said plurality of first transfer mechanisms, another one of said second transfer mechanisms being disposed at a side of said

plurality of first transfer mechanisms and spaced apart from said one of said second transfer mechanisms in the first horizontal direction, a remaining one of said second transfer mechanisms being disposed at another side of said plurality of first transfer mechanisms and opposite to said another one of said second transfer mechanisms.

5. The processing equipment as claimed in claim 3, wherein:

each of said conveyor assemblies includes a stator, said at least one carrier rack including a rotor; and

for each of said conveyor assemblies, said stator is engageable with said rotor to form a linear motor operable for driving said at least one carrier rack to move along the transfer axis.

6. The processing equipment as claimed in claim 5, wherein each of said conveyor assemblies further includes a guide rail that extends in the first horizontal direction, said at least one carrier rack further including a plurality of sliders that are slidably engageable with said guide rails of said conveyor assemblies.

7. The processing equipment as claimed in claim 3, wherein:

each of said second transfer mechanisms includes a transfer assembly extending along the lengthwise axis, and a linear motor extending along the

widthwise axis, connected to said transfer assembly, and operable for moving said transfer assembly along the widthwise axis;

said transfer assembly of each of said second transfer mechanisms includes a stator, said at least one carrier rack including a rotor; and

5 for each of said transfer assemblies, said stator is engageable with said rotor to form a linear motor operable for driving said at least one carrier rack to move along the lengthwise axis.

8. The processing equipment as claimed in claim 7, wherein each of said transfer assemblies further includes a guide rail that extends in the first horizontal direction,
10 said at least one carrier rack further including a plurality of sliders that are slidably engageable with said guide rails of said transfer assemblies.

9. The processing equipment as claimed in claim 3, wherein:

each of said second transfer mechanisms has a transfer assembly and a linear motor connected to said transfer assembly;

15 for each of said second transfer mechanisms, said transfer assembly is operable for moving said transfer assembly along the widthwise axis to a transferring position where the lengthwise axis of said second transfer mechanism is aligned with the transfer axis of one of said plurality of first transfer mechanisms,

thereby allowing operation of said transfer assembly to move said at least one carrier rack to one of said conveyor assemblies of said one of said plurality of first transfer mechanisms, or allowing said transfer assembly to receive said at least one carrier rack from said one of said conveyor assemblies of said one of said plurality of first transfer mechanisms; and

for each of said second transfer mechanisms, said transfer assembly is further operable for moving said transfer assembly along the widthwise axis to another transferring position where the lengthwise axis of said second transfer mechanism is aligned with the transfer axis of another one of said plurality of first transfer mechanisms, thereby allowing operation of said transfer assembly to move said at least one carrier rack to one of said conveyor assemblies of said another one of said plurality of first transfer mechanisms, or allowing said transfer assembly to receive said at least one carrier rack from said one of said conveyor assemblies of said another one of said plurality of first transfer mechanisms.

10. The processing equipment as claimed in claim 9, wherein:

said transfer assembly of each of said second transfer mechanisms includes a stator, said at least one carrier rack including a rotor; and

for each of said transfer assemblies, said stator is engageable with said rotor

to form a linear motor operable for driving said at least one carrier rack to move along the lengthwise axis.

11. The processing equipment as claimed in claim 2, wherein said at least one carrier rack includes a plurality of carrier racks, each of said plurality of carrier racks being adapted for receiving different kinds of workpieces.

12. The processing equipment as claimed in claim 1, wherein said conveyor device is adapted for conveying different kinds of workpieces to said plurality of workstations for processing the different kinds of workpieces.