

AUTOMATIC MILLING MACHINE

Technical Field

5 The present invention relates to the technical field of milling or drilling apparatus, in particular to a milling machine capable of automatically performing milling or drilling operations.

Technical Background

10

 Currently, many steps in a process of milling or drilling a hole in the surface of a workpiece, such as an aluminum block of widow stay, require manual participation, such as steps of: measuring the size of the aluminum block of widow stay, the position of the hole, and the size of the hole, etc; placing the aluminum block on an operating
15 table and pushing it to a predetermined position for fixing; milling or drilling the hole on the surface of the aluminum block, etc. In addition, when it is intended to form a different type of hole in the surface of the aluminum block, it is necessary to replace the current milling tool with a new one. As a result, multiple steps of the entire milling or drilling process require manual operation, which reduces the automation of the
20 milling apparatus, thus rendering the operation efficiency low. Moreover, precision of the milling or drilling operation is not sufficient, resulting in a phenomenon that the aluminum block of widow stay cannot be assembled with other components, so that the speed and accuracy of assembling operations will be affected.

25 Summary of the Invention

 The present invention aims to provide an automatic milling machine, which is of high degree of automation, and capable of performing milling or drilling operations with high milling accuracy.

30

 The present invention proposes an automatic milling machine, comprising: a milling device for performing milling or drilling operation on a metal part; a delivering rail mounted on a working table, for receiving a metal part and allowing the

metal part to move back and forth thereon; a pushing assembly for pushing the metal part to move forward along the delivering rail; a first moving assembly for driving the pushing assembly to move back and forth along the delivering rail; a second moving assembly for driving the milling device to move back and forth; a third moving assembly for driving the milling device to move up and down; a limiting assembly for blocking a forward movement of the metal part located at a milling station; a locking assembly for fixing the metal part located at the milling station; at least one sensor arranged at one side of the delivering rail, for detecting whether the metal part is on the delivering rail; and an electric control box with a PLC arranged therein. The milling device, the pushing assembly, the first moving assembly, the second moving assembly, the third moving assembly, the limiting assembly, the locking assembly and the sensor are connected to the electric control box respectively, and controlled by the PLC.

15 The pushing assembly comprises a first cylinder, a supporting member, a pushing block, and a spring. The supporting member is driven up and down by the first cylinder, and the pushing block is slidably arranged in front of the supporting member, the spring being arranged between the supporting member and the pushing block.

20 Two pushing assemblies are provided, one located behind the other. A connecting plate, to which a connecting element is fixedly connected, is fixedly connected between said two pushing assemblies, the connecting element being connected with the first moving assembly.

25 The first moving assembly comprises a first guide rail, a first ball screw, a first motor, and a first synchronizing wheel assembly. The first guide rail is arranged at one side of the delivering rail and parallel to a length direction of the delivering rail. The first ball screw is parallel to the first guide rail, and the connecting element is mounted on the first guide rail, and fixedly connected to a nut seat provided on the first ball screw. The first synchronous wheel assembly consists of a synchronous wheel fixed on an output shaft of the first motor, a synchronous wheel fixed on the first ball screw, and a synchronous belt. The first motor drives the first ball screw in rotation through the first synchronizing wheel assembly, thereby driving the

connecting element to move forward or backward.

The second moving assembly includes a second guide rail, a second ball screw, a second motor, and a second synchronous wheel assembly. The second guide rail is arranged at one side above the delivering rail and is parallel to the length direction of the delivering rail. The second ball screw is parallel to the second guide rail, and the milling device is mounted on a milling device mounting assembly, which is mounted on the second guide rail and fixedly connected to a nut seat provided on the second ball screw. The second synchronous wheel assembly consists of a synchronous wheel fixed on an output shaft of the second motor, a synchronous wheel fixed to the second ball screw, and a synchronous belt. The second motor drives the second ball screw in rotation through the second synchronous wheel assembly, thus driving the milling device mounting assembly to move forward or backward.

The third moving assembly is mounted on the milling device mounting assembly, and includes a third guide rail, a third ball screw, a third motor, and a third synchronous wheel assembly. The third guide rail and the third ball screw are both vertically arranged, and the milling device mounting assembly includes a fixing plate fixedly connected to the milling device, the fixing plate being mounted on the third guide rail and fixedly connected to a nut seat provided on the third ball screw. The third synchronous wheel assembly consists of a synchronous wheel fixed on an output shaft of the third motor, a synchronous wheel fixed to the third ball screw, and a synchronous belt. The third motor drives the third ball screw in rotation through the third synchronous wheel assembly, thus driving the fixing plate to move up or down.

The limiting assembly includes a limiting block, a second cylinder and a limiting bracket, wherein the limiting bracket, on which the second cylinder is mounted, is mounted on one side of the delivering rail, and the limiting block is driven by the second cylinder to extend toward or retract away from the delivering rail.

Two limiting assemblies are provided, one of which is arranged at a front end of the delivering rail while the other is arranged at a middle portion thereof.

The locking assembly includes a locking cylinder assembly and a rotary clamping cylinder assembly. The locking cylinder assembly includes a clamping block, a third cylinder and a clamping installation block. The clamping installation block is fixedly mounted on the working table, the third cylinder is mounted on the clamping installation block, and the clamping block is formed as an L-shaped structure by a horizontal plate and a vertical plate, wherein the horizontal plate is fixed to the third cylinder, and driven thereby to move left and right. When the third cylinder is retracted, the vertical plate of the clamping block clamps a side surface of the metal part located at the clamping block. The rotary clamping cylinder assembly includes a rotary clamping cylinder, and a pressing element, which is mounted on an output shaft of the rotary clamping cylinder, and driven by the rotary clamping cylinder in rotation to press down on a top of the metal part located there.

Compared with the prior arts, the automatic milling machine of the present invention realizes the automation of pushing, limiting, locking and milling metal parts, and has a high degree of overall automation, which can greatly reduce labor intensity and improve processing efficiency with high accuracy. Moreover, the milling tool can be customized for milling or drilling, and also for different types of holes. Therefore, the operation is more convenient.

Brief Description of the Drawings

Figure 1 is a perspective view of an automatic milling machine according to the present invention in an assembled state.

Figure 2 is a perspective view of the automatic milling machine according to the present invention, when a metal part is placed thereon.

Figure 3 is a rear view of the automatic milling machine according to the present invention in the assembled state.

Figure 4 schematically shows the structure of a pushing assembly.

Figure 5 schematically shows the structure of a limiting assembly.

Figure 6 schematically shows the structure of a locking cylinder assembly.

5

Figure 7 schematically shows the structure of a rotary clamping cylinder assembly.

Figure 8 schematically shows the structure of a connection between a front
10 pushing assembly and a rear pushing assembly.

Figure 9 schematically shows the structure of the automatic milling machine and a milling machine mounting assembly thereof.

15 Detailed Description of the Embodiments

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

20 Referring to Figures 1 to 3, an automatic milling machine according to the present invention mainly includes: a milling device 1 mounted above a working table 20, for performing milling or drilling operations on a metal part 10; a delivering rail 2 mounted on the working table 20, for receiving the metal part 10 and allowing the metal part 10 to move back and forth thereon; a pushing assembly 3 for pushing the
25 metal part 10 to move forward along the delivering rail 2; a first moving assembly for driving the pushing assembly 3 to move back and forth along the delivering rail 2; a second moving assembly for driving the milling device 1 to move back and forth; a third moving assembly for driving the milling device 1 to move up and down; a limiting assembly 5 for blocking a forward movement of the metal part 10; a locking
30 assembly for fixing the metal part 10; multiple sensors for detecting whether the metal part 10 is on the delivering rail 2; and an electric control box with a PLC (Programmable Logic Controller) arranged therein. The milling device 1, the pushing assembly 3, the first moving assembly, the second moving assembly, the third moving

assembly, the limiting assembly 5, the locking assembly and the sensors are connected to the electric control box respectively, and controlled by the PLC.

5 The delivering rail 2 is a linear rail extending in a front-to-rear direction. The rail is provided with two rows of rollers, a right row and a left row. The metal part 10 can be placed between said two rows of rollers, and can move along a length direction of the delivering rail 2 under a thrust force.

10 As shown in Figure 4, the pushing assembly 3 includes a first cylinder 31, a supporting member 32, a pushing block 33, and a spring 34. The supporting member 32 is driven by the first cylinder 31 to move up and down, and the pushing block 33 is slidably arranged in front of the supporting member 32, wherein the spring 34 is arranged between the supporting member 32 and the pushing block 33. In this embodiment, two pushing assemblies 3 are provided to push two metal parts 10, one
15 located behind the other, at the same time. As shown in Figure 8, said two pushing assemblies 3 are arranged one behind the other, with a distance between said two pushing assemblies 3 being greater than a length of the metal part 10. A connecting plate 35 is connected between the two pushing assemblies 3. One end of the supporting member 32 is hinged to an end of the connecting plate 35, and the other
20 end thereof is connected to the pushing block 33. The connecting plate 35 is fixedly connected to a connecting element 36, which is used to connect with the first moving assembly. By means of which, the first moving assembly can drive the two pushing assemblies 3 to move forward or backward at the same time through the connecting element 36. The supporting member 32 spans over the delivering rail 2. When the first
25 cylinder 31 drives the supporting member 32 to move down, the height of the pushing block 33 corresponds to the metal part 10 placed on the delivering rail 2. When the pushing assembly 3 moves forward, the metal part 10 will be pushed forward also, and in this case, the spring 34 can provide buffering effect against the thrust force. When the first cylinder 31 drives the supporting member 32 to move up, the height of
30 the pushing block 33 and the supporting member 32 located therebehind is higher than the metal part 10. At this time, the pushing assembly 3 will not touch the metal part 10 even if it moves back and forth.

As shown in Figures 1 and 3, the first moving assembly includes a first guide rail 411, a first ball screw 412, a first motor 413, and a first synchronous wheel assembly 414. The first guide rail 411 is arranged at one side of the delivering rail 2 and parallel to the length direction of the delivering rail 2. The first ball screw 412 is parallel to the first guide rail 411. The connecting element 36 is mounted on the first guide rail 411, and fixedly connected to a nut seat provided on the first ball screw 412. In order to move more smoothly, the connecting plate 35 is also mounted on the first guide rail 411. The first motor 413 is arranged at a rear end of the delivering rail 2. The first synchronous wheel assembly 414 consists of a synchronous wheel fixed on an output shaft of the first motor 413, a synchronous wheel fixed on the first ball screw 412, and a synchronous belt. In this manner, the engagement between teeth of the synchronous belt and grooves of the synchronous wheels can provide power transmission. The first motor 413 drives the first ball screw 412 in rotation through the first synchronizing wheel assembly 414, thereby driving the connecting element 36, the connecting plate 35 fixed thereto, and two pushing assemblies 3 to move forward or backward at the same time.

A mounting frame 30 is fixed at a side of the delivering rail 2. The milling device 1 is mounted on a milling device mounting assembly 8, which is mounted on the mounting frame 30 and includes a fixing plate 81 fixedly connected to the milling device 1. After being mounted, the milling device 1 is located at a position above the delivering rail 2. The second moving assembly and the third moving assembly are also mounted on the mounting frame 30.

As shown in Figures 1 and 3, the second moving assembly includes a second guide rail 421, a second ball screw 422, a second motor 423 and a second synchronous wheel assembly 424. The second guide rail 421 and the second ball screw 422 are both parallel to the length direction of the delivering rail 2. The milling device mounting assembly 8 is mounted on the second guide rail 421, and fixedly connected to a nut seat provided on the second ball screw 422. The second motor 423 can be arranged at a front end of the second guide rail 421. The second synchronous wheel assembly 424 consists of a synchronous wheel fixed on an output shaft of the second motor 423, a synchronous wheel fixed to the second ball screw 422, and a

synchronous belt. The second motor 423 drives the second ball screw 422 in rotation through the second synchronous wheel assembly 424, thus driving the milling device mounting assembly 8 and the milling device 1 to move forward or backward.

5 As shown in Figures 3 and 9, the third moving assembly is mounted on the milling device mounting assembly 8, and includes a third guide rail 431, a third ball screw 432, a third motor 433, and a third synchronous wheel assembly 434 . Two third guide rails 431 are vertically arranged on both sides of the milling device mounting assembly 8. The third ball screw 432 is vertically arranged in the middle of the
10 milling device mounting assembly 8. The fixing plate 81 is arranged on both third guide rails 431, and fixedly connected to a nut seat provided on the third ball screw 432. The third motor 433 is arranged on the top of the back side of the milling device mounting assembly 8. The third synchronous wheel assembly 434 consists of a synchronous wheel fixed on an output shaft of the third motor 433, a synchronous
15 wheel fixed to the third ball screw 432, and a synchronous belt. The third motor 433 drives the third ball screw 432 into rotation through the third synchronous wheel assembly 434, thus driving the fixing plate 81 and the milling device 1 to move up or down.

20 As shown in Figure 5, the limiting assembly 5 includes a limiting block 51, a second cylinder 52, and a limiting bracket 53. The limiting bracket 53 is mounted on one side of the delivering rail 2, and the second cylinder 52 is mounted on the limiting bracket 5. The limit block 51 is driven by the second cylinder 52 to extend toward or retract away from the delivering rail 2. Preferably, a rear end face 511 of the limiting
25 block 51 may be provided with a cut corner, which corresponds to a front end face of the metal part 10 in terms of shape. When the limiting block 51 is driven by the second cylinder 52 to extend, it is located slightly above the delivering rail 2, so as to prevent the metal part 10 located therebehind from moving forward on the delivering rail 2. When the limiting block 51 is driven by the second cylinder 52 to retract, the
30 limiting block 51 leaves away from the delivering rail 2, so that the metal part 10 on the delivering rail 2 is no longer blocked by the limiting block 51. In this embodiment, there are two limiting assemblies 5, one of which is arranged at the front end of the delivering rail 2 while the other is arranged at the middle thereof.

The locking assembly includes a locking cylinder assembly 61 for locking a side of the metal part 10, and a rotary clamping cylinder assembly 62 for pressing a top of the metal part 10.

5

As shown in Figure 6, the locking cylinder assembly 61 includes a clamping block 611, a third cylinder 612, and a clamping installation block 613. The clamping installation block 613 is fixedly mounted on the working table 20, and the third cylinder 612 is mounted on the clamping installation block 613. The clamping block 611 is formed as an L-shaped structure by a horizontal plate and a vertical plate, wherein the horizontal plate is fixed to the third cylinder 612, and the vertical plate is located outside of the side of the metal part 10. The clamping block 611 can be driven by the third cylinder 612 to move left or right. When the third cylinder 612 is retracted, the vertical plate of the clamping block 611 will clamp the side of the metal part 10 located at the clamping block 611. In this embodiment, several locking cylinder assemblies 61 are provided, and distributed along the length direction of the delivering rail 2. Of course, these locking cylinder assemblies 61 are mounted at the milling station of the metal part 10 in the middle section of the delivering rail 2, for clamping the side of the metal part 10 to facilitate the subsequent milling or drilling operation.

10
15
20

As shown in Figure 7, the rotary clamping cylinder assembly 62 includes a rotary clamping cylinder 621 and a pressing element 622. The pressing element 622 is mounted on an output shaft of the rotary clamping cylinder 621, and driven by the rotary clamping cylinder 621 in rotation to press down on the top of the metal part 10 located there. Similarly, the rotary clamping cylinder assembly 62 is located at the milling station of the metal part 10 in the middle of the delivering rail 2 also.

25

There are three sensors distributed along one side of the delivering rail 2, for detecting whether there is a metal part 10 on the delivering rail 2 at the positions where the sensors are located. As shown in Figure 1, in this embodiment, said three sensors include a rear sensor 71 located in the rear section of the delivering rail 2, a middle sensor 73 located in the middle section of the delivering rail 2, and a front

30

sensor 72 located in the front section of the delivering rail 2. As shown in Figure 5, the middle sensor 73 may be arranged on the side of the delivering rail 2 where the limiting assembly 5 is located.

5 In addition, in order to ensure safe operations of the automatic milling machine according to the present invention, as shown in Figure 1, a first front limit switch 92 and a first rear limit switch 91 are provided at the front and rear ends of the first ball screw 412, respectively. A first origin sensor 74 is further provided near the first rear limit switch 91. Moreover, a second front limit switch 94 and a second rear limit
10 switch 93 are provided on the mounting frame 30, at the front and rear ends of the second guide rail 421, respectively. A second origin sensor 75 is further provided near the second front limit switch 94. As shown in Figure 9, an ascending limit switch 95 and a descending limit switch 96 are provided on upper and lower portions of a side of the milling device mounting assembly 8, respectively, and a third origin sensor 76
15 is further provided above the third rail 431.

The first front limit switch 92 and a first rear limit switch 91 are each a micro switch or a travel switch. In the case that a corresponding component should, after being driven forward or backward by the first motor 413 to its predetermined position,
20 be stopped but cannot be stopped, the nut seat on the first ball screw 412 would touch the first front limit switch 92 or the first rear limit switch 91, so that the first motor 413 would immediately stop, whereby forward and backward protection can be achieved. Similarly, the second front limit switch 94 and a second rear limit switch 93 are each a micro switch or a travel switch also. In the case that a corresponding
25 component should, after being driven forward or backward by the second motor 423 to its predetermined position, be stopped but cannot be stopped, the second front limit switch 94 or the second rear limit switch 93 would be touched, so that the second motor 423 would immediately stop. The ascending limit switch 95 and the descending limit switch 96 are each a micro switch or a travel switch also. In the case that the
30 milling device 1 should, after being driven upward or downward by the third motor 433 to its predetermined position, be stopped but cannot be stopped, the ascending limit switch 95 or the descending limit switch 96 would be touched, so that the third motor 433 would immediately stop.

Each time when the entire machine is turned on, the first motor 413 is automatically activated to drive the first ball screw 412 in rotation, thus driving the nut seat on the first ball screw 412 and the components fixed on the nut seat, such as the pushing assembly 3, to return to the position of the first origin sensor 74. When the first origin sensor 74 outputs a signal, a corresponding electrical device in the electric control box will issue an instruction to stop the first motor 413 first, and then start it, thus driving the above components to their predetermined positions respectively. Similarly, each time when the entire machine is turned on, by means of the second origin sensor 75, the second motor 423 drives the milling device 1, the milling device mounting assembly 8, and the components mounted on the milling device mounting assembly 8 to their predetermined positions respectively. Again, each time when the entire machine is turned on, by means of the third origin sensor 76, the third motor 433 drives the milling device 1 to its predetermined position.

The process of performing milling operations on the metal part 10 with the automatic milling machine according to the present invention is as follows.

1. The machine is turned on, and the size and the model of the metal part 10 to be milled or drilled are set.

2. At this time, the first motor 413, the second motor 423, the third motor 433, the fourth motor 443, and the fifth motor 453 are all activated to return to their origins, respectively.

3. The metal part 10 to be milled or drilled is placed on the rear section of the delivering rail 2, so that the rear sensor 71 can sense existence of the metal part 10.

4. The first motor 413 is activated again, and according to the setting, drives the first synchronous wheel assembly 414 in rotation, thereby driving the first ball screw 412 to rotate. After the first ball screw 412 rotates, it drives the nut seat arranged thereon and the pushing assembly 3 connecting to the nut seat to push the metal part 10 forward. At this time, the second cylinder 52 and the limiting block 51 of the

limiting assembly 5 in the middle of the delivering rail 2 are both in an extended state.

5 5. When the metal part 10 is pushed to contact the limiting assembly 5 in the middle of the delivering rail 2, the cut corner of the front end of the metal part 10 just enters the cut corner of the back end face 511 of the limiting block 51 of the limiting assembly 5. At this time, the metal part 10 is located at the milling station, and at the same time, the middle sensor 73 also outputs a signal, so that the first motor 413 stops.

10 6. After the first motor 413 is stopped, the electrical control device in the electric control box issues an instruction, according to the signal from the middle sensor 73 and a signal indicating that the second cylinder 52 of the limiting assembly 5 in the middle of the delivering rail 2 extends to its predetermined position, for retracting the third cylinder 612 of the locking cylinder assembly 61. The clamping block 611
15 clamps the side of the metal part 10, and at the same time, the rotary clamping cylinder 621 will rotate to press down, so that the pressing element 622 presses the upper surface of the metal part 10. In this manner, the metal part 10 is completely fixed at the milling station.

20 7. When the metal part 10 is fixed at the milling station and the electrical element on the corresponding component sends out a signal, the milling device 1 and the third motor 433 are activated. At the same time, the third motor 433 drives, through the third synchronization wheel assembly 434, the third ball screw 432 in rotation, thereby driving the milling device 1 to move downward under the guidance of the
25 third guide rails 431.

8. When the milling device 1 is lowered to touch the upper surface of the metal part 10, the milling or drilling operation starts. The descending distance of the milling device 1 is preset. After the preset distance is reached so that the milling or drilling
30 operation on the metal part 10 is completed, the third motor 433 rotates reversely, so as to lift the milling device 1 to its initial position.

9. Next, if it is necessary to mill or drill the metal part 10 at another position, the

second motor 423 is activated to drive the second synchronous wheel assembly 424 in rotation, so that the second ball screw 422 rotates. The second ball screw 422 drives the milling device 1 fixed on the nut seat of the second ball screw 422, the milling device mounting assembly 8 or the like to move to their predetermined positions respectively, under the guidance of the second guide rail 421.

10. The above steps 7 and 8 are repeated when the milling device 1 reaches a position above the set position of the metal part 10, thus completing the milling or drilling operation.

10

11. After the operation on the metal part 10 is completed, the limiting assembly 5 in the middle of the delivering rail 2, the rotary clamping cylinder assembly 62 and the locking cylinder assembly 61 act simultaneously to return to their respective initial positions. After these assemblies return to their respective initial positions, a signal is transmitted to the electric control box. Then, the electrical control device in the electric control box issues an instruction to activate the second cylinder 52 of the limiting assembly 5, which is located at the front end of the delivering rail 2, so that the limiting block 51 is extended. At the same time, the first cylinder 31 of each of the front and rear pushing assemblies 3 is raised, thus pushing up an end of the supporting member 32 and the pushing block 33.

20

12. After all the actions of the above components have been completed, the first motor 413 starts to rotate reversely, driving two pushing assemblies 3 to their initial positions respectively. At the same time, the second cylinder 52 of the limiting assembly 5, which is located at the middle of the delivering rail 2, drives the limiting block 51 to extend again.

25

13. The first motor 413 then rotates forwardly, driving the pushing assemblies 3 to push the metal part 10 to be processed to the processing position. At the same time, the front pushing assembly 3 pushes the metal part 10 having been processed to a position where the limiting assembly 5 at the front end of delivering rail 2 is located. In this case, the cut corner of the front end of the metal part 10 having been processed just enters the cut corner of the back end face 511 of the limiting block 51 of the

30

limiting assembly 5 at the front end of delivering rail 2.

14. When the front sensor 72 detects existence of the metal part 10, the second cylinder 52 of the limiting assembly 5 at the front end of delivering rail 2 is retracted.

5 At this time, the metal part 10 having been processed can be taken away.

15. When step 14 is performing, the metal part 10 to be processed can be processed at the processing position concurrently, through repeating steps 6 to 8.

10 It can be seen from the above that the automatic milling machine of the present invention realizes the automation of pushing, limiting, locking and milling or drilling metal parts, which can greatly reduce labor intensity and improve processing efficiency with high accuracy. Moreover, the milling tool can be customized for milling or drilling, and also for different types of holes. Therefore, the operation is
15 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
20 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 milling machine, comprising:

a milling device (11) for performing milling or drilling operation on a metal part
5 (10);

a delivering rail (2) mounted on a working table (20), for receiving a metal part
(10) and allowing the metal part (10) to move back and forth thereon;

a pushing assembly (3) for pushing the metal part (10) to move forward along the
delivering rail (2);

10 a first moving assembly for driving the pushing assembly (3) to move back and
forth along the delivering rail (2);

a second moving assembly for driving the milling device (1) to move back and
forth;

a third moving assembly for driving the milling device (1) to move up and down;

15 a limiting assembly (5) for blocking a forward movement of the metal part (10)
located;

a locking assembly for fixing the metal part (10) located at a milling station;

at least one sensor arranged at one side of the delivering rail (2), for detecting
whether the metal part (10) is on the delivering rail (2); and

20 an electric control box with a PLC arranged therein,

wherein the milling device (1), the pushing assembly (3), the first moving
assembly, the second moving assembly, the third moving assembly, the limiting
assembly (5), the locking assembly and the sensor are connected to the electric control
box respectively, and controlled by the PLC.

25

2. The automatic milling machine according to claim 1, characterized in that the
pushing assembly (3) comprises a first cylinder (31), a supporting member (32), a
pushing block (33), and a spring (34), wherein the supporting member (32) is driven
up and down by the first cylinder (31), and the pushing block (33) is slidably arranged
30 in front of the supporting member (32), the spring (34) being arranged between the
supporting member (32) and the pushing block (33).

3. The automatic milling machine according to claim 2, characterized in that two

pushing assemblies (3) are provided, one located behind the other, and

a connecting plate (35), to which a connecting element (36) is fixedly connected, is fixedly connected between said two pushing assemblies (3), the connecting element (36) being connected with the first moving assembly.

5

4. The automatic milling machine according to claim 3, characterized in that the first moving assembly comprises a first guide rail (411), a first ball screw (412), a first motor (413), and a first synchronizing wheel assembly (414),

10 wherein the first guide rail (411) is arranged at one side of the delivering rail (2) and parallel to a length direction of the delivering rail (2);

the first ball screw (412) is parallel to the first guide rail (411), and the connecting element (36) is mounted on the first guide rail (411), and fixedly connected to a nut seat provided on the first ball screw (412);

15 the first synchronous wheel assembly (414) consists of a synchronous wheel fixed on an output shaft of the first motor (413), a synchronous wheel fixed on the first ball screw (412), and a synchronous belt; and

the first motor (413) drives the first ball screw (412) in rotation through the first synchronizing wheel assembly (414), thereby driving the connecting element (36) to move forward or backward.

20

5. The automatic milling machine according to any one of claims 1 to 4, characterized in that the second moving assembly includes a second guide rail (421), a second ball screw (422), a second motor (423), and a second synchronous wheel assembly (424),

25 wherein the second guide rail (421) is arranged at one side above the delivering rail (2) and is parallel to the length direction of the delivering rail (2);

30 the second ball screw (422) is parallel to the second guide rail (421), and the milling device (1) is mounted on a milling device mounting assembly (8), which is mounted on the second guide rail (421) and fixedly connected to a nut seat provided on the second ball screw (422);

the second synchronous wheel assembly (424) consists of a synchronous wheel fixed on an output shaft of the second motor (423), a synchronous wheel fixed to the second ball screw (422), and a synchronous belt; and

the second motor (423) drives the second ball screw (422) in rotation through the second synchronous wheel assembly (424), thus driving the milling device mounting assembly (8) to move forward or backward.

5 6. The automatic milling machine according to claim 5, characterized in that the third moving assembly is mounted on the milling device mounting assembly (8), and includes a third guide rail (431), a third ball screw (432), a third motor (433), and a third synchronous wheel assembly (434),

 wherein the third guide rail (431) and the third ball screw (432) are both
10 vertically arranged, and the milling device mounting assembly (8) includes a fixing plate (81) fixedly connected to the milling device (1), the fixing plate (81) being mounted on the third guide rail (431) and fixedly connected to a nut seat provided on the third ball screw (432);

 the third synchronous wheel assembly (434) consists of a synchronous wheel
15 fixed on an output shaft of the third motor (433), a synchronous wheel fixed to the third ball screw (432), and a synchronous belt; and

 the third motor (433) drives the third ball screw (432) in rotation through the third synchronous wheel assembly (434), thus driving the fixing plate (81) to move up or down.

20

 7. The automatic milling machine according to any one of claims 1 to 4, characterized in that the limiting assembly (5) includes a limiting block (51), a second cylinder (52) and a limiting bracket (53), wherein the limiting bracket (53), on which the second cylinder (52) is mounted, is mounted on one side of the delivering rail (2),
25 and the limiting block (51) is driven by the second cylinder (52) to extend toward or retract away from the delivering rail (2).

 8. The automatic milling machine according to claim 7, characterized in that two limiting assemblies (5) are provided, one of which is arranged at a front end of the
30 delivering rail (2) while the other is arranged at a middle portion thereof.

 9. The automatic milling machine according to any one of claims 1 to 4, characterized in that the locking assembly includes a locking cylinder assembly (61)

and a rotary clamping cylinder assembly (62),

wherein the locking cylinder assembly (61) includes a clamping block (611), a third cylinder (612) and a clamping installation block (613), wherein:

5 the clamping installation block (613) is fixedly mounted on the working table (20), the third cylinder (612) is mounted on the clamping installation block (613), and the clamping block (611) is formed as an L-shaped structure by a horizontal plate and a vertical plate, wherein the horizontal plate is fixed to the third cylinder (612), and driven thereby to move left and right, and

10 when the third cylinder (612) is retracted, the vertical plate of the clamping block (611) clamps a side surface of the metal part (10) located at the clamping block (611); and

the rotary clamping cylinder assembly (62) includes a rotary clamping cylinder (621), and a pressing element (622), which is mounted on an output shaft of the rotary clamping cylinder (621), and driven by the rotary clamping cylinder (621) in rotation
15 to press down on a top of the metal part (622) located there.