

AUTOMATIC CUTTING MACHINE

Technical Field

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The present invention relates to the technical field of cutting equipment, and in particular to an automatic cutting machine for automatically conveying and cutting elongated strip profiles.

10 Technical Background

Currently, when elongated strip profiles, such as aluminum profiles for window frames, are cut by a cutting machine, it requires manual participation in many steps. For example, a worker has to use a ruler to set a required cutting size, and pick up an elongated aluminum profile to put it on an operating table, and then push the aluminum profile by hand to a position of the set size. Subsequently, the worker activates the cutting machine by pressing a start button thereof to cut the aluminum profile, and removes the cut-off part of the aluminum profile by hand after the cutting is completed. In addition, the worker has to push the remaining part of the aluminum profile forward each time a cutting is completed, so that the cutting machine can be ready for performing a next cutting. If the aluminum profile is to be cut for forming an entire window frame, the cutting size should be adjusted at least twice. Moreover, because the entire cutting process requires manual participation, the overall efficiency is relatively low.

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Summary of the Invention

The present invention aims to provide an automatic cutting machine with a high degree of automation.

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The technical solution of the present invention proposes an automatic cutting machine, comprising: at least one first cutting device and at least one second cutting device, which are arranged in tandem, for cutting a profile to form a front end and a rear end of a finished product of profile, respectively; at least one finished product

taking device, for taking away the finished product of profile having been cut; at least one profile transporting device, for transporting the profile to be cut to the first cutting device and the second cutting device; at least one profile placing device, for placing the profile to be cut on the profile transporting device; and an electric control box with a PLC arranged therein. The first cutting device, the second cutting device, the finished product taking device, the profile transporting device and the profile placing device are connected to the electric control box respectively, and controlled by the PLC.

10 The first cutting device includes: a first cutting blade; a first cutting motor, having a motor shaft on which the first cutting blade is arranged, for outputting power to drive the first cutting blade into rotation; a first motor base, on which the first cutting motor is mounted; a first cutting motor moving device, for driving the first motor base to move rightward or leftward; and at least one sensor for detecting a position of the first motor base.

20 The second cutting device includes: a second cutting blade; a second cutting motor, having a motor shaft on which the second cutting blade is arranged, for outputting power to drive the second cutting blade into rotation; a second motor base, on which the second cutting motor is mounted; a second cutting motor moving device, for driving the second motor base to move rightward or leftward; at least one sensor for detecting a position of the second motor mounting base; a profile pressing assembly, for pressing, guiding and limiting the profile; a feeding assembly, for conveying the profile; a cutting platform; a platform moving device, for driving the cutting platform to move forward or rearward; and at least one sensor for detecting a position of the cutting platform. The second motor base, the second cutting motor moving device, the profile pressing assembly and the feeding assembly are all mounted on the cutting platform.

30 A lower part of the first cutting blade corresponds to a position where the profile is placed, while an upper part of the second cutting blade corresponds to the position where the profile is placed.

The first cutting device and the second cutting device are both provided with a

dust cover assembly, the dust cover assembly including a dust cover and a double-shaft cylinder for driving the dust cover to move vertically.

The profile pressing assembly comprises a front profile pressing unit, two middle profile pressing units, and a rear profile pressing unit, which are respectively arranged at a front portion, a middle portion and a rear portion of the cutting platform. The front profile pressing unit and the rear profile pressing unit each include a double-shaft cylinder and a guiding member, and each of said two middle profile pressing units includes a double-shaft cylinder and a roller member.

The finished product taking device comprises: at least one first guide rail, which are mounted on the first cutting device and the second cutting device; two mounting plates, both slidably mounted on said first guide rail; two mounting plate driving mechanisms, for driving said two mounting plates respectively to slide forward or rearward along the first guide rail; a first gripper assembly, which is arranged under each of the mounting plates in a vertically movable manner, for gripping the profile; and a first rodless cylinder fixed to each of the mounting plates, for driving the first gripper assembly to move rightward or leftward.

The profile placing devices comprises: at least one second guide rail and a rack, which are arranged transversely on a mounting frame along a left-right direction; a sliding plate, which is slidably mounted on the second guide rail; a transverse moving motor, which is fixed on the sliding plate; a second gripper assembly, which is arranged under the sliding plate, for gripping the profile to be cut; and a gripper vertical moving assembly, for driving the second gripper assembly to move vertically. The transverse moving motor has a motor shaft, which is provided thereon with a gear in engagement with the rack, so that the transverse moving motor drives the gear in rotation, for driving, through the rack, the sliding plate and the second gripper assembly to move transversely along the second guide rail.

The profile transporting device includes multiple auxiliary transporting assemblies, which are arranged longitudinally in a front-rear direction; and at least two material pressing and conveying assemblies, which are arranged in a direction along which the auxiliary transporting devices are arranged.

Each of the auxiliary transport assemblies includes: a limit receiving block, for receiving the profile; a double-shaft cylinder, for driving the limit receiving block to move vertically; a rodless cylinder, for driving the limit receiving block and the double-shaft cylinder to move transversely; and receiving rollers.

The material pressing and conveying assembly includes at least one bearing wheel, a conveying motor for driving the bearing wheel in rotation, at least one limiting wheel arranged above the bearing wheel, and a double-shaft cylinder for driving the limiting wheel to move vertically.

Two sets of the first cutting devices, two sets of the second cutting device, two sets of the finished product taking device and two sets of the profile transporting device are provided, each set being located at one side of the machine, and two sets of the profile placing device are arranged respectively at a front end and a rear end of said two sets of profile transporting devices.

Compared with the prior arts, the automatic cutting machine according to the present invention has the following advantages. It has a high degree of automation, so that no manual intervention is necessary in the whole profile cutting procedure. Therefore, the labor cost can be saved, the production efficiency can be improved, the structure of the machine can be optimized, and related operations can be more convenient. Moreover, two cutting devices can work concurrently at a close distance without affecting each other, so that a relatively short profile can be also cut smoothly.

Brief Description of the Drawings

Figure 1 schematically shows the structure of an automatic cutting machine according to the present invention.

Figure 2 schematically shows the structure of a first cutting device viewed obliquely from behind.

Figure 3 schematically shows the structure of the first cutting device viewed

obliquely from front.

Figure 4 schematically shows the structure of a second cutting device viewed obliquely from front.

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Figure 5 schematically shows the structure of the second cutting device viewed obliquely from behind.

Figure 6 schematically shows the structure of a finished product taking device.

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Figure 7 schematically shows the structure of a profile placing device, together with an auxiliary transporting device and a material pressing and conveying assembly arranged there.

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Figure 8 schematically shows the structure of the auxiliary transporting device.

Figure 9 schematically shows the structure of the material pressing and conveying assembly.

20 Detailed Description of the Embodiments

In the following, embodiments of the present invention will be further illustrated with reference to the accompany drawings.

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As shown in Figure 1, an automatic cutting machine according to the present invention mainly includes: at least one first cutting device 1 and at least one second cutting device 2, which are arranged in tandem for cutting a profile to form a front end and a rear end of a finished product of profile, respectively; at least one finished product taking device 3, for taking away the finished product of profile having been cut; at least one profile transporting device 4, for transporting the profile to be cut to the first cutting device 1 and the second cutting device 2; at least one profile placing device 5, for placing the profile to be cut on the profile transporting device 4; and an electric control box with a PLC (Programmable Logic Controller) arranged therein. The first cutting device 1, the second cutting device 2, the finished product taking

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device 3, the profile transporting device 4 and the profile placing device 5 are connected to the electric control box respectively, and controlled by the PLC.

5 In this embodiment, the first cutting device 1, the second cutting device 2, the finished product taking device 3 and the profile feeding device 4 are each provided with two sets, which are arranged on a right side and a left side of the machine respectively. The profile placing device 5 is also provided with two sets, which are installed on a front end and a rear end of the profile feeding device 4 respectively. In this manner, two sets of cutting apparatus are formed, one at the right side and the
10 other at the left side. The front profile placing device 5 and the rear profile placing device 5 are shared by the two sets of cutting apparatus. Each set of the cutting apparatus can cut two profiles at the same time, so that two sets of the cutting apparatus can provide a total of four cut profiles, which can, for example, be assembled into a complete window frame when the profiles are aluminum strip
15 profiles for the window frame.

In the following the above-mentioned devices will be described in further detail.

20 Figures 2 and 3 respectively show the rear view and the front view of the right and left sets of the first cutting devices 1. Each of the first cutting devices 1 includes a first cutting blade 11, a first cutting motor 12, a first motor base 13, a first cutting motor moving device, a plurality of sensors, and a first dust cover assembly.

25 The first cutting blade 11 is installed on a motor shaft of the first cutting motor 12, so that the first cutting blade 11 is driven into rotation by the output power from the first cutting motor 12, for cutting the profile. The first cutting motor 12 is mounted on the first motor base 13, which is further provided with an adjustable mounting plate for adjusting angles of the first cutting motor 12 and the first cutting blade 11. In this manner, the cutting angle of the profile can be adjusted.

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The first cutting motor moving device, which is used to drive the first motor mounting seat 13 to move rightward or leftward, includes a first cutting movement motor 141, a sliding rail 142, and a first synchronous belt assembly 143 consisting of a synchronous wheel and a synchronous belt. The first motor base 13 is slidably

mounted on the slide rail 142. The synchronous belt of the first synchronous belt assembly 143 is fixedly connected to the first motor base 13. The first cutting movement motor 141 can drive the synchronous belt of the first synchronous belt assembly 143 to move, thus driving the first motor mount base 13 to slide rightward or leftward.

The first dust cover assembly includes a double-shaft cylinder 16 and a dust cover (not shown). When the profile needs to be cut, the double-shaft cylinder 16 drives the dust cover down to contact with a surface of the machine table, so as to form a closed space. In this manner, debris generated in the cutting process will not be scattered to other positions of the machine.

The plurality of sensors, which is used to detect the position of the first motor base 13, includes a first forward position-limiting sensor 151, a first origin sensor 152, and a first reverse position-limiting sensor 153. When the first positive position-limiting sensor 151 detects an inductive sheet on the first motor base 13, the first cutting movement motor 141 will immediately stop, so that the first motor base 13 cannot continue to move, but move in the opposite direction only. When the first reverse position-limiting sensor 153 detects the inductive sheet on the first motor base 13, the first cutting movement motor 141 will immediately stop, so that the first motor base 13 cannot continue to move, but move in the opposite direction only. Every time the automatic cutting machine is restarted or a new set position is input, the first motor base 13 will move to a position where the first origin sensor 152 is located. When the first origin sensor 152 detects the first motor base 13 and then outputs a signal, a control element in the electric control box will issue a command to stop the first motor base 13, and then move it to the set position.

Figures 4 and 5 respectively show the front and rear views of a set of the second cutting devices 2. Each set of the second cutting devices 2 includes a second cutting blade 21, a second cutting motor 22, a second motor base 23, a second cutting motor moving device, a profile pressing assembly, a feeding assembly, a cutting platform 24, a platform moving device, a plurality of sensors, and a second dust cover assembly.

The second cutting blade 21 is installed on a motor shaft of the second cutting

motor 22, so that the second cutting blade 21 is driven into rotation by the output power from the second cutting motor 22, for cutting the profile. The second cutting motor 22 is mounted on the second motor base 23, which is further provided with an adjustable mounting plate for adjusting angles of the second cutting motor 22 and the second cutting blade 21. In this manner, the cutting angle of the profile can be adjusted.

The second cutting motor moving device, which is used to drive the second motor mounting seat 23 to move rightward or leftward, includes a second cutting movement motor 261, a sliding rail 262, and a second synchronous belt assembly 263 consisting of a synchronous wheel and a synchronous belt. The second motor base 23 is slidably mounted on the slide rail 262. The synchronous belt of the second synchronous belt assembly 263 is fixedly connected to the second motor base 23. The second cutting movement motor 261, which is a servo motor, can drive the synchronous wheel of the second synchronous belt assembly 263 to rotate and the synchronous thereof belt to move, so as to drive the second motor mount base 23 to slide rightward or leftward.

The feeding assembly, which is used for conveying the profile on the second cutting device 2, includes a feeding motor 281, a synchronous belt 282, a synchronous wheel 283, and a feeding roller assembly 284. The feeding roller assembly 284 comprises a number of rollers, roller brackets, limiting grooves or the like, and mainly functions to carry the profile and limit the position thereof. The feeding motor 281 drives, via the synchronous belt 282, the synchronous wheel 283 into rotation, which, in turn, drives the rollers of the feeding roller assembly 284 to roll.

The profile pressing assembly is installed on the cutting platform 24, for pressing, guiding and limiting the profile. The profile pressing assembly includes a front profile pressing unit 251, a middle profile pressing unit 252 and a rear profile pressing unit 253, which are respectively arranged at a front portion, a middle portion and a rear portion of the cutting platform 24. The front profile pressing unit 251 and the rear profile pressing unit 253 each include a double-shaft cylinder, a guiding member, or the like. When the profile enters an area below the two units 251 and 253, the double-shaft cylinders will drive the guiding members to press down respectively, for

guiding the profile and restricting the vertical movement of the profile. The middle profile pressing unit 252 is provided with two sets, each set including a double-shaft cylinder and a roller member. When the profile enters an area below two sets of the unitd 252, the cylinders will drive the roller members to press down. Accordingly, when the rollers press down on the profile, a frictional force between the profile and the feeding roller assembly 284 will be increased, so that the profile can advance smoothly, and at the same time the vertical movement of the profile generated by the pressing force can be restricted. The purpose of providing two sets of the middle profile pressing units 252 in this position is as follows. Each time when cutting is performed, two profiles are supplied at the same time. If one of the profiles advances to its destination while the other fails, the double-shaft cylinder of the set of the middle profile pressing units associated with the profile in position can be raised to reduce the friction of the profile, while that of the other set of the middle profile pressing unit can continue to press down, so that the profile that is not in position can continue to advance to its destination.

The second dust cover assembly includes a double-shaft cylinder 29 and a dust cover (not shown). When the profile needs to be cut, the double-shaft cylinder 29 drives the dust cover down to contact with the surface of the machine table, so as to form a closed space. In this manner, debris generated in the cutting process will not be scattered to other positions of the machine.

The second cutting blade 21, the second cutting motor 22, the second motor base 23, the second cutting motor moving device, the profile pressing assembly, the feeding assembly, and the second dust cover assembly are all mounted on the cutting platform 24. The platform moving device, which is used to drive the cutting platform 24 and all the assemblies and members mounted thereon to move forward or rearward, includes a platform moving motor 241, a rack 242 arranged longitudinally in a front-rear direction, and two linear guide rails 243 arranged at the right and left sides respectively. The platform moving motor 241 is a servo motor, which is used to output power for the movement of the cutting platform 24, and mounted at the bottom of the cutting platform 24. The motor shaft of the platform moving motor 241 is provided thereon with a gear, which is in engagement with the rack 242. The cutting platform 24 is slidably mounted on said two linear guide rails 243. The rotation of the platform

moving motor 241 will drive, through the gear and rack 242, the cutting platform 24 to slide forward or backward along the linear guide rails 243.

5 The sensors of the second cutting device 2 include: a second forward position-limiting sensor 271, a second origin sensor 272, and a second reverse position-limiting sensor 273, all for sensing the position of the second motor mounting base 23; a retreat position-limiting sensor 274, a third origin sensor 275, and an advance position-limiting sensor 276, all for sensing the position of the cutting platform 24; and an in-feeding sensor 277, for sensing whether there is a profile
10 reaching the feeding roller assembly 284.

When the profile needs to be cut, the second cutting movement motor 261 will drive the second cutting motor 22 with its second cutting blade 21 to move, in order to cut the profile. When the second forward position-limiting sensor 271 detects the
15 inductive sheet on the second motor base 23, the second cutting movement motor 261 will stop immediately, and cannot continue to move, but move in the opposite direction only. When the cutting of the profile is completed, the second cutting motor 261 will drive the second cutting motor 22 with its second cutting blade 21 to leave the cutting position. When the second reverse position-limiting sensor 273 detects the
20 inductive sheet on the second motor base 23, the second cutting movement motor 261 will stop immediately, and cannot continue to move, but move in the opposite direction only. Every time the machine is started, the second cutting movement motor 261 will automatically returns to its origin. When the second origin sensor 272 is detected at a position corresponding to that of the platform on which the second
25 cutting motor 22 is arranged and thus a signal is output, a corresponding electrical element in the electric control box will issue an instruction to stop the second cutting movement motor 261, and then restart to drive the second cutting motor 22 to the set position.

30 When the platform moving motor 241 drives the cutting platform 24 to a position where the retreat position-limiting sensor 274 can sense it, the sensor will send a signal, and finally the control element in the electrical control box, upon receipt of the signal, commands the platform moving motor 241 to stop immediately. This sensor can provide an emergency stop. Even if there is a command for retreat movement later,

the platform moving motor 241 cannot move rearward, but in the opposite direction of this direction only.

5 Every time the automatic cutting machine is restarted or a new set position is input, the cutting platform 24 will move to the position where the third origin sensor 275 is located. When the third origin sensor 275 detects the cutting platform 24 and then outputs a signal, the control element in the electric control box will issue a command to stop the cutting platform 24, and then move it to the set position.

10 When the platform moving motor 241 drives the cutting platform 24 to a position where the forward position-limiting sensor can sense it, the sensor sends a signal, and finally the control element in the electric control box receives the signal and then commands the platform moving motor 241 to stop immediately. This sensor functions to provide an emergency stop. Even if there is a command for forward movement later,
15 the platform moving motor cannot move forward, but in the opposite direction of this direction only.

Preferably, the installation angles of the first cutting blade 11 and the second cutting blade 21 in the same set of cutting devices are different from each other. More
20 specifically, a lower part of the first cutting blade 11 corresponds to the position where the profile is placed, which means it is the lower part of the first cutting blade 11 that is used to cut the profile, while an upper part of the second cutting blade 21 corresponds to the position where the profile is placed, which means it is the upper part of the second cutting blade 21 that is used to cut the profile. In this manner, an
25 entire profile with a set length can be cut off at one time. In addition, with this configuration and installation of the cutting blades, two cutting devices can work concurrently at a close distance without affecting each other, so that a relatively short profile can be also cut smoothly.

30 Figure 6 shows two sets of finished product taking devices 3, one at the right side and the other at the left side. The two sets of the finished product taking devices 3 are both arranged on a mounting frame 36, and located above the first cutting device 1 and the second cutting device 2. Each of the finished product taking devices 3 includes: two first guide rails 31, one at the right side and the other at the left side,

each longitudinally arranged in the front-rear direction; two mounting plates 32, one arranged before the other, both slidably mounted on said two first guide rails 31; two mounting plate driving mechanisms, for driving said two mounting plates 32 respectively to slide forward or rearward along the first guide rails 31; a first gripper assembly 33, which is installed under each of the mounting plates 32 in a vertically movable manner, for gripping the profile; and a first rodless cylinder 34 fixed on the bottom of each of the mounting plates 32, for driving the first gripper assembly 33 to move rightward or leftward.

Each of the mounting plate driving mechanisms further includes a driving motor 351, and a third synchronous belt assembly including synchronous wheels 352, 354 and a synchronous belt 353, wherein the synchronous belt 353 is fixedly connected to a corresponding mounting plate 32. When the driving motor 351 starts to rotate, it will drive corresponding synchronous wheels 352, 354 to rotate and the synchronous belt 353 to move, thereby driving the corresponding mounting plate 32 and the first gripper assembly 33 located therebelow to move forward or backward.

Each of the first gripper assemblies 33, consisting of a finger cylinder, a double-shaft cylinder, a gripper member, a mounting bracket or the like, can realize clamping or releasing actions of the gripper member, and vertical movement thereof. The first gripper assembly 33 located at the front is used for picking up unqualified profiles having been cut, while that located at the rear is used for picking up qualified ones.

Figure 7 schematically shows one of the profile placing devices 5, and two sets consisting of an auxiliary transporting device 41 and a material pressing and conveying assembly 42, one set at the right side while the other at the left side. Each of the profile placing devices 5 includes: two second guide rails 52 (one in front of the other) and a rack 53, all arranged transversely on an upper part of a mounting frame 51 along a left-right direction; a sliding plate 54, which is slidably mounted on the second guide rails 52; a transverse moving motor 55, which is fixed on the sliding plate 54; a second gripper assembly 56, which is arranged under the sliding plate 54 for gripping the profile to be cut; and a gripper vertical moving assembly.

The transverse moving motor 55 is a servo motor having a motor shaft, which is provided thereon with a gear in engagement with the rack 53. The transverse moving motor 55 drives the gear in rotation, so as to drive, through the rack 53, the sliding plate 54 and the second gripper assembly 56 to move transversely along the second guide rails 52, either leftward or rightward. The second gripper assembly 56, consisting of a finger cylinder, a gripper member, a mounting bracket or the like, is used for picking and placing the profile. The gripper vertical moving assembly includes a gripper motor 57, and a synchronous belt assembly consisting of a synchronous wheel, a synchronous belt or the like, for driving the second gripper assembly 56 to move vertically.

As shown in Figures 1 and 7, each of the profile transporting devices 4 includes: multiple auxiliary transporting assemblies 41, which are arranged longitudinally in the front-rear direction; and at least two material pressing and conveying assemblies 42, which are arranged in a direction along which the auxiliary transporting devices 41 are arranged.

As shown in Figure 8, each of the auxiliary transporting assemblies 41 is mounted on the top of a mounting frame 43, and includes: a limit receiving block 411, for receiving the profile; a double-shaft cylinder 412, for driving the limit receiving block 411 to move vertically; a rodless cylinder 413, for driving the limit receiving block 411 and the double-shaft cylinder 412 to move transversely in the left-right direction; and receiving rollers 414 for carrying and limiting the profile.

As shown in Figure 9, each of the material pressing and conveying assemblies 42 is mounted on the top of a mounting frame 44, and includes at least one bearing wheel 421, a conveying motor 422 and a fourth synchronous belt assembly 425 for driving the bearing wheel 421 in rotation, at least one limiting wheel 423 arranged above the bearing wheel 421, and a double-shaft cylinder 424 for driving the limiting wheel 423 to move vertically. When the profile is placed on the bearing wheel 421 and the double-shaft cylinder 424 drives the limiting wheel 423 to press down, the profile will be restricted within a preset space. At this time, the conveying motor 422 can be activated to realize that the profile is conveyed through the fourth synchronous belt assembly 425.

In the automatic cutting machine according to the present invention, two sets of cutting apparatus are operated in the same manner. The front and rear sets of the profile placing devices 5 are shared by the two sets of apparatus. The difference
5 between the two sets of cutting apparatus is that the lengths of the cut-off profiles are different from each other. The two sets of cutting apparatus are operated concurrently, and after the profiles, such as aluminum profiles, are cut, four sub-profiles cut from the two sets of cutting apparatus can be exactly assembled into a complete window frame.

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In the following, the operation procedure of one of the cutting apparatus will be described.

1. The length of the aluminum profile to be cut is set according to the
15 requirements of production.

2. The cutting platform 24, the first cutting movement motor 141 and the second cutting movement motor 261 are controlled to return to respective origins. When corresponding sensors (i.e., the first origin sensor 152, the second origin sensor 272,
20 and the third origin sensor 275) detect corresponding positions of the cutting platform 24 and output respective signals, corresponding electrical elements in the electric control box will issue commands to stop the motors, then start to drive corresponding components to respective preset positions, and finally stop. The preset positions are defined as start positions.

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3. The transverse moving motor 55 of each of two profile placing devices 5 is activated, driving the second gripper assembly 56 to the position where the aluminum profile is placed.

30 4. After the second gripper assembly 56 reaches the position where the aluminum profile is placed, the gripper motor 57 of each profile holding device 5 is activated to drive the synchronous belt into rotation, so as to move the gripper member of the second gripper assembly 56 down to its preset position.

5. When the second gripper assembly 56 is lowered to its position, the gripper motor 57 stops, and the finger cylinder of the assembly drives the gripper member to grip the aluminum profile. When a gripping signal is transmitted from the finger cylinder, the electric control box sends a command to restart the gripper motor 57,
5 thus lifting the gripper member with the aluminum profile to its preset position.

6. When the gripper member is lifted to its position, the transverse moving motor 55 of each of the two profile placing devices 5 is activated, so that the aluminum profile is moved to its preset position, which is above the auxiliary transporting
10 assembly 41.

7. When the profile placing device 5 carrying the aluminum profile reaches its preset position, the gripper motor 57 is activated to lower the second gripper assembly 56, until the aluminum profile is placed on the limit receiving block 411 of the
15 auxiliary transporting assembly 41.

8. After the aluminum profile is placed stably on the limit receiving block 411, the rodless cylinder 413 of the auxiliary transporting assembly 41 is activated to deliver the aluminum profile to a preset position above the receiving rollers 414 and
20 the bearing wheels 421. After that, the double-shaft cylinder 412 of the auxiliary transporting assembly 41 descends, in order to place the aluminum profile on the receiving rollers 414. After the aluminum profile is stably placed on the receiving rollers 414, the rodless cylinder 413 is activated again to return to its original position. Then, the double-shaft cylinder 424 of the material pressing and conveying assembly
25 42 drives its limiting wheel 423 to press down, so that the aluminum profile is placed stably.

9. After the aluminum profile is placed stably on the receiving rollers 414 and the limiting wheel 423 of the material pressing and conveying assembly 42 presses on the
30 aluminum profile tightly, two sets of the conveying motors 422 are activated, so that the aluminum profile is delivered to the feeding roller assembly 284 of the second cutting device 2.

10. After the aluminum profile is delivered onto the rollers of the feeding roller

assembly 284, the in-feeding sensor 277 detects the aluminum profile and outputs a signal to the electric control box. Then, according to the signal from the in-feeding sensor 277, the control element of the electric control box issues an instruction to activate the feeding motor 281, thus driving the rollers of the feeding roller assembly 284 into rotation. At this time, the front profile pressing unit 251, the middle profile pressing unit 252 and the rear profile pressing unit 253 simultaneously press down. Under the actions of the conveying motor 422 and the feeding motor 281, the aluminum profile finally advances along the cutting direction smoothly.

11. When the aluminum profile advances to the preset position, a corresponding signal is issued to stop the conveying motor 422 and the feeding motor 281.

12. When the feeding motor stops, the double-shaft cylinders 16 and 29 of the first dust cover assembly and the second dust cover assembly are activated to lower the dust covers to fit with the surface of the machine table. Then, the first cutting motor 12 and the second cutting motor 22 are activated at the same time.

13. After the above actions are completed, the first cutting movement motor 141 and the second cutting movement motor 261 associated with each cutting motor are activated, driving the cutting blades in rotation to cut the aluminum profile.

14. When the first cutting movement motor 141 and the second cutting movement motor 261 drive the corresponding cutting blades to cut the aluminum profile, then move to respective preset positions and stop there, the cutting procedure is completed. Then, corresponding electric elements in the electric control box issue instructions, so that the first cutting movement motor 141 and the second cutting movement motor 261 are driven reversely, thus returning to their preset original positions, respectively. After that, the first cutting movement motor 141, the second cutting movement motor 261, the first cutting motor 12 and the second cutting motor 22 all stop simultaneously.

15. After the aluminum profile is cut as needed, the right drive motor 351 starts to rotate, driving the synchronous wheels 352, 354 and the synchronous belt 353 into rotation, and finally driving the first gripper assembly 33 located at the rear to move,

if the cut aluminum profile is qualified. When the first gripper assembly 33 reaches its preset position above the cut aluminum profile, the right drive motor 351 stops. Then, the double-shaft cylinder of the first gripper assembly 33 located at the rear is operated to lower the finger cylinder, so that the gripper member finally picks up the aluminum profile. Subsequently, the right drive motor 351 is activated to drive the aluminum profile to move to a platform where qualified aluminum profiles should be placed, and then put down the aluminum profile after reaching a discharging position. If the aluminum profile is unqualified, the left drive motor 351 is activated, driving the first gripper assembly 33 located at the front and associated with the left drive motor 351 to perform the same actions, so that the unqualified aluminum profile is taken away and then put down at a waste position.

16. After the above operations are completed, the cutting of the aluminum profiled has been completed.

It can be seen that the automatic cutting machine according to the present invention performs automatic operations throughout the entire procedure of taking raw materials, transporting, cutting, and picking finished products, with no manual intervention necessary. In addition, four profiles of two lengths can be cut out at one time by means of the automatic cutting machine, which greatly improves the production efficiency. Moreover, according to the automatic cutting machine, labor cost can be saved, the structure of the machine can be optimized, and related operations can be more convenient.

It should be understood that the foregoing embodiments are only used to illustrate, rather than restrict, the technical solutions of the present invention. Those of ordinary skills in the art can modify the technical solutions in the foregoing embodiments, or make equivalent replacements on some of the technical features therein. Obviously, these modifications or replacements would not deviate from the spirit and protection scope of the technical solutions of the embodiments of the present invention.

CLAIMS

1. An automatic cutting machine, characterized in that it comprises:

at least one first cutting device (1) and at least one second cutting device (2),
5 which are arranged in tandem, for cutting a profile to form a front end and a rear end of a finished product of profile, respectively;

at least one finished product taking device (3), for taking away the finished product of profile having been cut;

at least one profile transporting device (4), for transporting the profile to be cut to
10 the first cutting device (1) and the second cutting device (2);

at least one profile placing device (5), for placing the profile to be cut on the profile transporting device (4); and

an electric control box with a PLC arranged therein,

wherein the first cutting device (1), the second cutting device (2), the finished
15 product taking device (3), the profile transporting device (4) and the profile placing device (5) are connected to the electric control box respectively, and controlled by the PLC.

2. The automatic cutting machine according to claim 1, characterized in that

20 the first cutting device (1) includes:

a first cutting blade (11);

a first cutting motor (12), having a motor shaft on which the first cutting blade (11) is arranged, for outputting power to drive the first cutting blade (11) into rotation;

25 a first motor base (13), on which the first cutting motor (12) is mounted;

a first cutting motor moving device, for driving the first motor base (13) to move rightward or leftward; and

at least one sensor for detecting a position of the first motor base (13), and

the second cutting device (2) includes:

30 a second cutting blade (21);

a second cutting motor (22), having a motor shaft on which the second cutting blade (11) is arranged, for outputting power to drive the second cutting blade (21) into rotation;

a second motor base (23), on which the second cutting motor (22) is

mounted;

a second cutting motor moving device, for driving the second motor base (23) to move rightward or leftward;

at least one sensor for detecting a position of the second motor mounting
5 base (23);

a profile pressing assembly, for pressing, guiding and limiting the profile;

a feeding assembly, for conveying the profile;

a cutting platform (24);

a platform moving device, for driving the cutting platform (24) to move
10 forward or rearward; and

at least one sensor for detecting a position of the cutting platform (24),

wherein the second motor base (23), the second cutting motor moving device, the profile pressing assembly and the feeding assembly are all mounted on the cutting platform (24).

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3. The automatic cutting machine according to claim 2, characterized in that a lower part of the first cutting blade (11) corresponds to a position where the profile is placed, while an upper part of the second cutting blade (21) corresponds to the position where the profile is placed.

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4. The automatic cutting machine according to claim 2, characterized in that the first cutting device (1) and the second cutting device (2) are both provided with a dust cover assembly, the dust cover assembly including a dust cover and a double-shaft cylinder for driving the dust cover to move vertically.

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5. The automatic cutting machine according to claim 2, characterized in that the profile pressing assembly comprises a front profile pressing unit (251), two middle profile pressing units (252), and a rear profile pressing unit (253), which are respectively arranged at a front portion, a middle portion and a rear portion of the cutting platform (24),

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wherein the front profile pressing unit (251) and the rear profile pressing unit (253) each include a double-shaft cylinder and a guiding member, and each of said two middle profile pressing units (252) includes a double-shaft cylinder and a roller member.

6. The automatic cutting machine according to any one of claims 1 to 5, characterized in that the finished product taking device (3) comprises:

at least one first guide rail (31), which are mounted on the first cutting device (1)

5 and the second cutting device (2);

two mounting plates (32), both slidably mounted on said first guide rail (31);

two mounting plate driving mechanisms, for driving said two mounting plates (32) respectively to slide forward or rearward along the first guide rail (31);

10 a first gripper assembly (33), which is arranged under each of the mounting plates (32) in a vertically movable manner, for gripping the profile; and

a first rodless cylinder (34) fixed to each of the mounting plates (32), for driving the first gripper assembly (33) to move rightward or leftward.

7. The automatic cutting machine according to any one of claims 1 to 5, 15 characterized in that the profile placing devices (5) comprises:

at least one second guide rail (52) and a rack (53), which are arranged transversely on a mounting frame (51) along a left-right direction;

a sliding plate (54), which is slidably mounted on the second guide rail (52);

a transverse moving motor (55), which is fixed on the sliding plate (54);

20 a second gripper assembly (56), which is arranged under the sliding plate (54), for gripping the profile to be cut; and

a gripper vertical moving assembly, for driving the second gripper assembly (56) to move vertically,

wherein the transverse moving motor (55) has a motor shaft, which is provided 25 thereon with a gear in engagement with the rack (53), so that the transverse moving motor (55) drives the gear in rotation, for driving, through the rack (53), the sliding plate (54) and the second gripper assembly (56) to move transversely along the second guide rail (52).

30 8. The automatic cutting machine according to any one of claims 1 to 5, characterized in that

the profile transporting device (4) includes multiple auxiliary transporting assemblies (41), which are arranged longitudinally in a front-rear direction; and at least two material pressing and conveying assemblies (42), which are arranged in a

direction along which the auxiliary transporting devices (41) are arranged,

wherein each of the auxiliary transport assemblies (41) includes: a limit receiving block, for receiving the profile; a double-shaft cylinder, for driving the limit receiving block to move vertically; a rodless cylinder, for driving the limit receiving block and the double-shaft cylinder to move transversely; and receiving rollers; and

the material pressing and conveying assembly (42) includes at least one bearing wheel, a conveying motor for driving the bearing wheel in rotation, at least one limiting wheel arranged above the bearing wheel, and a double-shaft cylinder for driving the limiting wheel to move vertically.

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9. The automatic cutting machine according to any one of claims 1 to 5, characterized in that two sets of the first cutting devices (1), two sets of the second cutting device (2), two sets of the finished product taking device (3) and two sets of the profile transporting device (4) are provided, each set being located at one side of the machine, and

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two sets of the profile placing device (5) are arranged respectively at a front end and a rear end of said two sets of profile transporting devices (4).