TRAY MOVING DEVICE AND CHECK SYSTEM

[0001] This application claims priority to Chinese Patent Application No. 202410358220.5, filed on March 27, 2024, the content of which are incorporated herein by reference in their entirety.

TECHNICAL FIELD

[0002] The present disclosure relates to the field of conveying device technology, security inspection technology, or other technologies, and in particular to a tray moving device and an inspection system.

BACKGROUND

[0003] At airports, railway stations, and other places, it is usually necessary to inspect cargo or passenger luggage to ensure traffic and travel safety.

[0004] In a security inspection area, a conveying device for conveying articles to be inspected is usually placed. The conveying device conveys an empty tray to a predetermined position, and the tray at the predetermined position is pushed by a pushing component to a placement position. A passenger or a security inspector takes the empty tray from the placement position, places the article to be inspected into the tray, and the tray loaded with the article is further conveyed to an inspection area for inspection. After inspection, the empty tray is again conveyed to the predetermined position, thereby realizing cycling use of trays.

[0005] In the related art, during the process of pushing the tray from the predetermined position to the placement position, a fixed pushing stroke may cause stroke waste for some trays, affecting conveying efficiency and inspection efficiency.

SUMMARY

[0006] A first aspect of embodiments of the present disclosure provide a tray moving device, including: a conveyor line configured to convey a tray carried on the conveyor line in a first direction; and a tray pushing mechanism including a driving part and a pushing part connected to each other, the pushing part is located on a side of the conveyor line, the pushing part is configured to be driven by the driving part to push the tray at a predetermined position in a second direction, and the second direction intersects the first direction. When the pushing part reaches an end point of a pushing stroke of the pushing part, the tray is pushed to leave the

conveyor line, and a position of the end point is associated with a geometric property of the tray, such that the pushing stroke meets a predetermined requirement.

[0007] According to embodiments of the present disclosure, the geometric property of the tray includes a length in the second direction, and the pushing stroke meeting the predetermined requirement includes: the pushing stroke is inversely proportional to the length for trays of different lengths.

[0008] According to embodiments of the present disclosure, the tray moving device further includes: a first detection mechanism, during a process of pushing the tray, the first detection mechanism is configured to, upon detecting that the pushing part reaches the end point, send a stop pushing signal; and a position of the first detection mechanism corresponds to the position of the end point, the position of the first detection mechanism is adjustable and is pre-adjusted according to the geometric property of the pushed tray, such that the pushing stroke meets the predetermined requirement.

[0009] According to embodiments of the present disclosure, after the stop pushing signal is sent, the pushing part is driven by the driving part to retract to a starting point of the pushing stroke; and the tray moving device further includes: a second detection mechanism opposite to the first detection mechanism in the second direction, the second detection mechanism is configured to, upon detecting that the pushing part reaches the starting point, send a stop retracting signal.

[0010] According to embodiments of the present disclosure, a position of the second detection mechanism has a corresponding relationship with a position of the starting point, and the position of the second detection mechanism is adjustable and is pre-adjusted according to the geometric property of the pushed tray; and when the pushing part is at the starting point, a distance between the starting point and a contact surface of the pushed tray is less than or equal to a preset distance and greater than or equal to 0.

[0011] According to embodiments of the present disclosure, the driving part is provided with a trigger member, and the first detection mechanism includes: a first photoelectric switch whose position is adjustable, and a position of a detection region of the first photoelectric switch changes in response to a change in a position of the first photoelectric switch; and during the process of pushing the tray, the driving part moves to move the trigger member, and it is detected that the pushing part reaches the end point when the trigger member moves to the detection region of the first photoelectric switch.

[0012] According to embodiments of the present disclosure, the second detection mechanism includes: a second photoelectric switch, whose position is adjustable, and a position

of a detection region of the second photoelectric switch changes in response to a change in a position of the second photoelectric switch; and during a process of retracting the pushing part, the driving part moves to move the trigger member, and it is detected that the pushing part reaches the starting point when the trigger member moves to the detection region of the second photoelectric switch.

[0013] According to embodiments of the present disclosure, the conveyor line includes: N rollers configured to convey the tray by rotation of each of the rollers, the N rollers include a first roller and a second roller adjacent to each other, and N is an integer greater than or equal to 2; during conveying of the tray, a top of the driving part is lower than a bottom of the tray, and the pushing part is connected to the driving part through a gap between the first roller and the second roller; and the pushing part is configured to push the tray to leave the conveyor line along the gap, and the pushing stroke is located within the gap.

[0014] According to embodiments of the present disclosure, the driving part includes: a first pulley; a second pulley opposite to the first pulley in the second direction; and a synchronous belt sleeved on an outer side of the first pulley and the second pulley; and the top of the driving part is a top of the synchronous belt, the pushing part is connected to the top of the synchronous belt, and an orthographic projection of the gap overlaps with an orthographic projection of the synchronous belt.

[0015] According to embodiments of the present disclosure, the driving part further includes: a driving mechanism located below the N rollers, the synchronous belt is sleeved on an outer side of the first pulley, the second pulley and the driving mechanism, a cross-section of the synchronous belt is substantially in a triangular shape, and a first side of the triangular shape corresponds to the top of the synchronous belt and is connected to the pushing part.

[0016] According to embodiments of the present disclosure, the tray moving device further includes: a first mounting part configured to mount the first detection mechanism, the position of the first detection mechanism is adjustable in an extension direction of a second side of the triangular shape; and/or a second mounting part configured to mount the second detection mechanism, the second detection mechanism is adjustable in an extension direction of a third side of the triangular shape.

[0017] According to embodiments of the present disclosure, a top edge of a side plate of the tray extends horizontally outward to form a flange; the tray moving device further includes: a baffle plate located on a same side of the conveyor line as the pushing part, the baffle plate is located above the pushing part; and when the tray is conveyed to the predetermined position and the flange abuts against the baffle plate, a reserved space is defined

by the flange and a lower portion of the baffle plate, and the starting point is located within the reserved space.

[0018] According to embodiments of the present disclosure, the tray moving device further includes: a sliding-off mechanism located on the other side of the conveyor line and opposite to the pushing part; and the sliding-off mechanism is connected to the conveyor line and is inclined, the sliding-off mechanism includes: a rolling mechanism mounted on an inclined surface of the sliding-off mechanism, and the rolling mechanism is configured to contact a bottom of the tray leaving the conveyor line.

[0019] A second aspect of the present disclosure provide an inspection system, including: the tray moving device as described above, the tray moving device is configured to push the tray to leave the conveyor line, and the tray is configured to accommodate an article to be inspected after leaving the conveyor line; and an inspection device configured to emit radiation rays to scan the article to be inspected accommodated in the tray, so as to obtain a scanned image.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The above and other objectives, features and advantages of the present disclosure will be more apparent through the following description of embodiments of the present disclosure with reference to the accompanying drawings, in which:

[0021] FIG. 1A schematically shows a structural schematic diagram of a tray moving device according to an embodiment of the present disclosure;

[0022] FIG. 1B schematically shows a schematic diagram of different pushing strokes according to an embodiment of the present disclosure;

[0023] FIG. 2 schematically shows a schematic diagram of a pushing part of a tray pushing mechanism moving to an end position according to an embodiment of the present disclosure;

[0024] FIG. 3 schematically shows a schematic diagram of a pushing part of a tray pushing mechanism returning to a starting position according to an embodiment of the present disclosure;

[0025] FIG. 4 schematically shows a schematic diagram of a tray located at a predetermined position on a conveyor line according to an embodiment of the present disclosure;

[0026] FIG. 5 schematically shows a schematic diagram of a tray separated from a conveyor line according to an embodiment of the present disclosure;

[0027] FIG. 6 schematically shows a schematic diagram of relative positions of a tray and a tray pushing mechanism according to an embodiment of the present disclosure;

[0028] FIG. 7 schematically shows a first structural schematic diagram of a tray pushing mechanism according to an embodiment of the present disclosure;

[0029] FIG. 8 schematically shows a second structural schematic diagram of a tray pushing mechanism according to an embodiment of the present disclosure;

[0030] FIG. 9 schematically shows a schematic diagram of relative positions of a first detection mechanism and a trigger member according to an embodiment of the present disclosure;

[0031] FIG. 10 schematically shows a schematic diagram of relative positions of a second detection mechanism and a trigger member according to an embodiment of the present disclosure;

[0032] FIG. 11 schematically shows a partial structural schematic diagram of a baffle plate and a tray according to an embodiment of the present disclosure;

[0033] FIG. 12 schematically shows a structural schematic diagram of a sliding-off mechanism according to an embodiment of the present disclosure;

[0034] FIG. 13 schematically shows a first structural schematic diagram of an inspection system according to an embodiment of the present disclosure; and

[0035] FIG. 14 schematically shows a second structural schematic diagram of an inspection system according to an embodiment of the present disclosure.

Reference signs: 1: Conveyor line; 11: First roller; 12: Second roller; 2: Tray pushing mechanism; 21: Driving part; 211: First pulley; 212: Second pulley; 213: Synchronous belt; 214: Driving mechanism; 22: Pushing part; 3: First detection mechanism; 31: First photoelectric switch; 32: First mounting part; 4: Tray; 5: Trigger member; 6: Second detection mechanism; 61: Second photoelectric switch; 62: Second mounting part; 7: Baffle plate; 8: Sliding-off mechanism; 81: Slide table; 82: Rolling mechanism; 9: Supporting platform; 10: Second conveyor line; 100: Mounting frame.

DETAILED DESCRIPTION OF EMBODIMENTS

[0036] In order to make objectives, technical solutions and advantages of the present disclosure more apparent and understandable, the present disclosure is further described in detail below in combination with specific embodiments and with reference to the accompanying drawings. It is obvious that the embodiments described are only some

embodiments of the present disclosure, rather than all embodiments. All other embodiments, which may be derived by those of ordinary skill in the art from embodiments in the present disclosure without creative labor, fall within the scope of protection of the present disclosure.

[0037] Terms used herein are for the purpose of describing specific embodiments only and are not intended to limit the present disclosure. Terms “comprising”, “including” and the like used herein specify the presence of said feature, step, operation and/or component, but do not preclude the presence or addition of one or more other features, steps, operations or components.

[0038] In the description of the present disclosure, it should be noted that, unless otherwise explicitly stated or limited, the terms “mounted”, “connected”, and “coupled” should be interpreted broadly. For example, they may refer to fixed connections, detachable connections, or integral connections; mechanical connections or electrical connections; direct connections, or indirect connections via intermediate media, or internal communications between two elements. Those of ordinary skill in the art may understand the specific meanings of the above-mentioned terms in the present disclosure according to specific situations.

[0039] In the related art, a pushing force is typically applied to a tray within a fixed pushing stroke. For example, after the distance of the pushing stroke is determined, it is applicable to various trays to ensure that all types of trays may be pushed to a target position. However, when different trays have different geometric properties, the fixed pushing stroke may cause stroke waste for some trays. That is, for one type of tray, the fixed pushing stroke just pushes that type of tray away from the conveyor line, while for another type of tray, the fixed pushing stroke may not end after pushing that type of tray away from the conveyor line, causing the pushing component to continue to travel the remaining stroke. This results in stroke waste, increasing the pushing time for a single tray and reducing overall conveying efficiency and inspection efficiency.

[0040] Some embodiments of the present disclosure provide a tray moving device and an inspection system, where during the process of pushing the tray away from the conveyor line, the position of the end point of the pushing part is associated with the geometric property of the tray. When pushing trays with different geometric properties, the position of the end point also varies accordingly; by precisely controlling the end point position of the pushing part, the pushing stroke may meet predetermined requirements for trays with different geometric properties, thereby avoiding stroke waste, improving conveying efficiency, while ensuring versatility of the tray moving device.

[0041] The tray moving device according to embodiments of the present disclosure will be described below with reference to FIG. 1A to FIG. 12.

[0042] As shown in FIG. 1A, FIG. 1B, FIG. 2, FIG. 3, FIG. 4, FIG. 5 and FIG. 6, the tray moving device provided by embodiments of the present disclosure includes a conveyor line 1, a tray pushing mechanism 2 and a first detection mechanism 3. The conveyor line 1 is configured to convey a tray 4 carried thereon in a first direction; the tray pushing mechanism 2 includes a driving part 21 and a pushing part 22 connected to each other; the pushing part 22 is located on one side of the conveyor line 1, and the pushing part 22 is configured to be driven by the driving part 21 to push the tray 4 at a predetermined position to leave the conveyor line 1 in a second direction, where the second direction intersects the first direction. Once the pushing part 22 reaches an end point of a pushing stroke thereof, the tray 4 is pushed to leave the conveyor line 1, and the position of the end point is associated with a geometric property of the tray 4, such that the pushing stroke meets a predetermined requirement.

[0043] It may be understood that when the tray 4 leaves the conveyor line 1, it may no longer be in contact with the conveyor line, or a photoelectric switch may be triggered.

[0044] In some embodiments, the geometric property of the tray 4 includes a length in the second direction, and the pushing stroke meeting the predetermined requirement includes: for trays 4 of different lengths, the pushing stroke is inversely proportional to the length. For example, referring to FIG. 1B, the arrow direction is the second direction, and pushing stroke A, pushing stroke B, and pushing stroke C are different. For trays 4 of different lengths, the pushing strokes are also different. A tray 4 with a larger length may have a shorter pushing stroke; while a tray 4 with a smaller length may require a certain stroke for the pushing part to contact the tray or to push the tray away from the conveyor line 1, thus its pushing stroke may be longer.

[0045] Exemplarily, adjacent trays may have different lengths, or trays of adjacent batches may have different lengths. The tray moving device may be provided with a length detection device, which may be an image recognition device or a photoelectric detection device, etc., capable of detecting the length of the tray to be pushed. The end point of the pushing part 22 is dynamically adjusted according to the length of the tray to be pushed. In addition to the provision of the length detection device, the end point position of the pushing part 22 may also be manually adjusted in advance according to the length of the tray to be pushed.

[0046] According to embodiments of the present disclosure, during the process of pushing the tray to leave the conveyor line, the position of the end point of the pushing part is associated with the geometric property of the tray. When pushing trays with different geometric

properties, the position of the end point also varies accordingly. By precisely controlling the end point position of the pushing part, the pushing stroke may meet predetermined requirements for trays with different geometric properties, thereby avoiding stroke waste, improving conveying efficiency, while ensuring versatility of the tray moving device.

[0047] During pushing the tray 4, the first detection mechanism 3 is configured to, upon detecting that the pushing part 22 reaches the end point of its pushing stroke, send a stop pushing signal. The position of the first detection mechanism 3 has a corresponding relationship with the position of the end point, and the position of the first detection mechanism 3 is adjustable and is pre-adjusted according to the geometric property of the tray 4 to be pushed. Therefore, the end point of the pushing stroke may be changed by dynamically changing the position of the first detection mechanism 3.

[0048] Specifically, the tray moving device includes the conveyor line 1, the tray pushing mechanism 2, the first detection mechanism 3, and a mounting frame 100. The mounting frame 100 is assembled from a plurality of transverse, longitudinal and vertical beams. The conveyor line 1, the tray pushing mechanism 2, and the first detection mechanism 3 are mounted on the mounting frame 100. The first detection mechanism 3 may include an imaging device, a photoelectric sensor, a time counter, or the like.

[0049] The conveyor line 1 may be a linear conveyor line or an annular conveyor line, and a carrying surface of the conveyor line 1 is used for carrying the empty tray 4. The conveyor line 1 may be a belt transmission structure or a roller transmission structure, and is used to convey the empty tray 4 in the first direction to a predetermined position.

[0050] The tray pushing mechanism 2 is arranged in the second direction. The conveyor line 1 is a linear conveyor line, and the second direction is perpendicular to the first direction; the conveyor line 1 is an annular conveyor line, the second direction is consistent with a direction of a central plane of the conveyor line 1, and the second direction intersects the first direction.

[0051] The tray pushing mechanism 2 includes the driving part 21 and the pushing part 22 connected to each other. The driving part 21 drives the pushing part 22 to reciprocate in the second direction. The pushing part 22 has a set pushing stroke, and may reciprocate between a starting point position and an end point position.

[0052] In FIG. 2, position A is the starting point position of the pushing part 22, and position B is the end point position of the pushing part 22. The pushing part 22 moves to position B, and the tray 4 is separated from the conveyor line 1. In FIG. 3, after the tray 4 is

separated from the conveyor line 1, the pushing part 22 is driven by the driving part 21 to return from position B to position A.

[0053] The conveyor line 1 has a first side and a second side opposite to each other. The starting point position corresponds to the first side, and the end point position corresponds to the second side. In the second direction, the tray 4 has a first side surface and a second side surface opposite to each other. When the empty tray 4 is moved by the conveyor line 1 to the predetermined position, the pushing part 22 is at the starting point position, and the pushing part 22 is in contact with the first side surface of the tray 4, or there is an appropriate distance between the pushing part 22 and the first side surface of the tray 4. After the tray 4 moves to the predetermined position, the driving part 21 drives the pushing part 22 to move in the second direction from the starting point position toward the end point position, and the pushing part 22 pushes the tray 4 to move from the first side to the second side of the conveyor line 1. When the pushing part 22 moves to the end point position, the tray 4 is separated from the conveyor line 1. After the tray 4 is completely separated from the conveyor line 1, the tray 4 is conveyed onto a slide table. An operator may take the empty tray 4 from the slide table, place the article to be inspected into the tray 4, and the tray 4 loaded with the article to be inspected is further conveyed to an inspection station, where the article to be inspected is inspected by an inspection device at the inspection station.

[0054] After the tray 4 is completely separated from the conveyor line 1, the driving part 21 drives the pushing part 22 to move in the second direction from the end point position toward the starting point position until the pushing part 22 returns to the starting point position, waiting for the next tray 4 conveyed by the conveyor line 1.

[0055] The tray pushing mechanism 2 may be a cylinder, with the driving part 21 being a piston rod and the pushing part 22 being a push plate, the push plate being connected to a free end of the piston rod, and the linear reciprocating motion of the piston rod drives the push plate to reciprocate in the second direction. The tray pushing mechanism 2 may also be a lead screw transmission structure, with the driving part 21 being a lead screw and a lead screw nut, and the pushing part 22 being a push plate connected to the lead screw nut, and the linear reciprocating motion of the lead screw nut drives the push plate to reciprocate in the second direction. The tray pushing mechanism 2 may also be a belt transmission structure, with the driving part 21 being a synchronous belt, on which a connecting block is fixedly connected, and the pushing part 22 being a push plate connected to the connecting block, and the reciprocating rotation of the synchronous belt drives the push plate to reciprocate in the second direction.

[0056] After the tray 4 is completely separated from the conveyor line 1, if no detection mechanism is provided, the pushing part 22 may continue to move forward in the second direction, which would prolong the time for the pushing part 22 to return to the starting point position, thereby reducing conveying efficiency. By providing the first detection mechanism 3, upon the pushing part 22 reaching the end point of the pushing stroke, the first detection mechanism 3 sends a stop pushing signal, and then the driving part 21 drives the pushing part 22 to move in the second direction from the second side toward the first side of the conveyor line 1 until it returns to the starting point position. By providing the first detection mechanism 3, precise control over the end point position and the return time of the pushing part 22 may be achieved.

[0057] The first detection mechanism 3 has a corresponding relationship with the end point position. The first detection mechanism 3 may be a photoelectric switch. The photoelectric switch is mounted below the second side of the conveyor line 1, when the photoelectric switch detects that the tray 4 is separated from the conveyor line 1, the photoelectric switch sends a stop pushing signal. Alternatively, the photoelectric switch is mounted below the first side of the conveyor line 1, when the pushing part 22 moves to the end point position, the photoelectric switch is triggered and may send a stop pushing signal.

[0058] The mounting position of the first detection mechanism 3 may be adjusted according to the geometric property of the tray 4. The geometric property of the tray 4 includes the relationship of the shape, size, magnitude, position, and orientation of the tray 4. According to the geometric property of the tray 4, the mounting position of the first detection mechanism 3 may be adjusted in the horizontal direction or in the vertical direction, such that after the tray 4 is separated from the conveyor line 1, the first detection mechanism 3 may detect the separation between the tray 4 and the conveyor line 1 and send a stop pushing signal.

[0059] The mounting position of the first detection mechanism 3 is adjusted accordingly according to the shape and size of the tray 4, so as to avoid the first detection mechanism 3 from sending a stop pushing signal in advance before the pushing part 22 reaches the end point, or sending the stop pushing signal with delay after the pushing part 22 reaches the end point. The position of the first detection mechanism 3 is adaptively adjusted according to the geometric property of the tray 4, ensuring that when the pushing part 22 reaches the end point, the first detection mechanism 3 sends the stop pushing signal in time, which is beneficial to improving versatility of the tray moving device.

[0060] The working process of the tray moving device will be described in detail below.

[0061] An empty tray 4 is carried on the carrying surface of the conveyor line 1, and the conveyor line 1 conveys the tray 4 in the first direction to the predetermined position. After the tray 4 reaches the predetermined position, the tray 4 stops moving in the first direction. When the tray 4 reaches the predetermined position, the pushing part 22 is at the starting point position, and the pushing part 22 faces the first side surface of the tray 4. The driving part 21 drives the pushing part 22 to move in the second direction from the starting point position toward the end point position, and the pushing part 22 pushes the tray 4 to move toward the second side of the conveyor line 1. When the pushing part 22 reaches the end point of the pushing stroke, the tray 4 is separated from the conveyor line 1, and the first detection mechanism 3 sends a stop pushing signal. The driving part 21 drives the pushing part 22 to move in the second direction from the end point position toward the starting point position until the pushing part 22 returns to the starting point position. According to the stop pushing signal sent by the first detection mechanism 3, precise control over the end point position of the pushing stroke of the pushing part 22 and the return time may be achieved, thereby improving conveying efficiency.

[0062] After the tray 4 is separated from the conveyor line 1, the tray 4 is conveyed onto the slide table. The operator may take the empty tray 4 from the slide table, place the article to be inspected into the tray 4, and the tray 4 loaded with the article to be inspected is further conveyed to the inspection station, where the article to be inspected is inspected by the inspection device at the inspection station.

[0063] In embodiments of the present disclosure, the conveyor line 1 conveys the tray 4 carried thereon in the first direction to the predetermined position, the driving part 21 drives the pushing part 22 to move in the second direction from the starting point position toward the end point position, and the pushing part 22 pushes the tray 4 from the first side to the second side of the conveyor line 1 until the tray 4 is separated from the conveyor line 1. The pushing part 22 moves to the end point position; the first detection mechanism 3 sends a stop pushing signal, and the driving part 21 drives the pushing part 22 to return from the end point position to the starting point position in the second direction to continue conveying the following tray 4. The position of the first detection mechanism 3 is adaptively adjusted according to the geometric property of the tray 4. Through the first detection mechanism 3, precise control over the end point position and the return time of the pushing part 22 is achieved, which is beneficial to improving conveying efficiency and ensuring versatility of the tray moving device.

[0064] As shown in FIG. 2, FIG. 3 and FIG. 6, in an optional embodiment, after the stop pushing signal is sent, the pushing part 22 is driven by the driving part 21 to retract to the

starting point of the pushing stroke. The tray moving device further includes a second detection mechanism 6. The second detection mechanism 6 is disposed opposite to the first detection mechanism 3 in the second direction, and the second detection mechanism is configured to, upon detecting that the pushing part 22 reaches the starting point, send a stop retracting signal. The second detection mechanism 6 may include an imaging device, a photoelectric sensor, a time counter, or the like.

[0065] Specifically, the second detection mechanism 6 is disposed opposite to the first detection mechanism 3. If the first detection mechanism 3 is located below the first side of the conveyor line 1, the second detection mechanism 6 is located below the second side of the conveyor line 1; or if the first detection mechanism 3 is located below the second side of the conveyor line 1, the second detection mechanism 6 is located below the first side of the conveyor line 1. It may be understood that the first detection mechanism 3 and the second detection mechanism 6 may also be mounted above the conveyor line 1.

[0066] The driving part 21 drives the pushing part 22 to move in the second direction from the starting point position to the end point position. When the pushing part 22 reaches the end point position and the tray 4 is separated from the conveyor line 1, the first detection mechanism 3 sends a stop pushing signal, and the driving part 21 drives the pushing part 22 to move in the second direction from the end point position toward the starting point position. When the pushing part 22 returns to the starting point position, the second detection mechanism 6 sends a stop retracting signal, and the pushing part 22 stops moving, thereby completing a working stroke of the pushing part 22. The pushing part 22 returns to the starting point position, waiting to push the next conveyed tray 4.

[0067] When the pushing part 22 returns to the starting point position, the second detection mechanism 6 sends a stop retracting signal, which may prevent the pushing part 22 from continuing to move forward. If the second detection mechanism 6 is not provided, after the pushing part 22 returns to the starting point position, the pushing part 22 may continue to move forward, resulting in an excessive distance between the pushing part 22 and the first side surface of the tray 4 at the predetermined position, which would increase the pushing time required for the pushing part 22 to push the tray 4 at the predetermined position to be separated from the conveyor line 1. When the pushing part 22 returns to the starting point position, the second detection mechanism 6 sends a stop retracting signal, and through the second detection mechanism 6, precise control over the starting point position and the pushing time of the pushing part 22 may be achieved, which is beneficial to improving conveying efficiency.

[0068] In embodiments of the present disclosure, the first detection mechanism 3 and the second detection mechanism 6 are opposite to each other along the second direction. When the pushing part 22 reaches the end point position, the first detection mechanism 3 sends a stop pushing signal. When the pushing part 22 returns to the starting point position, the second detection mechanism 6 sends a stop retracting signal. Through the first detection mechanism 3, precise control over the end point position and the return time of the pushing part 22 is achieved, and through the second detection mechanism 6, precise control over the starting point position and the pushing time of the pushing part 22 is achieved, effectively improving the conveying efficiency of the tray moving device.

[0069] In an optional embodiment, the position of the second detection mechanism 6 has a corresponding relationship with the position of the starting point, and the position of the second detection mechanism 6 is adjustable and is pre-adjusted according to the geometric property of the tray 4 to be pushed. When the pushing part 22 is at the starting point, the distance between the starting point position and a contact surface of the tray 4 to be pushed is less than or equal to a preset distance and greater than or equal to 0.

[0070] Specifically, the mounting position of the second detection mechanism 6 is adjusted accordingly according to the shape and size of the tray 4. According to the geometric property of the tray 4, the mounting position of the second detection mechanism 6 may be adjusted in the horizontal direction or in the vertical direction.

[0071] The mounting position of the second detection mechanism 6 ensures that when the pushing part 22 returns to the starting point position, the distance between the pushing part 22 and the contact surface of the tray 4 at the predetermined position is less than or equal to a preset distance. The contact surface of the tray 4 is also the first side surface of the tray 4. It may be understood that when the tray 4 is at the predetermined position, the distance between the pushing part 22 and the first side surface of the tray 4 is greater than or equal to 0.

[0072] When the pushing part 22 is at the starting point position and the distance between the pushing part 22 and the contact surface of the tray 4 is 0, in this state, the pushing time for the pushing part 22 to push the tray 4 to be separated from the conveyor line 1 is the shortest. When the pushing part 22 is at the starting point position, the distance between the pushing part 22 and the contact surface of the tray 4 is less than or equal to the preset distance, the preset distance is set according to actual requirements, and may be, for example, 10 mm to 50 mm.

[0073] Controlling the distance between the starting point position of the pushing part 22 and the contact surface of the tray 4 at the predetermined position within the preset distance

range may not only ensure that the tray 4 does not interfere or collide with the pushing part 22 during its movement in the first direction to the predetermined position, but also control the pushing time, avoiding the pushing part 22 being too far from the tray 4 at the predetermined position, which would increase the pushing time.

[0074] In embodiments of the present disclosure, the second detection mechanism 6 has a corresponding relationship with the starting point position of the pushing part 22. The position of the second detection mechanism 6 is adaptively adjusted according to the geometric property of the tray 4. When the pushing part 22 returns to the starting point position, the second detection mechanism 6 sends a stop retracting signal in time, which not only ensures that the tray 4 may be smoothly conveyed to the predetermined position in the first direction, but also ensures that the distance between the pushing part 22 and the contact surface of the tray 4 at the predetermined position is within the preset distance range, thereby achieving precise control of the pushing time and ensuring reliable operation of the tray moving device.

[0075] As shown in FIG. 6, FIG. 7 and FIG. 9, in an optional embodiment, the driving part 21 is provided with a trigger member 5, the first detection mechanism 3 includes a first photoelectric switch 31 whose position is adjustable. When the position of the first photoelectric switch changes, the position of its detection region changes accordingly. During pushing the tray 4, the driving part 21 moves to move the trigger member 5, and when the trigger member 5 moves to the detection region of the first photoelectric switch 31, it is determined that the pushing part 22 has reached the end point position.

[0076] Specifically, the first detection mechanism 3 includes a photoelectric switch which is defined herein as the first photoelectric switch 31, and the position of the first photoelectric switch 31 is adjustable. The trigger member 5 is mounted on the driving part 21, and may be an L-shaped bent plate connected to the driving part 21 by a fastener. For example, the first photoelectric switch 31 is mounted below the first side of the conveyor line 1, and the trigger member 5 and the pushing part 22 are located on two opposite sides of the driving part 21.

[0077] The driving part 21 drives the pushing part 22 to move in the second direction from the starting point position toward the end point position, and the trigger member 5 moves from the second side of the conveyor line 1 toward the first side of the conveyor line 1. When the pushing part 22 reaches the end point position, the trigger member 5 moves to a position corresponding to the first photoelectric switch 31, and a light beam emitted by the first photoelectric switch 31 is blocked by the trigger member 5, such that the first photoelectric switch 31 sends a stop pushing signal. Thereafter, the driving part 21 drives the pushing part

22 to move in the second direction from the end point position toward the starting point position, and the trigger member 5 moves from the first side of the conveyor line 1 toward the second side of the conveyor line 1.

[0078] Both the trigger member 5 and the pushing part 22 are connected to the driving part 21, the driving part 21 drives the pushing part 22 and the trigger member 5 to move synchronously. During pushing the tray 4, when the trigger member 5 moves to the detection region of the first photoelectric switch 31, the pushing part 22 moves to the end point position. The trigger member 5 and the first photoelectric switch 31 are used to determine that the pushing part 22 has reached the end point position, and the first photoelectric switch 31 sends a stop pushing signal. The trigger member 5 and the pushing part 22 move synchronously with the driving part 21, so that detection precision and accuracy are high.

[0079] As shown in FIG. 6, FIG. 7, FIG. 8 and FIG. 10, in an optional embodiment, the second detection mechanism 6 includes a second photoelectric switch 61, and the position of the second photoelectric switch 61 is adjustable. When the position of the first photoelectric switch changes, the position of its detection region changes accordingly. During retraction of the pushing part 22, the driving part 21 moves to move the trigger member 5, and when the trigger member 5 moves to the detection region of the second photoelectric switch 61, it is determined that the pushing part 22 has reached the starting point position.

[0080] Specifically, the second detection mechanism 6 includes a photoelectric switch which is defined herein as the second photoelectric switch 61, and the position of the second photoelectric switch 61 is adjustable. The first photoelectric switch 31 is mounted below the first side of the conveyor line 1, and the second photoelectric switch 61 is mounted below the second side of the conveyor line 1.

[0081] The driving part 21 drives the pushing part 22 to move in the second direction from the starting point position toward the end point position, and the trigger member 5 moves from the second side of the conveyor line 1 toward the first side of the conveyor line 1. When the pushing part 22 reaches the end point position, the trigger member 5 moves to a position corresponding to the first photoelectric switch 31, and the light beam emitted by the first photoelectric switch 31 is blocked by the trigger member 5, such that the first photoelectric switch 31 sends a stop pushing signal. Thereafter, the driving part 21 drives the pushing part 22 to move in the second direction from the end point position toward the starting point position, and the trigger member 5 moves from the first side of the conveyor line 1 toward the second side of the conveyor line 1. When the pushing part 22 returns to the starting point position, the trigger member 5 moves to a position corresponding to the second photoelectric switch 61, and

a light beam emitted by the second photoelectric switch 61 is blocked by the trigger member 5, such that the second photoelectric switch 61 sends a stop retracting signal.

[0082] The trigger member 5 and the pushing part 22 move synchronously with the driving part 21. During the process in which the pushing part 22 pushes the tray 4, the trigger member 5 moves to the detection region of the first photoelectric switch 31, and the first photoelectric switch 31 sends a stop pushing signal, determining that the pushing part 22 has reached the end point position. During the return process of the pushing part 22, the trigger member 5 moves to the detection region of the second photoelectric switch 61, and the second photoelectric switch 61 sends a stop retracting signal, determining that the pushing part 22 has returned to the starting point position.

[0083] In embodiments of the present disclosure, the first photoelectric switch 31, the second photoelectric switch 61 and the trigger member 5 are used to determine whether the pushing part 22 reaches the end point position or returns to the starting point position, with high detection precision and accuracy.

[0084] As shown in FIG. 5, in an optional embodiment, the conveyor line 1 includes N rollers configured to convey the tray 4 by rotation of each roller. The N rollers include a first roller 11 and a second roller 12 adjacent to each other, where N is an integer greater than or equal to 2. When conveying the tray 4, the top of the driving part 21 is lower than the bottom of the tray 4, and the pushing part 22 is connected to the driving part 21 through a gap between the first roller 11 and the second roller 12. The pushing part 22 is configured to push the tray 4 to leave the conveyor line 1 along the gap, and the pushing stroke is located within the gap.

[0085] Specifically, the conveyor line 1 includes a plurality of rollers, and the number of the rollers is at least two. The plurality of rollers are arranged linearly at intervals, or annularly at intervals. For example, the plurality of rollers may be conical rollers arranged annularly at intervals, with the smaller end of each roller corresponding to the first side of the conveyor line 1 and the larger end of each roller corresponding to the second side of the conveyor line 1. One of the plurality of rollers is connected to a drive shaft of a motor.

[0086] The two adjacent rollers located at a middle position of the conveyor line 1 are defined as the first roller 11 and the second roller 12, respectively, and the gap between the first roller 11 and the second roller 12 is adapted to accommodate the connecting block. The top of the driving part 21 is lower than the top contour line of the rollers. The connecting block is connected to the driving part 21, and the pushing part 22 is connected to the driving part 21 through the connecting block. The length and width dimensions of the pushing part 22 are adapted to the dimensions of the tray 4.

[0087] The driving part 21 is located below the top contour line of the first roller 11 and the second roller 12, the connecting block is located between the first roller 11 and the second roller 12, and the pushing part 22 is located above the top contour line of the first roller 11 and the second roller 12. The driving part 21 drives the connecting block to reciprocate along the gap between the first roller 11 and the second roller 12, thereby causing the pushing part 22 to reciprocate in the second direction. The structure makes full use of the upper space and lower space of the rollers, which is conducive to compactness of the overall structure.

[0088] In embodiments of the present disclosure, the conveyor line 1 includes a plurality of rollers, and the tray 4 is conveyed by rotation of the plurality of rollers, achieving smooth convey of the tray 4. The upper and lower spaces of the plurality of rollers are used to arrange the driving part 21 and the pushing part 22, which is conducive to compactness of the overall structure.

[0089] As shown in FIG. 5, FIG. 6, FIG. 7 and FIG. 8, in an optional embodiment, the driving part 21 includes a first pulley 211, a second pulley 212, and a synchronous belt 213. At least one of the first pulley 211 and the second pulley 212 may be a driving pulley, and the two are disposed opposite to each other in the second direction. The synchronous belt 213 is sleeved on an outer side of the first pulley 211 and the second pulley 212. The top of the driving part 21 is the top of the synchronous belt 213, and the pushing part 22 is connected to the top of the synchronous belt 213. An orthographic projection of the gap overlaps with an orthographic projection of the synchronous belt 213.

[0090] Specifically, the driving part 21 includes the first pulley 211 and the second pulley 212, and the first pulley 211 and the second pulley 212 are spaced apart in the second direction. One of the first pulley 211 and the second pulley 212 is close to the first side of the conveyor line 1, and the other is close to the second side of the conveyor line 1. The synchronous belt 213 is sleeved on the first pulley 211 and the second pulley 212. One of the first pulley 211 and the second pulley 212 is a driving pulley and the other is a driven pulley; or both the first pulley 211 and the second pulley 212 are driven pulleys, and are driven to rotate by a driving member. The first pulley 211 and the second pulley 212 may rotate forward or reverse synchronously.

[0091] The position of the synchronous belt 213 corresponds to the gap between the first roller 11 and the second roller 12. The connecting block is connected to the top of the synchronous belt 213, and the pushing part 22 is connected to the connecting block. The reciprocating rotation of the synchronous belt 213 drives the pushing part 22 to move from the starting point position to the end point position, or from the end point position to the starting

point position. Belt transmission is conducive to the smooth movement of the pushing part 22, effectively avoiding deviation of the tray 4 during the process of pushing the tray 4.

[0092] As shown in FIG. 6, FIG. 7 and FIG. 8, in an optional embodiment, the first pulley 211 and the second pulley 212 are not driving pulleys, and the driving part 21 further includes a driving mechanism 214 located below the N rollers. The synchronous belt 213 is sleeved on an outer side of the first pulley 211, the second pulley 212 and the driving mechanism 214, and has a cross-section substantially in a triangular shape. A first side of the triangular shape corresponds to the top of the synchronous belt 213 and is connected to the pushing part 22.

[0093] Specifically, the driving mechanism 214 includes a driving pulley and a motor, and the driving pulley and the motor may be integrated into one unit. The first pulley 211 and the second pulley 212 are spaced apart in the horizontal direction, and the driving pulley is located below the first pulley 211 and the second pulley 212 in a region between the first pulley 211 and the second pulley 212. The driving pulley, the first pulley 211 and the second pulley 212 form a triangular structure.

[0094] The first side of the triangular shape corresponds to the top of the synchronous belt 213, and the second and third sides of the triangular shape correspond to side portions of the synchronous belt 213. The trigger member 5 is mounted on the side portion of the synchronous belt 213. As the synchronous belt 213 rotates, the trigger member 5 moves to the detection region of the first photoelectric switch 31 or to the detection region of the second photoelectric switch 61.

[0095] By adjusting the vertical distance between the driving pulley and the first pulley 211 and the second pulley 212, or by adjusting the mounting position of the trigger member 5 on the side portion of the synchronous belt 213, it is ensured that when the pushing part 22 moves to the end point position, the trigger member 5 moves to the detection region of the first photoelectric switch 31; and when the pushing part 22 moves to the starting point position, the trigger member 5 moves to the detection region of the second photoelectric switch 61.

[0096] In embodiments of the present disclosure, the structure facilitates flexible adjustment of the movement trajectory of the trigger member 5 according to the pushing stroke of the pushing part 22, and further facilitates flexible adjustment of the mounting positions of the first photoelectric switch 31, the second photoelectric switch 61 and the trigger member 5 according to the geometric property of the tray 4.

[0097] As shown in FIG. 6, FIG. 7, FIG. 8, FIG. 9 and FIG. 10, in an optional embodiment, the trigger member 5 is located outside the synchronous belt 213. The tray

moving device further includes a first mounting part 32 for mounting the first detection mechanism, such as the first photoelectric switch 31, where the position of the first photoelectric switch is adjustable in an extension direction of the second side of the triangular shape; and/or a second mounting part 62 for mounting the second detection mechanism, such as the second photoelectric switch 61, where the second photoelectric switch 61 is adjustable in an extension direction of the third side of the triangular shape.

[0098] Specifically, the first mounting part 32 is used for mounting the first photoelectric switch 31, and is connected to the mounting frame 100 through a connecting plate. The mounting surface of the first mounting part 32 is parallel to the second side of the triangular shape. The second mounting part 62 is opposite to the first mounting part 32, and is used for mounting the second photoelectric switch 61. The second mounting part 62 is connected to the mounting frame 100 through a connecting plate, and the mounting surface of the second mounting part 62 is parallel to the third side of the triangular shape.

[0099] Taking the first mounting part 32 as an example, the mounting surface of the first mounting part 32 is provided with a strip-shaped hole, and the first photoelectric switch 31 is provided with a mounting hole. The first photoelectric switch 31 is connected to the first mounting part 32 by a fastener, and the mounting position of the first photoelectric switch 31 is adjusted by adjusting the alignment position between the mounting hole and the strip-shaped hole.

[0100] If the pushing stroke of the pushing part 22 is long, the first photoelectric switch 31 is adjusted upward in the extension direction of the second side of the triangular shape, such that the first photoelectric switch 31 moves toward the first pulley 211. If the pushing stroke of the pushing part 22 is short, the first photoelectric switch 31 is adjusted downward in the extension direction of the second side of the triangular shape, such that the first photoelectric switch 31 moves toward the driving pulley.

[0101] The adjustment manner of the mounting position of the second photoelectric switch 61 is the same as the adjustment manner of the mounting position of the first photoelectric switch 31, and will not be repeated here.

[0102] In embodiments of the present disclosure, the mounting position of the first photoelectric switch 31 is adjusted by the first mounting part 32, and the mounting position of the second photoelectric switch 61 is adjusted by the second mounting part 62, which facilitates flexible adjustment of the mounting positions of the first photoelectric switch 31 and the second photoelectric switch 61 according to the pushing stroke of the pushing part 22.

[0103] As shown in FIG. 11, in an optional embodiment, a top edge of a side plate of the tray 4 extends horizontally outward to form a flange. The tray moving device further includes a baffle plate 7, the baffle plate 7 is located on the same side of the conveyor line 1 as the pushing part 22, and the baffle plate 7is located above the pushing part 22. When the tray 4 is conveyed to the predetermined position and the flange abuts against the baffle plate 7, a reserved space is defined by the flange and a lower portion of the baffle plate 7, and the starting point is located within the reserved space.

[0104] Specifically, the baffle plate 7 is fixed to the mounting frame 100 and is located above the pushing part 22. The top edge of the side plate of the tray 4 extends horizontally outward to form a flange. When the tray 4 is conveyed to the predetermined position, the flange of the tray 4 abuts against the baffle plate 7, and a reserved space is defined by the flange and a lower portion of the baffle plate 7. The starting point position of the pushing part 22 is located within the reserved space.

[0105] When the pushing part 22 returns to the starting point position, if the pushing part 22 is outside the reserved space, interference may occur between the tray 4 and the pushing part 22 during the movement of the tray 4 in the first direction, preventing the tray 4 from reaching the predetermined position. The reserved space defined by the flange and the baffle plate 7 ensures that the tray 4 may smoothly move in the first direction to the predetermined position.

[0106] As shown in FIG. 1A, FIG. 2, FIG. 3 and FIG. 12, in an optional embodiment, the tray moving device further includes a sliding-off mechanism 8 located on the other side of the conveyor line 1 and opposite to the pushing part 22. The sliding-off mechanism 8 is connected to the conveyor line 1 and is inclined, the sliding-off mechanism 8 includes a rolling mechanism 82 mounted on an inclined surface of the sliding-off mechanism 8 for contacting the bottom of the tray 4 that has left the conveyor line 1.

[0107] Specifically, the sliding-off mechanism 8 is located on the second side of the conveyor line 1, and includes a slide table 81 and a rolling mechanism 82. The slide table 81 is inclined and has a first end close to the conveyor line 1 and a second end away from the conveyor line 1. The first end of the slide table 81 is not higher than the top contour line of the plurality of rollers.

[0108] The rolling mechanism 82 includes balls arranged at intervals on the slide table 81, and the rolling surfaces of the balls are used to contact the bottom surface of the tray 4. Alternatively, the rolling mechanism 82 includes a plurality of guide wheels arranged at

intervals on the slide table 81, and the wheel surfaces of the guide wheels are used to contact the bottom surface of the tray 4.

[0109] When the pushing part 22 moves to the end point position and the tray 4 is separated from the conveyor line 1, the tray 4 slides from the first end of the slide table 81 to the second end of the slide table 81 under the action of gravity. The plurality of balls reduce the friction during the sliding process of the tray 4, allowing the tray 4 to smoothly slide to the second end of the slide table 81.

[0110] In embodiments of the present disclosure, by providing the sliding-off mechanism 8, the tray 4 separated from the conveyor line 1 may smoothly slide to the second end of the slide table 81 without providing a power source, thereby achieving conveying of the tray 4.

[0111] As shown in FIG. 13 and FIG. 14, the present disclosure further provides an inspection system, and the inspection system includes a tray moving device and an inspection device. The tray moving device is configured to push the tray 4 to leave the conveyor line 1, and the tray 4 after leaving the conveyor line 1 is used for accommodating an article to be inspected. The inspection device is configured to emit radiation rays to scan the article to be inspected accommodated in the tray 4, so as to obtain a scanned image.

[0112] Specifically, the tray moving device has a two-layer structure. The first layer, i.e., the lower layer, is provided with the conveyor line 1 and the sliding-off mechanism 8, and the conveyor line 1 at the lower layer is defined as a first conveyor line. The second layer, i.e., the upper layer, is provided with a supporting platform 9 and a second conveyor line 10.

[0113] The first conveyor line is used to convey an empty tray 4 to the predetermined position. The driving part 21 and the pushing part 22 are used to push the tray 4 to the sliding-off mechanism 8. The supporting platform 9 is used for placing the tray 4 taken from the sliding-off mechanism 8. On the supporting platform 9, the article to be inspected is placed into the tray 4, and then the tray 4 loaded with the article is pushed onto the second conveyor line 10. The second conveyor line 10 is used to convey the tray 4 loaded with the article to the inspection station, and the inspection station is provided with the inspection device. The inspection device emits radiation rays to scan the article to be inspected placed in the tray 4 for inspection.

[0114] The working process of the inspection system will be described in detail below.

[0115] The first conveyor line conveys the empty tray 4 in the first direction to the predetermined position. The driving part 21 drives the pushing part 22 to move in the second direction from the starting point position toward the end point position, and the pushing part

22 pushes the tray 4 from the first side of the first conveyor line toward the second side of the first conveyor line. When the pushing part 22 reaches the end point position, the trigger member 5 moves to the detection region of the first photoelectric switch 31, and the first photoelectric switch 31 sends a stop pushing signal. Thereafter, the driving part 21 drives the pushing part 22 to move in the second direction from the end point position toward the starting point position. When the pushing part 22 returns to the starting point position, the trigger member 5 moves to the detection region of the second photoelectric switch 61, and the second photoelectric switch 61 sends a stop retracting signal. The pushing part 22 waits at the starting point position for the next tray 4 to be conveyed.

[0116] When the pushing part 22 reaches the end point position, the tray 4 is separated from the first conveyor line, and the tray 4 slides along the inclined slide table 81 from the first end of the slide table 81 to the second end of the slide table 81. At the second end of the slide table 81, the operator takes the tray 4 and places the tray 4 on the supporting platform 9 on the upper layer. The article to be inspected is placed into the tray 4 on the supporting platform 9. The tray 4 loaded with the article may be pushed onto the second conveyor line 10 manually or by a pushing mechanism. The second conveyor line 10 conveys the tray 4 loaded with the article to be inspected to the inspection station, and the inspection device at the inspection station emits radiation rays to scan the article to be inspected placed in the tray 4 for inspection.

[0117] Through the first photoelectric switch 31, the second photoelectric switch 61 and the trigger member 5, precise control over the starting point position, end point position, pushing time and return time of the pushing part 22 is achieved. The structural arrangement of the first pulley 211, the second pulley 212, the synchronous belt 213 and the driving pulley facilitates flexible adjustment of the mounting positions of the first photoelectric switch 31, the second photoelectric switch 61 and the trigger member 5. The inspection system effectively improves conveying efficiency and inspection efficiency.

[0118] The above description is merely specific embodiments of the present disclosure, but the protection scope of the present disclosure is not limited thereto. Any changes or substitutions made within the spirit and principle of the present disclosure should be covered within the protection scope of the present disclosure. Therefore, the protection scope of the present disclosure should be determined by the protection scope of the claims.

What is claimed is:

1. A tray moving device, comprising:

a conveyor line configured to convey a tray carried on the conveyor line in a first direction; and

a tray pushing mechanism comprising a driving part and a pushing part connected to each other, wherein the pushing part is located on a side of the conveyor line, the pushing part is configured to be driven by the driving part to push the tray at a predetermined position in a second direction, and the second direction intersects the first direction,

wherein when the pushing part reaches an end point of a pushing stroke of the pushing part, the tray is pushed to leave the conveyor line, and a position of the end point is associated with a geometric property of the tray, such that the pushing stroke meets a predetermined requirement.

2. The tray moving device according to claim 1, wherein,

the geometric property of the tray comprises a length in the second direction, and,

the pushing stroke meeting the predetermined requirement comprises: the pushing stroke is inversely proportional to the length for trays of different lengths.

3. The tray moving device according to claim 1, wherein,

the tray moving device further comprises: a first detection mechanism, wherein during a process of pushing the tray, the first detection mechanism is configured to, upon detecting that the pushing part reaches the end point, send a stop pushing signal; and

a position of the first detection mechanism corresponds to the position of the end point, the position of the first detection mechanism is adjustable and is pre-adjusted according to the geometric property of the pushed tray, such that the pushing stroke meets the predetermined requirement.

4. The tray moving device according to claim 3, wherein,

after the stop pushing signal is sent, the pushing part is driven by the driving part to retract to a starting point of the pushing stroke; and

the tray moving device further comprises: a second detection mechanism opposite to the first detection mechanism in the second direction, wherein the second detection mechanism is configured to, upon detecting that the pushing part reaches the starting point, send a stop retracting signal.

5. The tray moving device according to claim 4, wherein,

a position of the second detection mechanism has a corresponding relationship with a position of the starting point, and the position of the second detection mechanism is adjustable and is pre-adjusted according to the geometric property of the pushed tray; and

when the pushing part is at the starting point, a distance between the starting point and a contact surface of the pushed tray is less than or equal to a preset distance and greater than or equal to 0.

6. The tray moving device according to claim 4, wherein,

the driving part is provided with a trigger member, and the first detection mechanism comprises: a first photoelectric switch whose position is adjustable, and a position of a detection region of the first photoelectric switch changes in response to a change in a position of the first photoelectric switch; and

during the process of pushing the tray, the driving part moves to move the trigger member, and it is detected that the pushing part reaches the end point when the trigger member moves to the detection region of the first photoelectric switch.

7. The tray moving device according to claim 6, wherein,

the second detection mechanism comprises: a second photoelectric switch, whose position is adjustable, and a position of a detection region of the second photoelectric switch changes in response to a change in a position of the second photoelectric switch; and

during a process of retracting the pushing part, the driving part moves to move

the trigger member, and it is detected that the pushing part reaches the starting point when the trigger member moves to the detection region of the second photoelectric switch.

8. The tray moving device according to claim 4, wherein,

the conveyor line comprises: N rollers configured to convey the tray by rotation of each of the rollers, wherein the N rollers comprise a first roller and a second roller adjacent to each other, and N is an integer greater than or equal to 2;

during conveying of the tray, a top of the driving part is lower than a bottom of the tray, and the pushing part is connected to the driving part through a gap between the first roller and the second roller; and

the pushing part is configured to push the tray to leave the conveyor line along the gap, and the pushing stroke is located within the gap.

9. The tray moving device according to claim 8, wherein,

the driving part comprises: a first pulley; a second pulley opposite to the first pulley in the second direction; and a synchronous belt sleeved on an outer side of the first pulley and the second pulley; and

the top of the driving part is a top of the synchronous belt, the pushing part is connected to the top of the synchronous belt, and an orthographic projection of the gap overlaps with an orthographic projection of the synchronous belt.

10. The tray moving device according to claim 9, wherein the driving part further comprises:

a driving mechanism located below the N rollers, the synchronous belt is sleeved on an outer side of the first pulley, the second pulley and the driving mechanism, a cross-section of the synchronous belt is substantially in a triangular shape, and a first side of the triangular shape corresponds to the top of the synchronous belt and is connected to the pushing part.

11. The tray moving device according to claim 10, wherein the tray moving device

further comprises:

a first mounting part configured to mount the first detection mechanism, wherein the position of the first detection mechanism is adjustable in an extension direction of a second side of the triangular shape; and/or,

a second mounting part configured to mount the second detection mechanism, wherein the second detection mechanism is adjustable in an extension direction of a third side of the triangular shape.

12. The tray moving device according to claim 5, wherein,

a top edge of a side plate of the tray extends horizontally outward to form a flange;

the tray moving device further comprises: a baffle plate located on a same side of the conveyor line as the pushing part, wherein the baffle plate is located above the pushing part; and

when the tray is conveyed to the predetermined position and the flange abuts against the baffle plate, a reserved space is defined by the flange and a lower portion of the baffle plate, and the starting point is located within the reserved space.

13. The tray moving device according to claim 1, wherein,

the tray moving device further comprises: a sliding-off mechanism located on the other side of the conveyor line and opposite to the pushing part; and

the sliding-off mechanism is connected to the conveyor line and is inclined, wherein the sliding-off mechanism comprises: a rolling mechanism mounted on an inclined surface of the sliding-off mechanism, and the rolling mechanism is configured to contact a bottom of the tray leaving the conveyor line.

14. An inspection system, comprising:

the tray moving device according to any one of claims 1 to 13, wherein the tray moving device is configured to push the tray to leave the conveyor line, and the tray is configured to accommodate an article to be inspected after leaving the conveyor line; and

an inspection device configured to emit radiation rays to scan the article to be

inspected accommodated in the tray, so as to obtain a scanned image.