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(54) **TUBE-SEALING AND BAG-MAKING FILLING MACHINE**

(57) A tube-sealing, bag-making and filling machine comprising a rack (1), two tube feeding devices (3), two bag body feeding devices (4), two heat-sealing devices (5), two filling devices (6), two sealing devices (7), two bag withdrawing devices (8) and a transmission device (2). The transmission device (2) comprises a transmitting chain (21), on which a plurality of hanging panels (12) are arranged in equal intervals and each of the hanging panels (12) is provided with an opening (10). It is characterized in that each of the hanging panels (12) is hinged with the transmitting chain (21) on one side; an advancing path (2101) and a return path (2102) of the transmitting chain (21) are each provided with, in sequential order, a tube feeding position (221), a bag body feeding position (222), a heat-sealing position (223), a filling position (224), a sealing position (225) and a bag withdrawing position (226), with the devices arranged in their corresponding positions; a first turning mechanism is disposed between the tube feeding position (221) and the bag body feeding position (222); a second turning mechanism is disposed between the heat-sealing position (223) and the filling position (224); a hanging panel slot (15) capable of maintaining the hanging panels (12) in an upright position is disposed between the first turning mechanism and the second turning mechanism. The present invention combines the production of packing bags and filling of materials, and has a simple and compact structure,

low space occupation and a low machine failure rate.

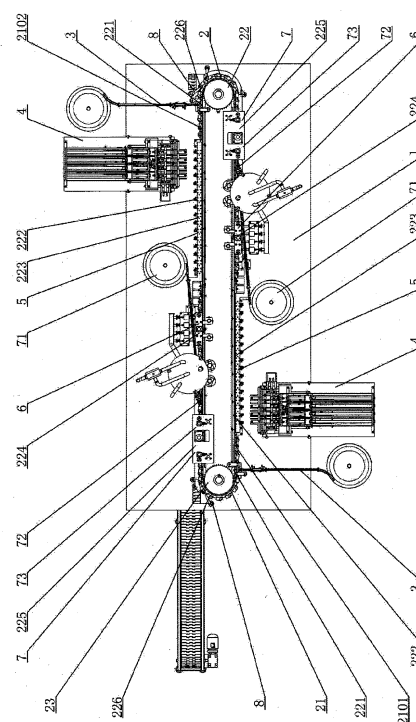


FIG.1

Description

Technical Field

[0001] The present invention relates to a machine for packing materials. More specifically, it relates to a tube-sealing, bag-making and filling machine which combines the production of packing bags and filling of materials.

Background Art

[0002] A tube-sealing, bag-making and filling machine uses packing bags to pack materials and usually comprises two sections, namely a bag-making section and a filling section.

[0003] In a conventional tube-sealing, bag-making and filling machine, the filling section and the bag-making section are usually independent from each other, and each section has a transmission device. In between the two transmission devices, there is a grip-and-turn device. The bag-making section comprises a tube feeding device, a bag body feeding device, a heat-sealing device and a first transmission device, wherein the tube feeding device, the bag body feeding device and the heat-sealing device are arranged in sequential order along a transmission direction of the first transmission device. The filling section comprises a filling device, a sealing device, a bag withdrawing device and a second transmission device, wherein the filling device, the sealing device and the bag withdrawing device are arranged in sequential order along a transmission direction of the second transmission device. In order to ensure secured connection between a suction tube and the bag body and therefore ensuring the quality of the packing bag, and in order to dispose the heating sealing device easily, the suction tube are usually required to be placed horizontally when it is transmitted to the bag body feeding device and the heat-sealing device. In the filling section, the packing bag is required to be placed vertically with the suction tube facing upwardly so that filling and sealing are easier and material leakage is prevented. The bag-making section during operation has its tube feeding device transmitting the suction tube to the first transmission device whereas the bag body feeding device is stored with prefabricated bag bodies (bag bodies are usually made of plastic films and each has a bag opening); when the suction tube is being transmitted to the bag body feeding device by the first transmission device, the bag body feeding device releases a bag body, opens the bag opening and sleeves the bag opening onto the suction tube; after that, the heat-sealing device seals and connects the suction tube and the bag opening to form a packing bag. When the bag-making section has finished making the packing bag, the packing bag is removed from the first transmission device of the bag-making section by the grip-and-turn device and then transmitted to the second transmission device of the filling section; during transmission from the first transmission device to the second transmission device,

the horizontally placed packing bag is turned to be placed vertically. After that, the filling device and the sealing device complete other processing steps one by one such as material filling and bag sealing. Finally, the bag withdrawing device removes the packing bag filled with materials from the second transmission device.

[0004] The conventional tube-sealing, bag-making and filling machine as described above is in fact a combination of a bag-making machine and a filling machine via a grip-and-turn device in between. Accordingly, the entire machine is structurally complicated, large in size and occupies a lot of space. Besides, the grip-and-turn device increases the manufacturing cost of the entire machine and the chances of machine failure.

Disclosure of the Invention

[0005] The present invention provides a tube-sealing, bag-making and filling machine which combines the production of packing bags and filling of materials. It has a simple structure, low manufacturing cost, and high operation efficiency. It also occupies less space and stands a lower chance of machine failure. The present invention adopts the following technical proposal:

[0006] A tube-sealing, bag-making and filling machine comprising a rack 1, a transmission device 2, two tube feeding devices 3, two bag body feeding devices 4, two heat-sealing devices 5, two filling devices 6, two sealing devices 7 and two bag withdrawing devices 8; the two tube feeding devices 3, the two bag body feeding devices 4, the two heat-sealing devices 5, the two filling devices 6, the two sealing devices 7 and the two bag withdrawing devices 8 are all provided on the rack 1; the transmission device 2 comprises a transmission chain 21, an active chain wheel 22, a passive chain wheel 23 and a main driving mechanism; the active chain wheel 22, the passive chain wheel 23 and the main driving mechanism are all mounted on the rack 1; the transmission chain 21 is mounted to the active chain wheel 22 and the passive chain wheel 23; the active chain wheel 22 and the main driving mechanism are connected for motion transmission; the transmission chain 21 is mounted with plurality of hanging panels 12 arranged in equal intervals; each of the hanging panels 12 is provided with an opening 10 which accommodates a suction tube 9; the tube-sealing, bag-making and filling machine is characterized in that: one side of each of the hanging panels 12 is hinged with the transmission chain 21; along an advancing direction of the transmission chain 21, a forward path 2101 and a return path 2102 of the transmission chain 21 are each provided in sequential order a tube feeding position 221, a bag body feeding position 222, a heat-sealing position 223, a filling position 224, a sealing position 225 and a bag withdrawing position 226; one of the tube feeding devices 3, one of the bag body feeding devices 4, one of the heat-sealing devices 5, one of the filling devices 6, one of the sealing devices 7 and one of the bag withdrawing devices 8 correspond respectively to positions

of the tube feeding position 221, the bag feeding position 222, the heat-sealing position 223, the filling position 224, the sealing position 225 and the bag withdrawing position 226 of the forward path 2101 of the transmission chain 21; another one of the tube feeding devices 3, another one of the bag body feeding devices 4, another one of the heat-sealing devices 5, another one of the filling devices 6, another one of the sealing devices 7 and another one of the bag withdrawing devices 8 correspond respectively to positions of the tube feeding position 221, the bag feeding position 222, the heat-sealing position 223, the filling position 224, the sealing position 225 and the bag withdrawing position 226 of the return path 2102 of the transmission chain 21; in between the tube feeding position 221 and the bag body feeding position 222, there is a first turning mechanism for turning the hanging panels 12 from a horizontal position to a vertical position; in between the heat-sealing position 223 and the filling position 224, there is a second turning mechanism for turning the hanging panels 12 from a vertical position to a horizontal position; In between the first turning mechanism and the second turning mechanism, there is a hanging panel slot 15 to maintain the hanging panels 12 in a vertical position.

[0007] Operation of the tube-sealing, bag-making and filling machine is briefly described as follows: Under the driving force of the main driving mechanism and the active chain wheel 22, the transmission chain 21 advances along a repeated route. On the forward path 2101 of the transmission chain 21, the hanging panels 12 reach the tube feeding position 221, and then the bag body feeding position 222, and then the heat-sealing position 223, and then the filling position 224, and then the sealing position 225, and then the bag withdrawing position 226 on the forward path 2101 of the transmission chain 21 to complete procedures such as tube feeding, bag body feeding, heat-sealing, filling, sealing and bag withdrawing one by one on the forward path 2101 of the transmission chain 21. At the tube feeding position 221, the hanging panels 12 are horizontally positioned, and for each hanging panel of the hanging panels 12, a relevant tube feeding device of the tube feeding devices 3 feeds the suction tube 9 to the opening 10 of the relevant hanging panel and the suction tube 9 will hang on the relevant hanging panel and will be vertically positioned. Since the bag body feeding procedure and the heat-sealing procedure require the suction tube and the bag body to be positioned horizontally, a first turning mechanism is provided between the tube feeding position 221 and the bag body feeding position 222 so that the relevant hanging panel can be turned from a horizontal position to a vertical position and thereby positioning the suction tube horizontally for the relevant bag body feeding device to feed the bag body to a position corresponding to the suction tube; next, the relevant heat-sealing device will immediately perform heat-sealing to connect the bag body and the suction tube; after the heat-sealing procedure is completed, a packing bag 17 is made and the packing bag 17 can now

be filled with materials; in filling procedure, the suction tube and the bag body are required to be placed vertically, therefore a second turning mechanism is provided between the heat-sealing position 223 and the filling position 224 to turn the relevant hanging panel from a vertical position to a horizontal position so that the suction tube and the bag body are positioned vertically with the suction tube facing upwardly for easier cooperation between the suction tube and the relevant filling device during the filling procedure. After filling, a relevant sealing device of the sealing devices 7 seals the suction tube 9 at the sealing position 225 (for example, by placing a cap on the suction tube 9 and then tighten the cap). When the packing bag 17 filled with materials reaches the bag withdrawing position 226, a relevant bag withdrawing device of the bag withdrawing devices 8 withdraws the packing bag 17 filled with materials from the relevant hanging panel, and procedures on the forward path 2101 of the transmission chain 21 such as bag making, material filling and sealing are completed. After bag withdrawing procedure is completed at the forward path 2101 of the transmission chain 21, the relevant hanging panel is empty and horizontally positioned and it advances together with the transmission chain 21 to enter the return path 2102 of the transmission chain 21. The relevant hanging panel then reaches the tube feeding position 221, and then the bag body feeding position 222, and then the heat-sealing position 223, and then the filling position 224, and then the sealing position 225, and then the bag withdrawing position 226 on the return path 2102 of the transmission chain 21 to complete procedures such as tube feeding, bag body feeding, heat-sealing, filling, sealing and bag withdrawing one by one on the return path 2102 of the transmission chain 21, and these procedures are the same as those on the forward path 2101 of the transmission chain 21. When the bag withdrawing procedure on the return path 2102 of the transmission chain 21 is completed, the relevant hanging panel is empty again and horizontally positioned and it advances back to the tube feeding position 221 on the forward path 2101 of the transmission chain 21 to repeat the working procedures as described above. A hanging panel slot 15 is provided between the first turning mechanism and the second turning mechanism to limit the position of the hanging panels 12 so that the hanging panels 12 are ensured to be maintained in a vertical position during bag body feeding procedure and heat-sealing procedure.

[0008] In normal circumstances, when a bag body feeding device of the bag body feeding devices 4 feeds a bag body, the bag body will then be subject to heat-sealing by a corresponding heat-sealing device of the heat-sealing devices 5 so that the bag body and the suction tube 9 are connected with each other; after that, further heat-sealing will be performed by the corresponding heat-sealing device so that the bag body and the suction tube 9 will be tightly connected with each other. Therefore, the heat-sealing position 223 usually corresponds to a section of the transmission chain 21, and the starting

end of the heat-sealing position 223 overlaps with the bag body feeding position 222.

[0009] One side (usually referred to as the "inner side") of each of the hanging panels 12 is hinged with the transmission chain 21. By choosing appropriately structured hinges 18, horizontally positioned hanging panels 12 can only turn upwardly but not downwardly, and the hanging panels 12 can only turn upwardly at a maximum angle of 90 degrees (the choice of hinges 18 is a common technical means known to any person skilled in this field of art). Accordingly, horizontally positioned hanging panels 12 do not require other structures to maintain the hanging panels 12 in a horizontal position, and after the horizontally positioned hanging panels 12 has been turned to be positioned vertically, they will not be turned continuously to flip to the inner side of the transmission chain 21.

[0010] In a preferred embodiment, the first turning mechanism comprises a first position limiting block 13, and the first position limiting block 13 comprises a first position limiting edge. The first position limiting edge contacts and cooperates with the bottom surfaces of the hanging panels 12. The first position limiting edge gradually closes towards the transmission chain 21 and gradually rises up along the advancing direction of the transmission chain 21. When a hanging panel of the hanging panels 12 arrives at the first turning mechanism, the bottom surface of the relevant hanging panel keeps contact with the first position limiting edge due to gravity force during its advancement together with the transmission chain 21, therefore the position of the relevant hanging panel during its advancement is determined by the first position limiting edge. As the transmission chain 21 advances forward, the relevant hanging panel also advances forward along the first position limiting edge. The first position limiting edge exerts a lifting force to the relevant hanging panel and a pushing force to push the relevant hanging panel towards the transmission chain 21. Accordingly, the relevant hanging panel gradually turns upward and its outer side (i.e. the side faces away from the transmission chain 21) continues to be lifted up until the relevant hanging panel is vertically positioned. Since the relevant hanging panel transmitted away from a relevant tube feeding device is initially positioned horizontally, a starting end and a finishing end of the first position limiting edge enable the following conditions so that the relevant hanging panel can be turned from a horizontal position to a vertical position: When the relevant hanging panel is at the starting end of the first position limiting edge, its bottom surface is on the starting end of the first position limiting edge, and when the relevant hanging panel arrives at the finishing end of the first position limiting edge, a gap between the transmission chain 21 and the finishing end of the first position limiting edge only allows the relevant hanging panel to pass through vertically, and the relevant hanging panel is then at an inner side of the finishing end of the first position limiting edge. The bottom surface of the relevant hanging panel is a line when viewed vertically from above, and the finishing end of the

first position limiting edge when viewed from above overlaps with that line. By using the first position limiting block 13 which cooperates with the hanging panels 12 hinged with the transmission chain 21, the hanging panels 12 can be turned from a horizontal position to a vertical position. This kind of structure is simple and reliable.

[0011] In another preferred embodiment, the first turning mechanism comprises a first position limiting block 13, and the first position limiting block 13 comprises a first guiding curved surface 131. The first guiding curved surface 131 contacts and cooperates with the bottom surfaces of the hanging panels 12. The first guiding curved surface 131 is gradually twisted from an upwardly facing horizontal position to a vertical position facing the transmission chain 21 along the advancing direction of the transmission chain 21. When a hanging panel of the hanging panels 12 arrives at the first turning mechanism, the bottom surface of the relevant hanging panel keeps contact with the first guiding curved surface 131 during its advancement together with the transmission chain 21, therefore the position of the relevant hanging panel during its advancement is determined by the first guiding curved surface 131. As the transmission chain 21 advances forward, the relevant hanging panel also advances forward along the first guiding curved surface 131. The first guiding curved surface 131 exerts a lifting force to the relevant hanging panel and a pushing force to push the relevant hanging panel towards the transmission chain 21. Accordingly, the relevant hanging panel gradually turns upward until the relevant hanging panel is vertically positioned. Since the relevant hanging panel keeps its surface contact with the first position limiting block 13 during the process of being turned upwardly, the first position limiting block 13 can provide better support to the relevant hanging panel. Since the relevant hanging panel transmitted away from a relevant tube feeding device is initially positioned horizontally, a starting end and a finishing end of the first guiding curved surface 131 enable the following conditions so that the relevant hanging panel can be turned from a horizontal position to a vertical position: When the relevant hanging panel is at the starting end of the first guiding curved surface 131, its bottom surface is on a horizontal surface of the starting end of the first guiding curved surface 131, and when the relevant hanging panel arrives at the finishing end of the first guiding curved surface 131, a gap between the transmission chain 21 and a vertical surface of the finishing end of the first guiding curved surface 131 only allows the relevant hanging panel to pass through vertically, and the relevant hanging panel is then at an inner side of the vertical surface of the finishing end of the first guiding curved surface 131. By using the first position limiting block 13 which cooperates with the hanging panels 12 hinged with the transmission chain 21, the hanging panels 12 can be turned from a horizontal position to a vertical position. This kind of structure is simple and reliable.

[0012] The second turning mechanism is provided to turn the hanging panels 12 from a vertical position to a

horizontal position. Therefore, the second turning mechanism functions oppositely as compared with the first turning mechanism.

[0013] In a preferred embodiment, the second turning mechanism comprises a second position limiting block 14, and the second position limiting block 14 comprises a second position limiting edge 141. The second position limiting edge 141 contacts and cooperates with the bottom surface of the hanging panels 12. The second position limiting edge 141 is gradually spaced apart from the transmission chain 21 and is gradually lowered in its position along the advancing direction of the transmission chain 21. When the packing bag 17 and a relevant hanging panel of the hanging panels 12 are transmitted away from the relevant heat-sealing device, the relevant hanging panel tends to turn downwardly due to gravity force. The bottom surface of the relevant hanging panel keeps contact with the second position limiting edge 141 during its advancement together with the transmission chain 21, therefore the position of the relevant hanging panel during its advancement is determined by the second position limiting edge 141. As the transmission chain 21 advances forward, the relevant hanging panel also advances forward along the second position limiting edge 141. The second position limiting edge 141 exerts a supporting force to the relevant hanging panel and the relevant hanging panel gradually turns downward and its outer side (i.e. the side faces away from the transmission chain 21) continues to be lowered down until the relevant hanging panel is horizontally positioned. By using the second position limiting block 14 which cooperates with the hanging panels 12 hinged with the transmission chain 21 and by taking advantage of the gravity force imposed to the packing bags and the hanging panels 12, the hanging panels 12 can be turned from a vertical position to a horizontal position. This kind of structure is simple and reliable.

[0014] In another preferred embodiment, the second turning mechanism comprises a second position limiting block 14, and the second position limiting block 14 comprises a second guiding curved surface. The second guiding curved surface contacts and cooperates with the bottom surface of the hanging panels 12. The second guiding curved surface gradually twisted from a vertical position facing the transmission chain 21 to a horizontal position facing upwardly along the advancing direction of the transmission chain 21. When the packing bag 17 and a relevant hanging panel of the hanging panels 12 are transmitted away from the relevant heat-sealing device, the relevant hanging panel tends to turn downwardly. The bottom surface of the relevant hanging panel keeps contact with the second guiding curved surface during its advancement together with the transmission chain 21, therefore the position of the relevant hanging panel during its advancement is determined by the second guiding curved surface. As the transmission chain 21 advances forward, the relevant hanging panel also advances forward along the second guiding curved surface. The second guiding curved surface exerts a sup-

porting force to the relevant hanging panel and the relevant hanging panel gradually turns downward and its outer side (i.e. the side faces away from the transmission chain 21) continues to be lowered down until the relevant hanging panel is horizontally positioned. Since the relevant hanging panel keeps its surface contact with the second position limiting block 14 during the process of being turned downwardly, the second position limiting block 14 can provide better support to the relevant hanging panel. By using the second position limiting block 14 which cooperates with the hanging panels 12 hinged with the transmission chain 21 and by taking advantage of the gravity force imposed to the packing bags and the hanging panels 12, the hanging panels 12 can be turned from a vertical position to a horizontal position. This kind of structure is simple and reliable.

[0015] The tube feeding devices 3, the bag body feeding devices 4, the heat-sealing devices 5, the filling devices 6, the sealing devices 7 (in a specific embodiment, each of the sealing devices 7 comprises a cap organizing device 71, a cap delivering device 72 and a cap turning device 73) and the bag withdrawing devices 8 are those devices currently available in the market.

[0016] In a preferred embodiment, each of the tube feeding devices 3 comprises a vibration disc 32, a tube feeding guiding rail 33, a tube delivery piston cylinder 34 and a tube delivery guiding rail 35; the vibration disc 32, the tube feeding guiding rail 33, the tube delivery piston cylinder 34 and the tube delivery guiding rail 35 are all mounted on the rack 1. A tube exit 36 of the vibration disc 32 is connected with a rear end 331 of the tube feeding guiding rail 33; the tube delivery guiding rail 35 links in continuity with a front end 332 of the tube feeding guiding rail 33; the tube delivery guiding rail 35 gradually approaches to the transmission chain 21 along the advancing direction of the transmission chain 21; a front portion of the tube feeding guiding rail 33 is a linear tube feeding guiding rail section 333; the tube delivery piston cylinder 34 is disposed above the tube feeding guiding rail 33, and the tube delivery piston cylinder 34 is parallel to the linear tube feeding guiding rail section 333. A piston rod 342 of the tube delivery piston cylinder 34 is disposed with a one-way hook 312 which can sweep suction tubes on the linear tube feeding guiding rail section 333. A rear part of the opening 10 of each of the hanging panels 12 is outwardly extended with a tube sweeping portion 11. The tube sweeping portion 11 of each of the hanging panels 12 has a width ensured to enable the tube sweeping portion 11 to sweep one suction tube 9 (usually the width of the tube sweeping portion 11 is identical to or slightly smaller than the width of the tube delivery guiding rail 35); during tube feeding procedure, under the driving force of the main driving mechanism, the transmission chain 21 advances and the hanging panels 12 therefore advance together with the transmission chain 21 as well; also, under the driving force of the tube delivery piston cylinder 34, the one-way hook 312 pushes the suction tubes on the tube feeding guiding rail 33 so that the suc-

tion tubes can move forward along the tube feeding guiding rail 33. Suction tube 9 at the forefront of the tube feeding guiding rail 33 is at a connector portion 317 between the tube feeding guiding rail 33 and the tube delivery guiding rail 35. When a hanging panel of the hanging panels 12 arrives at a position corresponding to the connector portion 317, the opening 10 of the hanging panel is blocked by an inner side wall 351 of the tube delivery guiding rail 35, and the tube sweeping portion 11 of the hanging panel contacts with the suction tube 9. As the hanging panel continues to advance forward, the suction tube 9 at the forefront of the tube feeding guiding rail 33 is fed to the tube delivery guiding rail 35 and that suction tube 9 is being driven to move along the tube delivery guiding rail 35. When the suction tube 9 is moving along the tube delivery guiding rail 35, the suction tube 9 gradually inserts into the opening 10 of the hanging panel under the effect of an outer side wall 352 of the tube delivery guiding rail 35. When the suction tube 9 leaves the tube delivery guiding rail 35, the suction tube 9 is completely in the opening 10 and hangs on the hanging panel. When the hanging panel passes the position corresponding to the connector portion 317, the one-way hook 312 pushes the next suction tube on the tube feeding guiding rail 33 to the connector portion 317. Then, the next hanging panel arrives at the position corresponding to the connector portion 317 and treats the next suction tube in the same way as its preceding hanging panel treats the preceding suction tube. Every action of the piston rod 342 of the tube delivery piston cylinder 34 can push plurality of suction tubes so that the plurality of suction tubes will be pushed one by one to the connector portion 317 between the tube feeding guiding rail 33 and the tube delivery guiding rail 35. In each forward advancement of the piston rod 342 of the tube delivery piston cylinder 34, a forward advancement path of the piston rod 342 of the tube delivery piston cylinder 34 determines how far the plurality of suction tubes can be pushed, thereby determining the number of suction tubes to be pushed to the connector portion 317 (If the distance between the centers of two adjacent suction tubes on the suction tube guiding rail 33 is L, and the distance travelled by each forward advancement of the piston rod 342 of the tube delivery piston cylinder 34 is N times of L, N number of suction tubes can be pushed to the connector portion 317 in each forward advancement of the piston rod 342 of the tube delivery piston cylinder 34). The structure of each of the tube feeding devices 3 as described above is simple and reliable. After each of the tube feed devices 3 completes a working cycle, a plurality of suction tubes will be transmitted to the transmission device 2, and in this case, simultaneous bag making using multiple number of adjacent lanes can be achieved, thereby enhancing production efficiency.

[0017] The tube sweeping portion 11 of each of the hanging panels 12 has a width at its front end gradually decreased towards its rear end. When a hanging panel of the hanging panels 12 feeds the suction tube 9 at the

forefront of the tube feeding guiding rail 33 to the tube delivery guiding rail 35 and drives the suction tube 9 to move along the tube delivery guiding rail 35, the next suction tube contacts a side of the tube sweeping portion 11 and slides with respect to the tube sweeping portion 11, and the next suction tube is then being stably transferred to the connector portion 317.

[0018] In general, the tube feeding guiding rail rear end 331 is placed higher than the tube feeding guiding rail front end 332. Therefore, when the suction tubes that have left the tube exit 36 of the vibration disc 32 arrive at the tube feeding guiding rail 33, the suction tubes on the tube feeding guiding rail 33 slide from the tube feeding guiding rail rear end 331 towards the tube feeding guiding rail front end 332 under gravity force. The linear tube feeding guiding rail section 333 can be placed along a horizontal level or it can be sloped downward from its rear end towards its front end.

[0019] The one-way hook 312 is able to swing forward freely, but its backward swing is subject to certain restrictions. In a specific embodiment, the piston rod 342 of the tube delivery piston cylinder 34 is mounted with a connection panel 313. The connection panel 313 is disposed with a one-way hook seat 314 on its front side surface. An upper end of the one-way hook 312 is rotably mounted to the one-way hook seat 314. Accordingly, when the piston rod 342 of the tube delivery piston cylinder 34 retreats backward, the connection panel 313 and the one-way hook 312 move backward. Since the one-way hook 312 is able to swing forward when it touches a suction tube 9, the suction tube 9 will not hinder the movement of the one-way hook 312. When the piston rod 342 of the tube delivery piston cylinder 34 advances forward, lower end of the one-way hook 312 contacts with the suction tube 9 and swings backward. When a rear side of the one-way hook 312 contacts with a lower end of the connection panel 313, the one-way hook 312 can no longer swing backward due to the blocking of the lower end of the connection panel 313. Then, under the driving force of the tube delivery piston cylinder 34, the one-way hook 312 pushes suction tubes on the tube feeding guiding rail 33 forward along the tube feeding guiding rail 33. Usually, a lower end of the one-way hook 312 has a size smaller than a material filling hole 91 of the suction tube 9 so that the lower end of the one-way hook 312 can be inserted to the material filling hole 91 of the suction tube 9, thereby securing reliable contact between the lower end of the one-way hook 312 and the suction tube 9. Alternatively, the lower end of the one-way hook 312 can be in a form of a sheet which can be inserted between a gap between two adjacent suction tubes, and in this case, reliable contact between the lower end of the one-way hook 312 and the suction tube 9 can also be secured.

[0020] To ensure stable movement of the one-way hook 312, it is preferable to mount a guiding rod 315 to the connection panel 313. The guiding rod 315 is parallel to the tube delivery piston cylinder 34. The rack 1 is disposed with a guiding sleeve 316, and the guiding rod 315

is disposed inside the guiding sleeve 316.

[0021] In a specific embodiment, the linear tube feeding guiding rail section 333 is perpendicular to a corresponding section of the transmission chain 21. An angle of intersection between the linear tube feeding guiding rail section 333 and the corresponding section of the transmission chain 21 can be an angle not identical to 90 degrees, but it is most preferable to have the linear tube feeding guiding rail section 333 substantially perpendicular to the corresponding section of the transmission chain 21.

[0022] In a specific embodiment, the tube delivery guiding rail 35 is a linear guiding rail. In other embodiments, the tube delivery guiding rail 35 can be formed by a parallel section and a bent section smoothly connected with each other, wherein a first end of the parallel section is connected with the tube feeding guiding rail 33 and a second end of the parallel section is connected with the bent section; the parallel section is parallel to the transmission chain 21; the bent section is gradually bent towards the transmission chain 21 along the advancing direction of the transmission chain 21.

[0023] In a preferred embodiment, each of the bag body feeding devices 4 comprises a bag storage unit, a bag transferring unit, a bag body transmission unit, a bag opening unit and a bag body feeding unit, wherein the bag body transmission unit can receive a bag body from the bag transferring unit and transmit the bag body to the bag opening unit. The bag storage unit and the bag transferring unit are mounted on the rack 1. The bag body feeding unit comprises a movable seat 424 and a movable seat position switching unit. The movable seat position switching unit is mounted on the rack 1. A power output end of the movable seat position switching unit is connected with the movable seat 424. The bag opening unit is mounted on the movable seat 424. Each of the bag body feeding devices 4 can automatically feed a bag body, open a bag opening of the bag body and sleeve the bag opening of the bag body to a suction tube 9 on the transmission chain 21.

[0024] In a specific embodiment, the bag storage unit comprises a bag storage box 42 and a bag delivery unit; the bag storage box 42 is provided on the rack 1 along a horizontal direction. The bag storage box 42 has a cross-section that matches with the bag body. A front end of the bag storage box 42 is disposed with a bag exit 43 (an inner side of the bag exit 43 is usually provided with a bag blocking flange or a plurality of bag blocking pieces). The bag delivery unit comprises a bag delivery panel 44, a bag delivery rodless piston cylinder 45, a bag body sweeping fork 46, a bag body sweeping fork laterally movable piston cylinder 47, an elevation platform 48 and a bag body sweeping fork elevation piston cylinder 49. The bag delivery panel 44 is disposed inside the bag storage box 42. The bag delivery rodless piston cylinder 45 is mounted on the rack 1. Sliding block 451 of the bag body delivery rodless piston cylinder 45 is connected with the bag delivery panel 44. The bag body sweeping fork

elevation piston cylinder 49 is vertically positioned. Piston cylinder 491 of the bag body sweeping fork elevation piston cylinder 49 is mounted on the rack 1. The elevation platform 48 is connected with piston rod 492 of the bag body sweeping fork elevation piston cylinder 49. The bag body sweeping fork laterally movable piston cylinder 47 is parallel to the bag body delivery rodless piston cylinder 45. Piston cylinder 471 of the bag body sweeping fork laterally movable piston cylinder 47 is mounted on the elevation platform 48. The bag body sweeping fork 46 is connected with piston rod 472 of the bag body sweeping fork laterally movable piston cylinder 47. The bag delivery rodless piston cylinder 45 has the same moving direction as the bag storage box 42. Under driving force of the sliding block 451 of the bag delivery rodless piston cylinder 45, the bag delivery panel 44 can move back and forth in the bag storage box 42. The bag delivery rodless piston cylinder 45 is disposed below the bag storage box 42, or it can be disposed above the bag storage box 42 or on one side of the bag storage box 42. In order that the elevation platform 48 can move stably, the bag body sweeping fork elevation piston cylinder 49 is a bi-axial piston cylinder, alternatively, a guiding unit can be provided on the rack 1 to guide the movement of the elevation platform 48 (e.g. a guiding rod is disposed on the elevation platform 48, wherein the guiding rod is parallel to the bag body sweeping fork elevation piston cylinder 49; guiding sleeve is also provided on the rack 1 and the guiding rod is sleeved inside the guiding sleeve). In order that the bag body sweeping fork 46 can move stably, guiding unit which comprises a lateral guiding rod 410 and a lateral guiding sleeve 411 can be provided; the lateral guiding rod 410 is parallel to the bag body sweeping fork laterally movable piston cylinder 47; the lateral guiding rod 410 is mounted on the elevation platform 48; the lateral guiding sleeve 411 is connected with the bag body sweeping fork 46; the lateral guiding rod 410 is disposed inside the lateral guiding sleeve 411. The bag delivery panel 44 and the bag body sweeping fork 46 alternately push bag bodies in the bag storage box 42 to move towards the bag exit 43: firstly, the bag delivery rodless piston cylinder 45 drives the bag delivery panel 44 to move forward, thereby pushing the bags forward; when the bag delivery panel 44 moves to a predetermined position, there are a few bag bodies left in the bag storage box 42; then the piston rod 492 of the bag body sweeping fork elevation piston cylinder 49 extends outwardly to lift up the elevation platform 48; an upper end of the bag body sweeping fork 46 then inserts into a cavity of the bag storage box 42; next, the piston rod 472 of the bag body sweeping fork laterally movable piston cylinder 47 extends outwardly to move the bag body sweeping fork 46 forward so that the bags are pushed forward; next the sliding block 451 of the bag delivery rodless piston cylinder 45 and the bag delivery panel 44 move backward and an alert signal of insufficient bags is sent; an operator will then refill the bag storage box 42 with bag bodies and then press a reset button; the sliding block 451 of the bag

delivery rodless piston cylinder 45 and the bag delivery panel 44 move forward and push the bags forward, then the piston rod 492 of the bag body sweeping fork elevation piston cylinder 49 retreats to lower the elevation platform 48, and the bag body sweeping fork 46 retreats from the cavity of the bag storage box 42; next, the piston rod 472 of the bag body sweeping fork laterally movable piston cylinder 47 retreats and the bag body sweeping fork 46 resets its position, and the procedures will then repeat again. In a specific embodiment, bottom part of the bag storage box 42 has an elongated opening disposed in a direction that runs along the front and back of the bag storage box 42, and an upper end of the bag body sweeping fork 46 is inserted into the cavity of the bag storage box 42 through the elongated opening.

[0025] In a specific embodiment, the bag transferring unit comprises a position switching unit and a bag suction unit. The bag suction unit comprises a vacuum suction disc 412 and a suction disc seat 413. The vacuum suction disc 412 is disposed on the suction disc seat 413. The position switching unit comprises a rotation axis 414, a telescopic piston cylinder 415 and a rotation axis driving unit. The rotation axis 414 is rotably mounted on the rack 1. Piston cylinder 4151 of the telescopic piston cylinder 415 is mounted on the rotation axis 414. The suction disc seat 413 is fixedly mounted on piston rod 4152 of the telescopic piston cylinder 415. The rotation axis driving unit comprises an oscillating piston cylinder 416. The oscillating piston cylinder 416 is mounted on the rack 1. A power output end 4161 of the oscillating piston cylinder 416 is connected with the rotation axis 414 for motion transmission. When the oscillating piston cylinder 416 is activated, the rotation axis 414, the telescopic piston cylinder 415 and the bag suction unit (comprising the suction disc seat 413 and the vacuum suction disc 412) are driven to rotate. During production, under the driving force of the oscillating piston cylinder 416, the bag suction unit can switch its position back and forth repeatedly between a bag suction position (i.e. a position corresponding to the bag exit 43 of the bag storage box 42) and a bag release position (i.e. a position corresponding to the bag body transmission unit), and the bag suction unit completes the bag suction procedure and bag release procedure under cooperation of the telescopic piston cylinder 415 so that a bag body is transferred from the bag storage unit to the bag body transmission unit. To describe in detail: firstly, the oscillating piston cylinder 416 is activated and the rotation axis 414 is driven to rotate, thereby driving the telescopic piston cylinder 415, the suction disc seat 413 and the vacuum suction disc 412 to rotate upward as well; the position of the vacuum suction disc 412 corresponds to the bag exit 43 of the bag storage box 42; next, the piston rod 4152 of the telescopic piston cylinder 415 extends outwardly and the vacuum suction disc 412 sucks the bag body at the forefront position; next, the piston rod 4152 of the telescopic piston cylinder 415 retreats and the vacuum suction disc 412 hold the bag body at the forefront position and the bag

body is forced to deform a bit in its shape and then being taken out while other bag bodies in the bag storage box 42 continue to move forward; next, the oscillating piston cylinder 416 is activated in a reversed direction (i.e. to reset its position), the rotation axis 414 is driven to rotate, thereby driving the telescopic piston cylinder 415, the suction disc seat 413 and the vacuum suction disc 412 to rotate downward as well; the position of the vacuum suction disc 412 now corresponds to the bag body transmission unit, in other words, the vacuum suction disc 412 and the bag body are both above the bag body transmission unit; next, the vacuum suction disc 412 releases the bag body and the bag body will be released on the bag body transmission unit (alternatively, when the vacuum suction disc 412 and the bag body are above the bag body transmission unit, piston rod 4152 of the telescopic piston cylinder 415 extends outwardly, and then the vacuum suction disc 412 releases the bag body, and after that the piston rod 4152 of the telescopic piston cylinder 415 retreats), thereby completing a bag transferring procedure.

[0026] The bag storage unit and the bag transferring unit can be those currently available in the market, for example those disclosed by Chinese patent publication number CN201037052Y in which the bag suction and delivery mechanism described therein is equivalent to the bag transferring unit of the present invention.

[0027] According to an embodiment, the bag body transmission unit comprises a bag transmission guiding rail set, a bag sweeping panel 417 and a bag sweeping piston cylinder 418. The bag transmission guiding rail set comprises two bag transmission guiding rails 419 parallel to each other. The bag transmission guiding rails 419 are mounted on the rack 1. The bag sweeping panel 417 has a bag sweeping portion 420. The bag sweeping portion 420 is disposed in between the two bag transmission guiding rails 419 of the bag transmission guiding rail set. The bag sweeping piston cylinder 418 is parallel to the bag transmission guiding rail set. Piston cylinder 4181 of the bag sweeping piston cylinder 418 is mounted on the rack 1. Piston rod 4182 of the bag sweeping piston cylinder 418 is connected with the bag sweeping panel 417. In order that the bag sweeping panel 417 can move stably, in a preferred embodiment, the bag body transmission unit also comprises two bag sweeping panel guiding rods 421, two bag sweeping panel guiding sleeves 422 and a first cross rod 423. The two bag sweeping panel guiding rods 421 correspond to the two bag sweeping panel guiding sleeves 422 respectively. The bag sweeping panel guiding rods 421 are disposed inside the bag sweeping panel guiding sleeves 422. The bag sweeping panel guiding rods 421 are parallel to the bag transmission guiding rail set. The bag sweeping panel guiding sleeves 422 are mounted on the rack 1. First ends of the bag sweeping panel guiding rods 421 are connected with the bag sweeping panel 417. Second ends of the bag sweeping panel guiding rods 421 are connected with the first cross rod 423. The first cross rod 423 is connected

with piston rod 4182 of the bag sweeping piston cylinder 418 (in other words, the piston rod 4182 of the bag sweeping piston cylinder 418 is connected to the bag sweeping panel 417 via the first cross rod 423 and the bag sweeping panel guiding rods 421). In general, the two bag sweeping panel guiding rods 421 are respectively positioned at two sides of the bag sweeping piston cylinder 417. A rear end of the bag transmission guiding rail set corresponds to the position of the bag transferring unit. A front end of the bag transmission guiding rail set corresponds to the position of the bag opening unit. The bag transmission guiding rail set is perpendicular to a portion of the transmission chain 21 corresponding to a bag body feeding device of the bag body feeding devices 4. The piston rod 4182 of the bag sweeping piston cylinder 418 faces towards or away from the transmission chain 21. In the bag transmission guiding rail set, there is a space between the two bag transmission guiding rails 419 which are parallel to each other, and the bag sweeping portion 420 is disposed in the space. An upper end of the bag sweeping portion 420 is positioned higher than supporting surfaces of the bag transmission guiding rails 419 so that the bag sweeping portion 420 can touch a rear end of a bag body when the bag sweeping panel 417 advances forward. Left and right sides of the bag body on the bag transmission guiding rail set are supported by the two bag transmission guiding rails 419 respectively, while middle part of the bag body is not supported and suspended in air. During operation, after the bag transferring unit has released the bag body to the rear end of the bag transmission guiding rail set, the bag sweeping piston cylinder 418 drives the bag sweeping panel 417 to move forward along the bag transmission guiding rails 419; the bag sweeping panel 417 contacts with a rear end of the bag body and pushes the bag body to move forward along the bag transmission guiding rail set so that the bag body arrives at a position corresponding to the bag opening unit; next, the bag sweeping piston cylinder 418 drives the bag sweeping panel 417 to move backward and reset in position along the bag transmission guiding rail set for transferring the next bag body. When the bag body arrives at the bag opening unit, the bag opening unit will generally use suction discs to suck and pull an upper side and a lower side of the bag body (at a middle portion of the bag body near to the bag opening) respectively so as to open the bag opening of the bag body.

[0028] In another embodiment, the bag body transmission unit comprises a bag body supporting tray which can receive a bag body from the bag transferring unit, and a bag body supporting tray position switching unit which can transfer the bag body supporting tray to the bag opening unit. The bag body supporting tray is disposed below the bag transferring unit. A power output end of the bag body supporting tray position switching unit is connected with the bag body supporting tray. The bag body supporting tray position switching unit is mounted on the moveable seat 424. In a specific embodiment, the bag body supporting tray position switching unit com-

prises a bag body supporting tray position switching piston cylinder. The piston cylinder of the bag body supporting tray position switching piston cylinder is mounted on the movable seat 424. The bag body supporting tray is connected with a piston rod of the bag body supporting tray position switching piston cylinder. To ensure that the bag body supporting tray moves stably, the bag body transmission unit preferably comprises also a supporting tray rack and a supporting tray guiding rail. The bag body supporting tray is mounted on the supporting tray rack. The supporting tray guiding rail is mounted on the movable seat 424. The supporting tray guiding rail is parallel to the bag body supporting tray position switching piston cylinder. The supporting tray is disposed on the supporting tray guiding rail and slidably cooperates with the supporting tray guiding rail. The supporting tray rack is connected with the piston rod of the bag body supporting tray position switching piston cylinder. In another preferred embodiment, the bag body transmission unit also comprises the supporting tray rack, a supporting tray guiding sleeve and a supporting tray guiding rod. The bag body supporting tray is mounted on the supporting tray rack. The supporting tray guiding sleeve is mounted on the movable seat 424. The supporting tray guiding rod is parallel to the bag body supporting tray position switching piston cylinder. One end of the supporting tray guiding rod is connected with the supporting tray rack, another end of the supporting tray guiding rod is connected with the piston rod of the bag body supporting tray position switching piston cylinder. In general, the bag body supporting tray position switching piston cylinder is perpendicular to a section on the transmission chain 21 corresponding to a corresponding bag body feeding device of the bag body feeding devices 4. The piston rod of the bag body supporting tray position switching piston cylinder can face towards the transmission chain 21 or face away from the transmission chain 21.

[0029] In general, the bag body supporting tray comprises a bottom part and side walls. A lower edge of each of the side walls is connected with a respective edge of the bottom part. The bottom part and the side walls form a cavity that matches with the shape and size of a bag body. When the bag body supporting tray and a corresponding bag body arrive at the bag opening unit, the bag opening unit usually sucks and then pull simultaneously the upper side and the lower side of the bag body by using suction discs (the position of the suction discs correspond to the position of the bag opening of the bag body) so as to open the bag opening of the bag body. In order that the suction discs on the bag opening unit can suck the lower side of the bag body, at least an opening should be disposed near a front side of the bottom part of the bag body supporting tray, so that the suction disc on the bag opening unit can suck the lower side of the bag body through the opening. In a specific embodiment, the bottom part of the bag body supporting tray comprises a left supporting rod and a right supporting rod; in between the left supporting rod and the right supporting rod

there is a gap; accordingly, left and right sides of a bag body on the bag body supporting tray are supported by the left supporting rod and the right supporting rod respectively, and a middle part of the bag body is suspended in air.

[0030] In a specific embodiment, the bag opening unit comprises a left gripper piston cylinder 429, a right gripper piston cylinder 430, an upper suction disc 431, an upper suction disc mounting panel 432, a lower suction disc 433 and a lower suction disc mounting panel 434. Piston cylinder 4291 of the left gripper piston cylinder 429 and piston cylinder 4301 of the right gripper piston cylinder 430 are both mounted on the movable seat 424. The left gripper piston cylinder 429 is disposed at a left side of the movable seat 424. The right gripper piston cylinder 430 is disposed at a right side of the movable seat 424. A left end of the upper suction disc mounting panel 432 is connected with an upper pneumatic grip 4292 of the left gripper piston cylinder 429, and a right end of the upper suction disc mounting panel 432 is connected with an upper pneumatic grip 4302 of the right gripper piston cylinder 430. A left end of the lower suction disc mounting panel 434 is connected with a lower pneumatic grip 4293 of the left gripper piston cylinder 429, and a right end of the lower suction disc mounting panel 434 is connected with a lower pneumatic grip 4303 of the right gripper piston cylinder 430. The upper suction disc 431 is mounted on the upper suction disc mounting panel 432. The lower suction disc 433 is mounted on the lower suction disc mounting panel 434. The upper suction disc 431 and the lower suction disc 433 correspond to each other in position. Gripper piston cylinders of the present invention are those commonly available in the market each comprising a pair of pneumatic grips which can close and open with respect of each other. In general, quantity of the upper suction disc 431 is the same as the quantity of the lower suction disc 433 and for each pair of suction discs comprising the upper suction disc 431 and the lower suction disc 433, the upper suction disc 431 and the lower suction disc 433 in each pair correspond to each other in position. Each bag body can correspond to one pair of suction disc comprising the upper suction disc 431 and the lower suction disc 433 or is correspondingly disposed across multiple pairs of suction discs each comprising the upper suction disc 431 and the lower suction disc 433. After the bag body transmission unit transfers the bag body to the bag opening unit, the upper pneumatic grip 4292 and the lower pneumatic grip 4293 of the left gripper piston cylinder 429 close towards each other and the upper pneumatic grip 4302 and the lower pneumatic grip 4303 of the right gripper piston cylinder 430 also close together; next, the upper suction disc mounting panel 432 drives the upper suction disc 431 to move downward so that the upper suction disc 431 sucks an outer wall of an upper side of the bag body, and the lower suction disc mounting panel 434 also drives the lower suction disc 433 to move upward so that the lower suction disc 433 sucks an outer wall of a lower side of the bag body; next, the upper pneu-

matic grip 4292 and the lower pneumatic grip 4293 of the left gripper piston cylinder 429 separate from each other and the upper pneumatic grip 4302 and the lower pneumatic grip 4303 of the right gripper piston cylinder 430 also separate from each other; next, the upper suction disc mounting panel 432 drives the upper suction disc 431 to move upward and the lower suction disc mounting panel 434 drives the lower suction disc 433 to move downward; since the upper suction disc 431 and the lower suction disc 433 suck the outer walls of the upper and lower sides of the bag body respectively, the bag opening of the bag body is opened, thereby completing a bag opening procedure.

[0031] The bag opening unit can also adopt an existing structure, such as the design disclosed by the Chinese patent publication number CN101070105A.

[0032] In a specific embodiment, the movable seat position switching unit comprises a movable seat position switching piston cylinder 425. Piston cylinder 4251 of the movable seat position switching piston cylinder 425 is mounted on the rack 1. The movable seat 424 is connected with the piston rod 4252 of the movable seat position switching piston cylinder 425. In order that the movable seat 424 can move stably, in a preferred embodiment, the bag body feeding unit also comprises two movable seat guiding sleeves 426, two movable seat guiding rods 427 and a second cross rod 428. The two movable seat guiding rods 427 correspond to the two movable seat guiding sleeves 426 respectively. The movable seat guiding rods 427 are disposed in the movable seat guiding sleeves 426. The movable seat guiding rods 427 are parallel to the movable seat position switching piston cylinder 425. The movable seat guiding sleeves 426 are mounted on the rack 1. First ends of the movable seat guiding rods 427 are connected with the movable seat 424, second ends of the movable seat guiding rods 427 are connected with the second cross rod 428. The second cross rod 428 is connected with a piston rod 4252 of the movable seat position switching piston cylinder 425 (in other words, the movable seat 424 is connected with the piston rod 4252 of the movable seat position switching piston cylinder 425 via the movable seat guiding rods 427 and the second cross rod 428). In general, the two movable seat guiding rods 427 are positioned at two sides of the movable seat position switching piston cylinder 425 respectively. In general, the movable seat position switching piston cylinder 425 is perpendicular to a portion of the transmission chain 21 corresponding to a corresponding bag body feeding device of the bag body feeding devices 4. The piston rod 4252 of the movable seat position switching piston cylinder 425 faces towards the transmission chain 21 or faces away from the transmission chain 21. In another preferred embodiment, the bag body feeding unit comprises a movable seat guiding sleeve and a moveable seat guiding rod; the movable seat guiding sleeve is mounted on the movable seat 424; the movable seat guiding rod is mounted on the rack 1; the movable seat guiding rod is placed inside the movable

seat guiding sleeve; the movable seat guiding rod is parallel to the movable seat position switching piston cylinder 425. In yet another embodiment, the bag body feeding unit also comprises a movable seat guiding rail; the movable seat guiding rail is mounted on the rack 1; the movable seat guiding rail is parallel to the movable seat position switching piston cylinder; the movable seat 424 is disposed on the movable seat guiding rail and slidably cooperates with the movable seat guiding rail.

[0033] The movable seat position switching unit can also adopt an existing structure, such as a chain assembly for motion transmission or a gear-gear rack assembly.

[0034] In a preferred embodiment, each of the heat-sealing devices 5 comprises a heat sealing rack 51, at least one spot sealing head 52, a spot sealing driving unit for driving the open and close operation of the spot sealing head 52, at least one heat sealing head 53 and a heat sealing driving unit for driving the open and close operation of the heat sealing head 53. The heat sealing rack 51 is mounted on the rack 1. The spot sealing head is disposed in front of the heat sealing head. The spot sealing driving unit is mounted on the heat sealing rack 51. A power output end of the spot sealing unit is connected with the spot sealing head 52. The heat sealing driving unit is mounted on the heat sealing rack 51. A power output end of the heat sealing driving unit is connected with the heat sealing head. When a suction tube 9 inserts into the bag opening, the spot sealing head closes to perform spot sealing so that the suction tube 9 is fixed onto the bag opening; the spot sealing head is only required to fix the position of the suction tube 9 onto the bag opening; next, the bag body after spot sealing will be transferred to the heat sealing head for heat sealing, and the heat sealing head will further reinforce the fixation between the fixing position between the suction tube 9 and the bag opening. Therefore, fixation of the suction tube 9 and reinforcement of the fixation are separated into two different procedures, namely spot sealing and heat sealing, and the time required for both procedures is obviously shortened. In this case, the present invention can avoid the long time period required in a single heat sealing procedure and thereby avoiding delayed progress during production. Because of faster production, the present invention is suitable to be used in high-speed production line. Besides, the present invention can also reinforce the fixation of the fixing position between the suction tube 9 and the bag opening.

[0035] The heat sealing head 53 usually comprises an upper heat sealing head 5311 and a lower heat sealing head 5312, the former one at an upper position and the latter one at a lower position. The upper heating sealing head 5311 and the lower heat sealing head 5312 closes with respect to each other to complete heat sealing. Spot sealing head 52 has a substantially same structure as the heat sealing head 53; the spot sealing head 52 comprises an upper sealing head and a lower sealing head, the former one at an upper position and the latter one at a lower position. As compared with heat sealing head,

the spot sealing head has smaller sealing contact surfaces and only perform spot sealing at contact portion between the suction tube 9 and the bag opening. The heat sealing driving unit usually comprises two piston cylinders for elevation and those piston cylinders are mounted on the heat sealing rack 51; a piston rod of one of the piston cylinders is connected with the upper heat sealing head 5311, and a piston rod of another one of the piston cylinders is connected with the lower heat sealing head 5312. The two piston cylinders move in opposite directions; when the piston rods of the two piston cylinders extend outwardly at the same time, heat sealing head 53 closes to complete heat sealing; when the two piston rods of the two piston cylinders retreat at the same time, the heat sealing head 53 opens. The spot sealing driving unit and its connection with the spot sealing head 52 are structurally similar to the heat sealing driving unit and its connection with the heat sealing head 53.

[0036] In order to achieve better heat sealing effect and further enhance the speed of production, each of the heat-sealing devices 5 preferably also comprises at least one second heat sealing head 54 and a second heat sealing driving unit. The second heat sealing head 54 is disposed behind the heat sealing head 53. The second heat sealing driving unit is mounted on the heat sealing rack 51. A power output end of the second heat sealing driving unit is connected with the second heat sealing head 54. The structure of the second heat sealing head 54, the structure of the second heat sealing driving unit and their connection can be designed based on the structure of the heat sealing head 53 and the heat sealing driving unit. By configuring the second heat sealing head 54 behind the heat sealing head 53 so that the bag body is subject to further heat sealing after the first heat sealing by the heat sealing head 53, better heat sealing effect can be achieved and the time for first heat sealing can be shortened, thereby further increasing the speed of production.

[0037] In order to achieve better heat sealing effect and further enhance the speed of production, each of the heat-sealing devices 5 preferably also comprises at least one cold sealing head 55 and a cold sealing driving unit. The cold sealing head 55 is disposed behind the heat sealing head 53. The cold sealing driving unit is mounted on the heat sealing rack. A power output end of the cold sealing driving unit is connected with the cold sealing head. The cold sealing head 55 has a substantially same structure as the heat sealing head 53, the difference is that the cold sealing head 55 does not have any heating component; instead, cooling liquid is used to cool the cold sealing head 55. The structure of the cold sealing driving unit can be designed based on the heat sealing driving unit. A bag opening is not tough enough immediately after heat sealing, it can be easily deformed or torn and therefore is not immediately ready for the filling procedure; a long period of waiting time for the bag opening to cool down will result in delayed production progress or result in lengthy production line. By configuring the

cold sealing head 55, the bag opening after heat sealing can be quickly cooled down, fixed in shape and grow tougher, and is ready immediately for filling procedure. Accordingly, the speed of production is increased. In an embodiment in which the second heat sealing head 54 is provided, the cold sealing head 55 will be disposed behind the second heat sealing head 54.

[0038] Usually, quantities of the spot sealing head 52, the heat sealing head 53, the second heat sealing head 54 and the cold sealing head 55 are all in a same plural number, so that heating sealing can be done simultaneously in multiple lanes. In a specific embodiment, there are four spot sealing heads 52, four heat sealing heads 53, four second heat sealing heads 54 and four cold sealing heads 55.

[0039] Preferably, if plurality of spot sealing heads 52, plurality of heat sealing heads 53, plurality of second heat sealing heads 54 and plurality of cold sealing heads 55 are provided, each of the upper spot sealing heads 5211, each of the lower spot sealing heads 5212, each of the upper heat sealing heads 5311, each of the lower heat sealing heads 5312, each of the second upper heat sealing heads 5411, each of the second lower heat sealing heads 5412, each of the upper cold sealing heads 5511 and each of the lower cold sealing heads 5512 are each connected with a piston cylinder for independent driving. By configuring independent piston cylinders, micro-adjustment of each of the spot sealing heads 52, each of the heat sealing heads 53, each of the second heat sealing heads 54 and each of the cold sealing heads 54 can be facilitated so that when multiple bag bodies are subject to spot sealing, heat sealing and cold sealing simultaneously, spot sealing, heat sealing and cold sealing of each of the bag bodies can be performed accurately, thereby ensuring better heat sealing effect and tight connection between the suction tube 9 and the bag opening.

[0040] In a preferred embodiment, each of the filling devices 6 comprises a filling piston cylinder 61, a constant rate pump 62, a liquid inlet valve 63, a liquid outlet valve 64, a connector 68, a first pin 69, a first position limiting piece 610, a first blocking ring 611, a second pin 612, a second position limiting piece 613 and a second blocking ring 614. The liquid inlet valve 63 and the liquid outlet valve 64 are both connected to and communicated with a bottom end of a pump cavity 65 of the constant rate pump 62. A push rod 66 of the constant rate pump 62 is connected with a piston rod 67 of the filling piston cylinder 61 via the connector 68. One end of the connector 68 is provided with a first groove 615, another end of the connector 68 is provided with a second groove 616. The first groove 615 and the second groove 616 are disposed in two different directions. An end portion of the piston rod 67 is disposed in the first groove 615, and an end surface of a rear end of the end portion of the piston rod 67 contacts with a bottom part of the first groove 615. The first pin 69 passes through a side wall of the first groove 615 and the end portion of the piston rod 67. The first position limiting piece 610 is provided at one end of the first pin

69, and another end of the first pin 69 is provided with a first slot 617. The first blocking ring 611 engages with the first slot 617. An end portion of the push rod 66 is disposed in the second groove 616. An end surface of a rear end of the end portion of the push rod 66 contacts with a bottom part of the second groove 616. The second pin 612 passes through a side wall of the second groove 616 and the end portion of the push rod 66. The second position limiting piece 613 is disposed at one end of the second pin 612, and another end of the second pin 612 is provided with a second slot 618. The second blocking ring 614 engages with the second slot 618. In general, the constant rate pump 62 comprises the pump cavity 65, the push rod 66 and also a piston; the piston is disposed inside the pump cavity 65; the piston is connected with one end of the push rod 66; the push rod 66 drives the piston to slide within the pump cavity 65; amount of materials being pumped is determined by a movement path of the piston; during installation, sleeve the end portion of the piston rod 67 of the filling piston cylinder 61 in the connector 68 so that the end portion of the piston rod 67 of the filling piston cylinder 61 is disposed inside the first groove 615; next, insert the first pin 69 disposed with the first position limiting piece 610 so that the first pin 69 passes through the side wall of the first groove 615 and the end portion of the piston rod 67 of the filling piston cylinder 61 (there are openings disposed in corresponding positions on the side wall of the first groove 615 and on the end portion of the piston rod 67 of the filling piston cylinder 61); next, the first blocking ring 611 is fitted in the first slot 617 so that the piston rod 67 of the filling piston cylinder 61 is fixed with the connector 68; installation method of the push rod 66 and the connector 68 is substantially the same as the installation method between the piston rod 67 of the filling piston cylinder 61 and the connector 68, only that the push rod 66 should first be pulled up to insert into the second groove 616. During disassembly, the piston rod 67 of the filling piston cylinder 61 retreats; next, pull out the first blocking ring 611 and the second blocking ring 614, and pull out the first pin 69 from an end of which the first position limiting piece 610 is disposed, and also pull out the second pin 612 from an end of which the second position limiting piece 613 is disposed; next, lower down the push rod 66 and take away the connector 68; next, pull up the push rod 66 again so that the push rod 66 and the piston of the constant rate pump 62 are completely removed altogether from the pump cavity 65 (because of the connector 68, the push rod 66 will not contact with the piston rod 67 of the filling piston cylinder 61 when the push rod 66 and the piston are completely removed from the pump cavity 65); next, the piston and the pump cavity 65 of the constant rate pump 62 can be cleaned easily.

[0041] The first groove 615 and the second groove 616 are disposed in two different directions which are different from each other by an angle of 90 degrees.

[0042] To achieve easier disassembly, the first position limiting piece 610 and the second position limiting piece

613 are pulling rings. By configuring the first position limiting piece 610 and the second position limiting piece 613 as pulling rings, the first pin 69 and the second pin 612 can be removed by pulling the pulling rings under situation where the blocking rings 611, 614 are dismounted. The pulling rings can serve the function of position limiting and can facilitate removal of the first pin 69 and the second pin 612. The first position limiting piece 610 and the second position limiting piece 613 can also be configured as blocks and the blocks are disposed on outer perimeters of the first pin 69 and the second pin 612 respectively.

[0043] To facilitate easier filling, each of the filling devices 6 preferably also comprises an elevation mechanism; the liquid outlet valve 64 is connected to a bottom end of the constant rate pump 62 through a soft tube 620; the liquid outlet valve 64 is connected with a power output end of the elevation mechanism; the elevation mechanism controls the up and down movement of the liquid outlet valve 64, so that the liquid outlet valve 64 can move up and down for easier connection with a suction tube 9 to perform the filling procedure. The elevation mechanism can be an elevation piston cylinder 619.

[0044] In a preferred embodiment, each of the bag withdrawing devices 8 comprises a bag withdrawing panel 16; the bag withdrawing panel 16 is mounted on the rack 1; an outer side of the bag withdrawing panel 16 (i.e. the side of the bag withdrawing panel 16 facing away from the transmission chain 21) has a bag withdrawing guiding surface 161; the bag withdrawing guiding surface 161 is gradually spaced apart from the transmission chain 21 along the advancing direction of the transmission chain 21; the bag withdrawing panel 16 is usually disposed above the hanging panels 12; the bag withdrawing guiding surface 161 cooperates with the suction tube 9 on a packing bag 17. When a relevant hanging panel carries the corresponding packing bag 17 to a position corresponding to the starting end of the bag withdrawing panel 16, the suction tube 9 of the relevant hanging panel is positioned at an outer side of the bag withdrawing panel 16. The suction tube contacts with the bag withdrawing guiding surface 161; next, the relevant hanging panel and the packing bag 17 advances forward together with the transmission chain 21, and the suction tube 9 will move along the bag withdrawing guiding surface 161; next, the bag withdrawing guiding surface 161 exerts an outward pushing force pushing the suction tube 9 gradually away from the opening 10 of the relevant hanging panel. When the relevant hanging panel passes the bag withdrawing panel 16, the suction tube 9 is totally withdrawn from the opening 10 of the relevant hanging panel. The packing bag 17 will then be withdrawn from the transmission chain 21 and falls off under gravity force.

[0045] The present invention uses dual production lines. The forward path and the return path of the transmission chain 21 are each disposed in sequential order, a tube feeding position 221, a bag body feeding position 222, a heat-sealing position 223, a filling position 224, a

sealing position 225 and a bag withdrawing position 226. A tube feeding device, a bag body feeding device, a heat-sealing device, a filling device, a sealing device and a bag withdrawing device are provided at positions corresponding to the said positions 221-226 on the forward path of the transmission chain 21 and also at positions corresponding to the said positions 221-226 on the return path of the transmission chain 21. The hanging panels 12 are hinged with the transmission chain 21. By means of cooperation between the first turning mechanism, the hanging panel slot 15 and the second turning mechanism, the hanging panels 12 can be turned, namely that the hanging panels 12 can be switched between a horizontal position and a vertical position, so that the suction tube 9 and the packing bag 17 can be turned as well. Therefore, in a transmission device 2, the present invention can complete 2 sets of working procedures each comprising a tube feeding procedure, a bag body feeding procedure, a heat-sealing procedure, a filling procedure, a sealing procedure and a bag withdrawing procedure (one set done on the forward path of the transmission chain 21 and the other set done on the return path of the transmission chain 21). The present invention combines the production of packing bags and filling of materials and at the same time also integrates 2 sets of bag making and filling machines but only occupies slightly more space than one single set of bag making and filling machine having one single production line. The present invention has a simple and compact structure; it occupies limited space but it has high working efficiency, thereby saving much manpower. Besides, the production cost of the present invention is far lower than the production costs of two sets of bag making and filling machine each having a single production line. Furthermore, since the hanging panels 12 can be turned by using simple mechanical structure without the need of using a grip-and-turn device which is structurally complicated. Accordingly, the chances of machine failure are lower.

Brief Description of Drawings

[0046]

FIG. 1 shows the overall structure of the present invention according to a preferred embodiment.

FIG. 2 shows the structure of the transmission device as shown in FIG. 1.

FIG. 3 is a partially enlarged view of portion A as shown in FIG. 2.

FIG. 4 is a partially enlarged view of portion B as shown in FIG. 2.

FIG. 5 shows the structure of the tube feeding device as shown in FIG. 1.

FIG. 6 is a partially enlarged view of portion C as shown in FIG. 5.

FIG. 7 shows the cooperation between the tube feeding device and the transmission device.

FIG. 8 is a front elevational view showing the struc-

ture of the bag body feeding device as shown in FIG. 1.

FIG. 9 is a perspective view showing the structure of the bag body feeding device as shown in FIG. 1; the bag storage box is not illustrated in the figure.

FIG. 10 shows a partial structure of the bag body feeding device as shown in FIG. 1; the bag body transmission unit, the bag body feeding unit and the bag opening unit are illustrated in figure.

FIG. 11 is a top plan view of FIG. 10.

FIG. 12 is a perspective view of FIG. 10.

FIG. 13 shows the structure of the heat-sealing device as shown in FIG. 1.

FIG. 14 shows the structure of the filling device as shown in FIG. 1.

FIG. 15 shows the connecting structure between the connector, the filling piston cylinder and the constant rate pump as shown in FIG. 14.

Best Mode for Carrying out the Invention

[0047] As shown in FIG. 1, the tube-sealing, bag-making and filling machine of the present invention comprises a rack 1, a transmission device 2, two tube feeding devices 3, two bag body feeding devices 4, two heat-sealing devices 5, two filling devices 6, two sealing devices 7 and two bag withdrawing devices 8. The two tube feeding devices 3, the two bag body feeding devices 4, the two heat-sealing devices 5, the two filling devices 6, the two sealing devices 7 (each of the sealing devices 7 comprises a cap organizing device 71, a cap delivering device 72 and a cap turning device 73) and the two bag withdrawing devices 8 are all provided on the rack 1.

[0048] By reference to FIG. 1 and FIG. 2, the transmission device 2 comprises a transmission chain 21, an active chain wheel 22, a passive chain wheel 23 and a main driving mechanism, wherein the active chain wheel 22, the passive chain wheel 23 and the main driving mechanism are all mounted on the rack 1. The transmission chain 21 is mounted to the active chain wheel 22 and the passive chain wheel 23. The active chain wheel 22 and the main driving mechanism are connected for motion transmission. The transmission chain 21 is mounted with plurality of hanging panels 12 arranged in equal intervals. One side (usually referred to as the "inner side") of each of the hanging panels 12 is hinged with the transmission chain 21. Each of the hanging panels 12 is provided with an opening 10 which can accommodate a suction tube 9; rear part of the opening 10 is outwardly extended with a tube sweeping portion 11. By choosing appropriately structured hinges 18, horizontally placed hanging panels 12 can only turn upwardly but not downwardly, and the hanging panels 12 can only turn upwardly at a maximum angle of 90 degrees (the choice of hinges 18 is a common technical means known to any person skilled in this field of art). Along a advancing direction of the transmission chain 21, an forward path 2101 and a return path 2102 of the transmission chain 21 are each provided in se-

quential order, a tube feeding position 221, a bag body feeding position 222, a heat-sealing position 223, a filling position 224, a sealing position 225 and a bag withdrawing position 226, wherein one of the tube feeding devices 3, one of the bag body feeding devices 4, one of the heat-sealing devices 5, one of the filling devices 6, one of the sealing devices 7 and one of the bag withdrawing devices 8 correspond respectively to positions of the tube feeding position 221, the bag feeding position 222, the heat-sealing position 223, the filling position 224, the sealing position 225 and the bag withdrawing position 226 of the forward path 2101 of the transmission chain 21; another one of the tube feeding devices 3, another one of the bag body feeding devices 4, another one of the heat-sealing devices 5, another one of the filling devices 6, another one of the sealing devices 7 and another one of the bag withdrawing devices 8 correspond respectively to positions of the tube feeding position 221, the bag feeding position 222, the heat-sealing position 223, the filling position 224, the sealing position 225 and the bag withdrawing position 226 of the return path 2102 of the transmission chain 21. In between the tube feeding position 221 and the bag body feeding position 222, there is a first turning mechanism for turning the hanging panels 12 from a horizontal position to a vertical position. In between the heat-sealing position 223 and the filling position 224, there is a second turning mechanism for turning the hanging panels 12 from a vertical position to a horizontal position. In between the first turning mechanism and the second turning mechanism, there is a hanging panel slot 15 to maintain the hanging panels 12 in a vertical position. The heat-sealing position 223 corresponds to a section of the transmission chain 21, and a starting end of the heat-sealing position 223 overlaps with the bag body feeding position 222.

[0049] As shown in FIG. 3, the first turning mechanism comprises a first position limiting block 13; the first position limiting block 13 has a first guiding curved surface 131; the first guiding curved surface 131 contacts and cooperates with a bottom surface of each of the hanging panels 12; along an advancing direction of the transmission chain 21, the first guiding curved surface 131 is initially configured as lying horizontally and faces upwardly and then it is gradually twisted so that it is configured vertically facing the transmission chain 21. A starting end and a finishing end of the first guiding curved surface 131 enable the following conditions: When one of the hanging panels 12 is at the starting end of the first guiding curved surface 131, its bottom surface is on a horizontal surface of the starting end of the first guiding curved surface 131, and when it is at the finishing end of the first guiding curved surface 131, a gap between the transmission chain 21 and a vertical surface of the finishing end of the first guiding curved surface 131 only allows it to pass through vertically, and it is then at an inner side of the vertical surface of the finishing end of the first guiding curved surface 131.

[0050] As shown in FIG. 4, the second turning mech-

anism comprises a second position limiting block 14; the second position limiting block 14 has a second position limiting edge 141; the second position limiting edge 141 contacts and cooperates with the bottom surface of each of the hanging panels 12; along the advancing direction of the transmission chain 21, the second position limiting edge 141 is gradually spaced apart from the transmission chain 21 and is gradually lowered in its position.

[0051] As shown in FIG. 2, each of the bag withdrawing devices 8 comprises a bag withdrawing panel 16; the bag withdrawing panel 16 is mounted on the rack 1; an outer side of the bag withdrawing panel 16 (i.e. the side of the bag withdrawing panel 16 facing away from the transmission chain 21) has a bag withdrawing guiding surface 161; the bag withdrawing guiding surface 161 is gradually spaced apart from the transmission chain 21 along the advancing direction of the transmission chain 21; the bag withdrawing panel 16 is disposed above the hanging panels 12; the bag withdrawing guiding surface 161 cooperates with the suction tube 9 on a packing bag 17.

[0052] As shown in FIG. 5 to FIG. 7, each of the tube feeding devices 3 comprises a vibration disc 32, a tube feeding guiding rail 33, a tube delivery piston cylinder 34 and a tube delivery guiding rail 35; the vibration disc 32, the tube feeding guiding rail 33, the tube delivery piston cylinder 34 and the tube delivery guiding rail 35 are all mounted to the rack 1.

[0053] A rear end 331 of the tube feeding guiding rail 33 is placed higher than a front end 332 of the tube feeding guiding rail 33; a tube exit 36 of the vibration disc 32 is connected with the rear end 331 of the tube feeding guiding rail 33; the tube delivery guiding rail 35 links in continuity with the front end 332 of the tube feeding guiding rail 33; the tube delivery guiding rail 35 gradually approaches to the transmission chain 21 along the advancing direction of the transmission chain 21 (as shown by the arrow of FIG. 7); the tube sweeping portion 11 of each of the hanging panels 12 has a width ensured to enable the tube sweeping portion 11 to sweep one suction tube 9 (usually the width of the tube sweeping portion 11 is identical to or slightly smaller than the width of the tube delivery guiding rail 35); the tube sweeping portion 11 of each of the hanging panels 12 has a width at its front end gradually decreased towards its rear end. In this embodiment, the tube delivery guiding rail 35 is a linear guiding rail.

[0054] A front portion of the tube feeding guiding rail 33 is a linear tube feeding guiding rail section 333; in this embodiment, the linear tube feeding guiding rail section 333 is positioned horizontally; the linear tube feeding guiding rail section 333 is perpendicular to a corresponding section of the transmission chain 21. The tube delivery piston cylinder 34 is disposed above the tube feeding guiding rail 33 (in this embodiment, the tube delivery piston cylinder 34 is disposed right above the linear tube feeding guiding rail section 333), and the tube delivery piston cylinder 34 is parallel to the linear tube feeding guiding rail section 333. A piston cylinder 341 of the tube

delivery piston cylinder 34 is mounted to the rack 1; a piston rod 342 of the tube delivery piston cylinder 34 is disposed with a one-way hook 312 which can sweep the suction tube 9 on the linear tube feeding guiding rail section 333. In this embodiment, the piston rod 342 of the tube delivery piston cylinder 34 is mounted with a connection panel 313. The connection panel 313 is disposed with a one-way hook seat 314 on its front side surface. An upper end of the one-way hook 312 is rotably mounted to the one-way hook seat 314. A lower end of the one-way hook 312 has a size smaller than a material filling hole 91 of the suction tube 9. The lower end of the one-way hook 312 can be inserted to the material filling hole 91 of the suction tube 9. A guiding rod 315 is mounted to the connection panel 313. The guiding rod 315 is parallel to the tube delivery piston cylinder 34. The rack 1 is disposed with a guiding sleeve 316. The guiding rod 315 is disposed inside the guiding sleeve 316.

[0055] As shown in FIG. 8-FIG. 9, each of the bag body feeding devices 4 comprises a bag storage unit, a bag transferring unit, a bag body transmission unit, a bag opening unit and a bag body feeding unit, wherein the bag body transmission unit can receive a bag body from the bag transferring unit and transmit the bag body to the bag opening unit.

[0056] The bag storage unit comprises a bag storage box 42 and a bag delivery unit; the bag storage box 42 is provided on the rack 1 along a horizontal direction. The bag storage box 42 has a cross-section that matches with the bag body. A front end of the bag storage box 42 is disposed with a bag exit 43 (an inner side of the bag exit 43 can be provided with a bag blocking flange or a plurality of bag blocking pieces). The bag delivery unit comprises a bag delivery panel 44, a bag delivery rodless piston cylinder 45, a bag body sweeping fork 46, a bag body sweeping fork laterally movable piston cylinder 47, an elevation platform 48 and a bag body sweeping fork elevation piston cylinder 49. The bag delivery panel 44 is disposed inside the bag storage box 42. The bag delivery rodless piston cylinder 45 is mounted on the rack 1. Sliding block 451 of the bag body delivery rodless piston cylinder 45 is connected with the bag delivery panel 44. The bag body sweeping fork elevation piston cylinder 49 is vertically positioned. Piston cylinder 491 of the bag body sweeping fork elevation piston cylinder 49 is mounted on the rack 1. The elevation platform 48 is connected with piston rod 492 of the bag body sweeping fork elevation piston cylinder 49. The bag body sweeping fork laterally movable piston cylinder 47 is parallel to the bag body delivery rodless piston cylinder 45. Piston cylinder 471 of the bag body sweeping fork laterally movable piston cylinder 47 is mounted on the elevation platform 48. The bag body sweeping fork 46 is connected with piston rod 472 of the bag body sweeping fork laterally movable piston cylinder 47. The bag delivery rodless piston cylinder 45 has the same moving direction as the bag storage box 42. Under driving force of the sliding block 451 of the bag delivery rodless piston cylinder 45, the bag delivery

panel 44 can move back and forth in the bag storage box 42. In this embodiment, the bag delivery rodless piston cylinder 45 is disposed below the bag storage box 42. The bag body sweeping fork elevation piston cylinder 49 is a bi-axial piston cylinder. The bag delivery unit also comprises a guiding unit which comprises a lateral guiding rod 410 and a lateral guiding sleeve 411. The lateral guiding rod 410 is parallel to the bag body sweeping fork laterally movable piston cylinder 47. The lateral guiding rod 410 is mounted on the elevation platform 48. The lateral guiding sleeve 411 is connected with the bag body sweeping fork 46. The lateral guiding rod 410 is disposed inside the lateral guiding sleeve 411. Specifically, bottom part of the bag storage box 42 has an elongated opening disposed in a direction that runs along the front and back of the bag storage box, and an upper end of the bag body sweeping fork 46 is inserted to a cavity of the bag storage box 42 through the elongated opening.

[0057] The bag transferring unit comprises a position switching unit and a bag suction unit. The bag suction unit comprises a vacuum suction disc 412 and a suction disc seat 413. The vacuum suction disc 412 is disposed on the suction disc seat 413. The position switching unit comprises a rotation axis 414, a telescopic piston cylinder 415 and a rotation axis driving unit. The rotation axis 414 is rotably mounted on the rack 1. Piston cylinder 415 of the telescopic piston cylinder 415 is mounted on the rotation axis 414. The suction disc seat 413 is fixedly mounted on piston rod 4152 of the telescopic piston cylinder 415. The rotation axis driving unit comprises an oscillating piston cylinder 416. The oscillating piston cylinder 416 is mounted on the rack 1. A power output end 4161 of the oscillating piston cylinder 416 is connected with the rotation axis 414 for motion transmission.

[0058] As shown in FIG. 10 to FIG. 12, the bag body transmission unit comprises a bag transmission guiding rail set, a bag sweeping panel 417 and a bag sweeping piston cylinder 418. The bag transmission guiding rail set comprises two bag transmission guiding rails 419 parallel to each other. The bag transmission guiding rails 419 are mounted on the rack 1. The bag sweeping panel 417 has a bag sweeping portion 420. The bag sweeping portion 420 is disposed in between the two bag transmission guiding rails 419 of the bag transmission guiding rail set. The bag sweeping piston cylinder 418 is parallel to the bag transmission guiding rail set (i.e. the bag sweeping piston cylinder 418 is parallel to the bag transmission guiding rails 419). Piston cylinder 4181 of the bag sweeping piston cylinder 418 is mounted on the rack 1. The bag body transmission unit also comprises two bag sweeping panel guiding rods 421, two bag sweeping panel guiding sleeves 422 and a first cross rod 423. The two bag sweeping panel guiding rods 421 correspond to the two bag sweeping panel guiding sleeves 422 respectively. The bag sweeping panel guiding rods 421 are disposed inside the bag sweeping panel guiding sleeves 422. The bag sweeping panel guiding rods 421 are parallel to the bag transmission guiding rail set (i.e. The bag sweeping pis-

ton cylinder 418 is parallel to the bag transmission guiding rails 419). The bag sweeping panel guiding sleeves 422 are mounted on the rack 1. First ends of the bag sweeping panel guiding rods 421 are connected with the bag sweeping panel 417. Second ends of the bag sweeping panel guiding rods 421 are connected with the first cross rod 423. The first cross rod 423 is connected with piston rod 4182 of the bag sweeping piston cylinder 418 (in other words, the piston rod 4182 of the bag sweeping piston cylinder 418 is connected to the bag sweeping panel 417 via the first cross rod 423 and the bag sweeping panel guiding rods 421). The two bag sweeping panel guiding rods 421 are respectively positioned at two sides of the bag sweeping piston cylinder 417. A rear end of the bag transmission guiding rail set corresponds to the position of the bag transferring unit. A front end of the bag transmission guiding rail set corresponds to the position of the bag opening unit. The bag transmission guiding rail set is perpendicular to a portion of the transmission chain 21 corresponding to a bag body feeding device of the bag body feeding devices 4. In this embodiment, the piston rod 4182 of the bag sweeping piston cylinder 418 faces away from the transmission chain 21. In the bag transmission guiding rail set, there is a space between the two bag transmission guiding rails 419 which are parallel to each other, and the bag sweeping portion 420 is disposed in the space. An upper end of the bag sweeping portion 420 is positioned higher than supporting surfaces of the bag transmission guiding rails 419 so that the bag sweeping portion 420 can touch a rear end of a bag body when the bag sweeping panel 417 advances forward. Left and right sides of the bag body on the bag transmission guiding rail set are supported by the two bag transmission guiding rails 419 respectively, while middle part of the bag body is not supported and suspended in air.

[0059] As shown in FIG. 10 to FIG. 12, the bag body feeding unit comprises a movable seat 424 and a movable seat position switching unit. The movable seat position switching unit is mounted on the rack 1. A power output end of the movable seat position switching unit is connected with the movable seat 424. In this embodiment, the movable seat position switching unit comprises a movable seat position switching piston cylinder 425. Piston cylinder 4251 of the movable seat position switching piston cylinder 425 is mounted on the rack 1. The bag body feeding unit also comprises two movable seat guiding sleeves 426, two movable seat guiding rods 427 and a second cross rod 428. The two movable seat guiding rods 427 correspond to the two movable seat guiding sleeves 426 respectively. The movable seat guiding rods 427 are disposed in the movable seat guiding sleeves 426. The movable seat guiding rods 427 are parallel to the movable seat position switching piston cylinder 425. The movable seat guiding sleeves 426 are mounted on the rack 1. First ends of the movable seat guiding rods 427 are connected with the movable seat 424, second ends of the movable seat guiding rods 427 are connected with the second cross rod 428. The second cross rod 428

is connected with a piston rod 4252 of the movable seat position switching piston cylinder 425 (in other words, the movable seat 424 is connected with the piston rod 4252 of the movable seat position switching piston cylinder 425 via the movable seat guiding rods 427 and the second cross rod 428). The two movable seat guiding rods 427 are positioned at two sides of the movable seat position switching piston cylinder 425 respectively. The movable seat position switching piston cylinder 425 is perpendicular to a portion of the transmission chain 21 corresponding to a bag body feeding device of the bag body feeding devices 4. The piston rod 4252 of the movable seat position switching piston cylinder 425 faces towards the transmission chain 21.

[0060] As shown in FIG. 10 to FIG. 12, the bag opening unit comprises a left gripper piston cylinder 429, a right gripper piston cylinder 430, an upper suction disc 431, an upper suction disc mounting panel 432, a lower suction disc 433 and a lower suction disc mounting panel 434. Piston cylinder 4291 of the left gripper piston cylinder 429 and piston cylinder 4301 of the right gripper piston cylinder 430 are both mounted on the movable seat 424. The left gripper piston cylinder 429 is disposed at a left side of the movable seat 424. The right gripper piston cylinder 430 is disposed at a right side of the movable seat 424. A left end of the upper suction disc mounting panel 432 is connected with an upper pneumatic grip 4292 of the left gripper piston cylinder 429, and a right end of the upper suction disc mounting panel 432 is connected with an upper pneumatic grip 4302 of the right gripper piston cylinder 430. A left end of the lower suction disc mounting panel 434 is connected with a lower pneumatic grip 4293 of the left gripper piston cylinder 429, and a right end of the lower suction disc mounting panel 434 is connected with a lower pneumatic grip 4303 of the right gripper piston cylinder 430. The upper suction disc 431 is mounted on the upper suction disc mounting panel 432. The lower suction disc 433 is mounted on the lower suction disc mounting panel 434. The upper suction disc 431 and the lower suction disc 433 correspond to each other in position. Quantity of the upper suction disc 431 is the same as the quantity of the lower suction disc 433 and for each pair of suction discs comprising the upper suction disc 431 and the lower suction disc 433, the upper suction disc 431 and the lower suction disc 433 in each pair correspond to each other in position. Each bag body can correspond to one pair of suction disc comprising the upper suction disc 431 and the lower suction disc 433 or is correspondingly disposed across multiple pairs of suction discs each comprising the upper suction disc 431 and the lower suction disc 433.

[0061] In this embodiment, bag bodies are supplied in four adjacent lanes, in which the bag storage box 42, the bag delivery panel 44, the bag delivery rodless piston cylinder 45, the bag body sweeping fork 46, the bag body sweeping fork laterally movable piston cylinder 47, the elevation platform 48, the bag body sweeping fork elevation piston cylinder 49, the telescopic piston cylinder

418, the bag suction unit, the bag transmission guiding rail set are each multiplied by four in number so that the quantity of each of these components is four. Accordingly, there are four pairs of upper suction disc 431 and lower suction disc 433. The rotation axis 414, the oscillating piston cylinder 416, the bag sweeping piston cylinder 418, the movable seat 424, the movable seat position switching piston cylinder 425, the left gripper piston cylinder 429, the right gripper piston cylinder 430, the upper suction disc mounting panel 432 and the lower suction disc mounting panel 434 are shared by the four adjacent lanes. Also, the four adjacent lanes share bag sweeping panel 417 while each lane will be provided with the bag sweeping portion 420 (i.e. there are four bag sweeping portions in total).

[0062] As shown in FIG. 13, each of the heat-sealing devices 5 comprises a heat sealing rack 51, four spot sealing heads 52, four heat sealing heads 53, four second heat sealing heads 54, four cold sealing heads 55, a spot sealing driving unit, a heating sealing driving unit, a second heat sealing driving unit and a cold sealing driving unit. The spot sealing heads 52, the heat sealing heads 53, the second heat sealing heads 54 and the cold sealing heads 55 are arranged in sequential order along the advancing direction of the transmission chain 21. The heat sealing rack 51 is mounted on the rack 1.

[0063] Each of the spot sealing heads 52 comprises an upper spot sealing head 5211 and a lower spot sealing head 5212. Each of the heat sealing heads 53 comprises an upper heat sealing head 5311 and a lower heat sealing head 5312. Each of the second heating sealing heads 54 comprises an upper second heat sealing head 5411 and a lower second heat sealing head 5412. Each of the cold sealing heads 55 comprises an upper cold sealing head 5511 and a lower cold sealing head 5512.

[0064] The spot sealing driving unit comprises four pairs of spot sealing piston cylinders 56, the heat sealing driving unit comprises four pairs of heat sealing piston cylinders 57, the second heat sealing driving unit comprises four pairs of second heat sealing piston cylinders 58, the cold sealing driving unit comprises four pairs of cold sealing piston cylinders 59, and each piston cylinder of the above piston cylinders 56, 57, 58, 59 is mounted on the heat sealing rack 51, and each pair of piston cylinders of the above pairs of piston cylinders 56, 57, 58, 59 has its respective two piston cylinders having two respective piston rods operating in mutually opposite directions. In each pair of spot sealing piston cylinders 56, a piston rod 5611 of one of the spot sealing piston cylinders 56 is connected with the respective upper spot sealing head 5211, and a piston rod 5612 of another one of the spot sealing piston cylinders 56 is connected with the respective lower spot sealing head 5212. In each pair of heat sealing piston cylinders 57, a piston rod 5711 of one of the heat sealing piston cylinders 57 is connected with the respective upper heat sealing head 5311, and a piston rod 5712 of another one of the heat sealing piston cylinders 57 is connected with the respective lower heat

sealing head 5312. In each pair of second heat sealing piston cylinders 58, a piston rod 5811 of one of the second heat sealing piston cylinders 58 is connected with the respective upper second heat sealing head 5411, and a piston rod 5812 of another one of the second heat sealing piston cylinders 58 is connected with the respective lower second heat sealing head 5412. In each pair of cold sealing piston cylinders 59, a piston rod 5911 of one of the cold sealing piston cylinders 59 is connected with the respective upper cold sealing head 5511, and a piston rod 5912 of another one of the cold sealing piston cylinders 59 is connected with the respective lower cold sealing head 5512.

[0065] As shown in FIG. 14, each of the filling devices 6 comprises a filling piston cylinder 61, a constant rate pump 62, a liquid inlet valve 63, a liquid outlet valve 64, a connector 68, a first pin 69, a first position limiting piece 610, a first blocking ring 611, a second pin 612, a second position limiting piece 613 and a second blocking ring 614. The liquid inlet valve 63 and the liquid outlet valve 64 are both connected to and communicated with a bottom end of a pump cavity 65 of the constant rate pump 62. A push rod 66 of the constant rate pump 62 is connected with a piston rod 67 of the filling piston cylinder 61 via the connector 68. Piston cylinder of the filling piston cylinder 61, the constant rate pump 62 and the liquid inlet valve 63 are all mounted on the rack 1.

[0066] As shown in FIG. 15, one end of the connector 68 is provided with a first groove 615, another end of the connector 68 is provided with a second groove 616. The first groove 615 and the second groove 616 are disposed in two different directions which are different from each other by an angle of 90 degrees. An end portion of the piston rod 67 is disposed in the first groove 615, and an end surface of a rear end of the end portion of the piston rod 67 contacts with a bottom part of the first groove 615. The first pin 69 passes through a side wall of the first groove 615 and the end portion of the piston rod 67. The first position limiting piece 610 is provided at one end of the first pin 69, and another end of the first pin 69 is provided with a first slot 617. The first blocking ring 611 engages with the first slot 617. An end portion of the push rod 66 is disposed in the second groove 616. An end surface of a rear end of the end portion of the push rod 66 contacts with a bottom part of the second groove 616. The second pin 612 passes through a side wall of the second groove 616 and the end portion of the push rod 66. The second position limiting piece 613 is disposed at one end of the second pin 612, and another end of the second pin 612 is provided with a second slot 618. The second blocking ring 614 engages with the second slot 618. The first position limiting piece 610 and the second position limiting piece 613 are both pull rings.

[0067] Each of the filling devices 6 also comprises an elevation piston cylinder 619. Piston cylinder 6191 of the elevation piston cylinder 619 is mounted on the rack 1. The liquid outlet valve 64 is connected with a bottom end of the constant rate pump 62. The liquid outlet valve 64

is connected with a piston rod 6192 of the elevation piston cylinder 619 (in this embodiment, filling occurs in four lanes at the same time, so the quantity of the liquid outlet valve 64 is four and all the liquid outlet valves are mounted on an elevation rack 621, and the elevation rack 621 is connected with the piston rod 6192 of the elevation piston cylinder 619).

[0068] The liquid inlet valve 63 comprises a liquid inlet valve seat 6301, a liquid inlet valve core 6302 and a liquid inlet piston cylinder 6303. Piston rod 6304 of the liquid inlet piston cylinder 6303 is connected with the liquid inlet valve core 6302. The liquid outlet valve 64 comprises a liquid outlet valve seat 6401, a liquid outlet valve core 6402 and a liquid outlet piston cylinder 6403. Piston rod 6404 of the liquid outlet piston cylinder 6403 is connected with the liquid outlet valve core 6302.

[0069] The operation principle of the present invention is detailed as follows:

[0070] Under the driving force of the main driving mechanism and the active chain wheel 22, the transmission chain 21 advances along a repeated route. On the forward path 2101 of the transmission chain 21, the hanging panels 12 reach the tube feeding position 221, and then the bag body feeding position 222, and then the heat-sealing position 223, and then the filling position 224, and then the sealing position 225, and then the bag withdrawing position 226 on the forward path 2101 of the transmission chain 21 to complete procedures such as tube feeding, bag body feeding, heat-sealing, filling, sealing and bag withdrawing one by one on the forward path 2101 of the transmission chain 21. At the tube feeding position 221, the hanging panels 12 are horizontally positioned, and for each hanging panel of the hanging panels 12, a relevant tube feeding device of the tube feeding devices 3 feeds the suction tube 9 to the opening 10 of the relevant hanging panel and the suction tube 9 will hang on the relevant hanging panel and will be vertically positioned. Next, the first position limiting block 13 disposed between the tube feeding position 221 and the bag body feeding position 222 turns the relevant hanging panel from a horizontal position to a vertical position so that the suction tube 9 is horizontally positioned. Next, the hanging panel slot 15 limits the position of the relevant hanging panel to ensure that the relevant hanging panel is kept at a vertical position during bag body feeding procedure and heat-sealing procedure. Next, a relevant bag body feeding device of the bag body feeding devices 4 feeds a bag body to a position that corresponds to the suction tube 9 and then a relevant heat-sealing device of the heat-sealing devices 5 immediately performs heat-sealing so that the bag body and the suction tube 9 are connected with each other to form a packing bag 17. Next, the relevant hanging panel leaves the hanging panel slot 15, and the second position limiting block 14 disposed between the heat-sealing position 223 and the filling position 224 turns the relevant hanging panel from a vertical position to a horizontal position so that the suction tube and the bag body are vertically positioned with the

suction tube 9 facing upwardly. Next, a relevant filling device of the filling devices 6 fills materials to the packing bag 17. After filling, a relevant sealing device of the sealing devices 7 seals the suction tube 9 at the sealing position 225. When the packing bag 17 filled with materials reaches the bag withdrawing position 226, a relevant bag withdrawing device of the bag withdrawing devices 8 withdraws the packing bag 17 filled with materials from the relevant hanging panel, and procedures on the forward path 2101 of the transmission chain 21 such as bag making, material filling and sealing are completed. After bag withdrawing procedure is completed at the forward path 2101 of the transmission chain 21, the relevant hanging panel is empty and horizontally positioned and it advances together with the transmission chain 21 to enter the return path 2102 of the transmission chain 21. The relevant hanging panel then reaches the tube feeding position 221, and then the bag body feeding position 222, and then the heat-sealing position 223, and then the filling position 224, and then the sealing position 225, and then the bag withdrawing position 226 on the return path 2102 of the transmission chain 21 to complete procedures such as tube feeding, bag body feeding, heat-sealing, filling, sealing and bag withdrawing one by one on the return path 2102 of the transmission chain 21, and these procedures are the same as those on the forward path 2101 of the transmission chain 21. When the bag withdrawing procedure on the return path 2102 of the transmission chain 21 is completed, the relevant hanging panel is empty again and horizontally positioned and it advances back to the tube feeding position 221 on the forward path 2101 of the transmission chain 21 to repeat the working procedures as described above.

[0071] Each working procedure is detailed as follows:

(1) Operating principle of the tube feeding devices 3:

[0072] In each of the tube feeding devices 3, the vibration disc 32 keeps vibrating to organize the suction tubes in the vibration disc 32, adjust their positions and keeps feeding the suction tubes to the tube exit 36. The suction tubes that leave the vibration disc 32 via the tube exit 36 enter the tube feeding guiding rail 33. All the suction tubes on the tube feeding guiding rail 33 are arranged in the same manner (suction portion faces upward and connection portion faces downward). Under gravity force, the suction tubes on the tube feeding guiding rail 33 slides from the tube feeding guiding rail rear end 331 towards the tube feeding guiding rail front end 332 and reach the linear tube feeding guiding rail section 333.

[0073] Under the driving force of the main driving mechanism, the transmission chain 21 advances and the hanging panels 12 therefore advance together with the transmission chain 21 as well. Also, under the driving force of the tube delivery piston cylinder 34, the one-way hook 312 pushes the suction tubes on the linear tube feeding guiding rail section 333 so that the suction tubes can move forward along the linear tube feeding guiding

rail section 333. A suction tube at the forefront of the tube feeding guiding rail 33 is at a connector portion 317 between the tube feeding guiding rail 33 and the tube delivery guiding rail 35. When the relevant hanging panel arrives at a position corresponding to the connector portion 317, the opening 10 of the relevant hanging panel is blocked by an inner side wall 351 of the tube delivery guiding rail 35, and the tube sweeping portion 11 of the relevant hanging panel contacts with the suction tube. As the relevant hanging panel continues to advance forward (when the relevant hanging panel is advancing, it is positioned above the tube delivery guiding rail 35), the suction tube at the forefront of the tube feeding guiding rail 33 is fed to the tube delivery guiding rail 35 and that suction tube is being driven to move along the tube delivery guiding rail 35. When the suction tube is moving along the tube delivery guiding rail 35, the suction tube gradually inserts into the opening 10 of the relevant hanging panel under the effect of an outer side wall 352 of the tube delivery guiding rail 35. When the suction tube leaves the tube delivery guiding rail 35, the suction tube is completely in the opening 10 and hangs on the relevant hanging panel.

[0074] When the relevant hanging panel feeds the suction tube at the forefront of the tube feeding guiding rail 33 to the tube delivery guiding rail 35 and drives the suction tube to move along the tube delivery guiding rail 35, the next suction tube contacts a side of the tube sweeping portion 11 and slides with respect to the tube sweeping portion 11 under the pushing force of the one-way hook 312, and being stably transferred to the connector portion 317. When the relevant hanging panel passes the position corresponding to the connector portion 317, the one-way hook 312 pushes the next suction tube on the tube feeding guiding rail 33 to the connector portion 317. Then, the next hanging panel arrives at the position corresponding to the connector portion 317 and treats the next suction tube in the same way as its preceding hanging panel treats the preceding suction tube.

[0075] The tube delivery piston cylinder 34 and the one-way hook 312 operate as follows: When the piston rod 342 of the tube delivery piston cylinder 34 retreats backward, the connection panel 313 and the one-way hook 312 move backward. Since the one-way hook 312 is able to swing forward when it touches a suction tube, suction tube will not hinder the movement of the connection panel 313 and the one-way hook 312. When the piston rod 342 of the tube delivery piston cylinder 34 advances forward, lower end of the one-way hook 312 inserts into the material filling hole 91 of a suction tube and swings backward. When a rear side of the one-way hook 312 contacts with a lower end of the connection panel 313, the one-way hook 312 can no longer swing backward due to the blocking of the lower end of the connection panel 313. Then, under the driving force of the tube delivery piston cylinder 34, the one-way hook 312 pushes suction tubes in front of the one-way hook 312 on the linear tube feeding guiding rail section 333 forward along

the linear tube feeding guiding rail section 333.

[0076] Every action of the piston rod 342 of the tube delivery piston cylinder 34 can push plurality of suction tubes so that the plurality of suction tubes will be pushed one by one to the connector portion 317 disposed between the tube feeding guiding rail 33 and the tube delivery guiding rail 35. In each forward advancement of the piston rod 342 of the tube delivery piston cylinder 34, the path of forward advancement of the piston rod 342 of the tube delivery piston cylinder 34 determines how far the plurality of suction tubes can be pushed, thereby determining the number of suction tubes to be pushed to the connector portion 317. If the distance between the centers of two adjacent suction tubes on the suction tube guiding rail 33 is L, and the distance travelled by each forward advancement of the piston rod 342 of the tube delivery piston cylinder 34 is N times of L, N number of suction tubes can be pushed to the connector portion 317 in each forward advancement of the piston rod 342 of the tube delivery piston cylinder 34. In this embodiment, advancement of the transmission chain 21 is a motion of stepping forward, step-by-step. N number of hanging panels 12 pass the connector portion 317 in each advancing step of the transmission chain 21. Corresponding to an advancing step of the transmission chain 21, the piston rod 342 of the tube delivery piston cylinder 34 also advances once to push N number of suction tubes to the connector portion 317. Accordingly, when the relevant tube feeding device completes a working cycle, N number of suction tubes will be transmitted to the transmission device, and in this case, simultaneous bag making using N number of adjacent lanes can be achieved.

[0077] (2) When the relevant hanging panel arrives at the first position limiting block 13, the bottom surface of the relevant hanging panel has always been keeping contact with the first guiding curved surface 131 during its advancement together with the transmission chain 21, therefore the position of the relevant hanging panel during its advancement is determined by the first guiding curved surface 131. As the transmission chain 21 advances forward, the relevant hanging panel also advances forward along the first guiding curved surface 131. The first guiding curved surface 131 exerts a lifting force to the relevant hanging panel and a pushing force to push the relevant hanging panel towards the transmission chain 21. Accordingly, the relevant hanging panel gradually turns upward until it is vertically positioned.

[0078] When the relevant hanging panel is turned to position vertically, the outer side of the relevant hanging panel is turned to the top end of that vertical position. When the relevant hanging panel 12 leaves the first position limiting block 13, the outer side of the relevant hanging panel inserts into the hanging panel slot 15. As the transmission chain 21 advances, the relevant hanging panel advances along the hanging panel slot 15 and keeps positioned vertically. Accordingly, the hanging panel slot 15 limits the position of the relevant hanging panel and ensures that the relevant hanging panel is kept

in a vertical position during bag body feeding procedure and heat-sealing procedure.

(3) Operating principle of the bag body feeding devices 4:

[0079] (3-1) Bag storage unit: The bag delivery panel 44 and the bag body sweeping fork 46 alternately push bag bodies in the bag storage box 42 to move towards the bag exit 43. Firstly, the bag delivery rodless piston cylinder 45 drives the sliding block 451 and the bag delivery panel 44 to move forward, thereby pushing the bags forward; when the bag delivery panel 44 moves to a predetermined position, there are a few bag bodies left in the bag storage box 42; then the piston rod 492 of the bag body sweeping fork elevation piston cylinder 49 extends outwardly to lift up the elevation platform 48; an upper end of the bag body sweeping fork 46 then inserts into the cavity of the bag storage box 42; next, the piston rod 472 of the bag body sweeping fork laterally movable piston cylinder 47 extends outwardly to move the bag body sweeping fork 46 forward so that the bags are pushed forward; next the sliding block 451 of the bag delivery rodless piston cylinder 45 and the bag delivery panel 44 move backward and an alert signal of insufficient bags is sent; an operator will then refills the bag storage box 42 with bag bodies and press a reset button; the sliding block 451 of the bag delivery rodless piston cylinder 45 and the bag delivery panel 44 move forward and push the bags forward, then the piston rod 492 of the bag body sweeping fork elevation piston cylinder 49 retreats to lower the elevation platform 48, and the bag body sweeping fork 46 retreats from the cavity of the bag storage box 42; next, the piston rod 472 of the bag body sweeping fork laterally movable piston cylinder 47 retreats and the bag body sweeping fork 46 resets its position. The procedures will then repeat again.

[0080] (3-2) Bag transferring unit: Under the driving force of the oscillating piston cylinder 416, the bag suction unit can switch its position back and forth repeatedly between a bag suction position (i.e. a position corresponding to the bag exit 43 of the bag storage box 42) and a bag release position (i.e. a position corresponding to the bag body transmission unit), and the bag suction unit completes the bag suction procedure and bag release procedure under cooperation of the telescopic piston cylinder 415 so that a bag body is transferred from the bag storage unit to the bag body transmission unit. To describe in detail: Firstly, the oscillating piston cylinder 416 is activated and the rotation axis 414 is driven to rotate, thereby driving the telescopic piston cylinder 415, the suction disc seat 413 and the vacuum suction disc 412 to rotate upward as well. The position of the vacuum suction disc 412 corresponds to the bag exit 43 of the bag storage box 42. Next, the piston rod 4152 of the telescopic piston cylinder 415 extends outwardly and the vacuum suction disc 412 sucks the bag body at the forefront position; next, the piston rod 4152 of the telescopic piston cylinder 415 retreats and the vacuum suction disc 412

hold the bag body at the forefront position and the bag body is forced to deform a bit in its shape and then being taken out while other bag bodies in the bag storage box 42 continue to move forward; next, the oscillating piston cylinder 416 is activated in a reversed direction (i.e. to reset its position), the rotation axis 414 is driven to rotate, thereby driving the telescopic piston cylinder 415, the suction disc seat 413 and the vacuum suction disc 412 to rotate downward as well; the position of the vacuum suction disc 412 now corresponds to the bag body transmission unit (the position of the vacuum suction disc 412 corresponds to the rear end of the bag transmission guiding rail set), and in this case, the vacuum suction disc 412 and the bag body are both above the bag body transmission unit; next, the vacuum suction disc 412 releases the bag body and the bag body will be released on the bag body transmission unit (the bag body is on the rear end of the bag transmission guiding rail set), thereby completing a bag transferring procedure.

[0081] (3-3) Bag body transmission unit: During operation, after the bag transferring unit has released the bag body to the rear end of the bag transmission guiding rail set, the piston rod 4182 of the bag sweeping piston cylinder 418 retreats, thereby driving the bag sweeping panel 417 to move forward along the bag transmission guiding rails 419; the bag sweeping portion 420 of the bag sweeping panel 417 contacts with a rear end of the bag body and pushes the bag body to move forward along the bag transmission guiding rail set so that the bag body arrives at a position corresponding to the bag opening unit; next, the piston rod 4182 of the bag sweeping piston cylinder 418 extends outwardly, thereby driving the bag sweeping panel 417 to move backward and reset in position along the bag transmission guiding rail set for transferring the next bag body.

[0082] (3-4) Bag opening unit: After the bag body transmission unit transfers the bag body to the bag opening unit, the upper pneumatic grip 4292 and the lower pneumatic grip 4293 of the left gripper piston cylinder 429 close towards each other and the upper pneumatic grip 4302 and the lower pneumatic grip 4303 of the right gripper piston cylinder 430 also close together; next, the upper suction disc mounting panel 432 drives the upper suction disc 431 to move downward so that the upper suction disc 431 sucks an outer wall of an upper side of the bag body, and the lower suction disc mounting panel 434 drives the lower suction disc 433 to move upward so that the lower suction disc 433 sucks an outer wall of a lower side of the bag body; next, the upper pneumatic grip 4292 and the lower pneumatic grip 4293 of the left gripper piston cylinder 429 separate from each other and the upper pneumatic grip 4302 and the lower pneumatic grip 4303 of the right gripper piston cylinder 430 also separate from each other; next, the upper suction disc mounting panel 432 drives the upper suction disc 431 to move upward and the lower suction disc mounting panel 434 drives the lower suction disc 433 to move downward; since the upper suction disc 431 and the lower suction

disc 433 suck the outer walls of the upper and lower sides of the bag body respectively, the bag opening of the bag body is opened, thereby completing a bag opening procedure.

[0083] (3-5) Bag body feeding unit: After the bag opening unit opens the bag opening of the bag body, the piston rod 4252 of the movable seat position switching piston cylinder 425 extends outwardly, and the second cross rod 428, the movable seat guiding rods 427, the movable seat, the bag opening unit and the bag body with its bag opening opened all move towards the transmission chain 21; the bag opening of the bag body sleeves in the connection portion of a suction tube on the transmission chain 21; next, a relevant heat-sealing device of the heat-sealing devices 5 connects the connection portion of the suction tube with the bag opening of the bag body, and the upper suction disc 431 and the lower suction disc 433 will release the bag body; next, the piston rod 4252 of the movable seat position switching piston cylinder 425 retreats so that the second cross rod 428, the movable seat guiding rods 427, the movable seat 424 and the bag opening unit reset their positions; the bag opening unit is then ready to open the bag opening of the next bag body, and the bag body feeding unit ready to sleeve the bag opening of the next bag body to a connection portion of the next suction tube.

(4) Operating principle of the heat-sealing devices 5:

[0084] During operation of each of the heat-sealing devices 5, the piston rods of the four pairs (i.e. total number of eight) of the spot sealing piston cylinder 56 extend outwardly at the same time, thereby closing the four spot sealing heads 52 to complete spot sealing of the suction tubes so that the suction tubes are fixed on the respective bag openings of the respective bag bodies; next, the piston rods of the four pairs (i.e. total number of eight) of the spot sealing piston cylinder 56 retreat at the same time, thereby opening the four spot sealing heads 52; the bag bodies will then be transmitted to the corresponding four heat-sealing heads 53; the piston rods of the four pairs (i.e. total number of eight) of the heat-sealing piston cylinders 57 extend outwardly at the same time, thereby closing the four heat-sealing heads 53 to complete the first heat-sealing procedure of the bag openings of the bag bodies; next, the piston rods of the four pairs (i.e. total number of eight) of the heat-sealing piston cylinders 57 retreat at the same time, thereby opening the four heat-sealing heads 53; the bag bodies will then be transmitted to the corresponding four second heat-sealing heads 54; the piston rods of the four pairs (i.e. total number of eight) of the second heat-sealing piston cylinders 58 extend outwardly at the same time, thereby closing the four second heat-sealing heads 54 to complete the second heat-sealing procedure of the bag openings of the bag bodies; next, the piston rods of the four pairs (i.e. total number of eight) of the second heat-sealing piston cylinders 58 retreat at the same time, thereby

opening the four second heat-sealing heads 54; the bag bodies will then be transmitted to the corresponding four cold sealing heads 55; the piston rods of the four pairs (i.e. total number of eight) of the cold sealing piston cylinders 59 extend outwardly at the same time, thereby closing the four cold sealing heads 55 to complete the cold sealing procedure; next, the piston rods of the four pairs (i.e. total number of eight) of the cold sealing piston cylinders 59 retreat at the same time, thereby opening the four cold sealing heads 55; packing bags can therefore be obtained and the packing bags will be transmitted away from the relevant heat-sealing device.

[0085] (5) When a packing bag 17 of the packing bags and the relevant hanging panel transmitted away from the relevant heat-sealing device arrive at the second position limiting block 14, the relevant hanging panel will tend to turn downward under gravity force; the bottom surface of the relevant hanging panel has always been keeping contact with the second position limiting edge 141 during its advancement together with the transmission chain 21, therefore the position of the relevant hanging panel during its advancement is determined by the second position limiting edge 141. As the transmission chain 21 advances forward, the relevant hanging panel also advances forward along the second position limiting edge 141. The second position limiting edge 141 exerts a supporting force to the relevant hanging panel. Accordingly, the relevant hanging panel gradually turns downward and its outer side (i.e. the side facing away from the transmission chain 21) continues to be lowered down until it is horizontally positioned.

[0086] (6) In each of the filling devices 6, the filling piston cylinder 61, the constant rate pump 62, the liquid inlet valve 63, the liquid outlet valve 64 and the elevation piston cylinder 619 cooperate with one another to complete filling of materials.

[0087] (7) In each of the sealing devices 7, the cap organizing device 71 organizes the caps; the caps are then transmitted to the cap delivering device 72. The cap delivering device 72 put a cap on a relevant suction tube and the cap is then tightened by the cap turning device 73 to complete sealing.

[0088] (8) Bag withdrawing: When the relevant hanging panel carries the relevant packing bag 17 to a position corresponding to the starting end of the bag withdrawing panel 16, the suction tube of the relevant hanging panel is positioned at an outer side of the bag withdrawing panel 16. The suction tube contacts with the bag withdrawing guiding surface 161; next, the relevant hanging panel and the packing bag 17 advances forward together with the transmission chain 21, and the suction tube will move along the bag withdrawing guiding surface 161; next, the bag withdrawing guiding surface 161 exerts an outward pushing force pushing the suction tube gradually from the opening 10 of the relevant hanging panel. When the relevant hanging panel passes the bag withdrawing panel 16, the suction tube is totally withdrawn from the opening 10 of the relevant hanging panel. The packing bag

17 will then be withdrawn from the transmission chain 21 and falls off under gravity force.

[0089] In another embodiment, the first turning mechanism comprises the first position limiting block, and the first position limiting block comprises a first position limiting edge. The first position limiting edge contacts and cooperates with the bottom surface of the relevant hanging panel. The first position limiting edge gradually closes towards the transmission chain and gradually rises up along the advancing direction of the transmission chain. When the relevant hanging panel arrives at the first turning mechanism, the bottom surface of the relevant hanging panel keeps contact with the first position limiting edge due to gravity force during its advancement together with the transmission chain, therefore the position of the relevant hanging panel during its advancement is determined by the first position limiting edge. As the transmission chain advances forward, the relevant hanging panel also advances forward along the first position limiting edge. The first position limiting edge exerts a lifting force to the relevant hanging panel and a pushing force to push the relevant hanging panel towards the transmission chain. Accordingly, the relevant hanging panel gradually turns upward and its outer side (i.e. the side faces away from the transmission chain) continues to be lifted up until the relevant hanging panel is vertically positioned. Since the relevant hanging panel transmitted away from the relevant tube feeding device is initially positioned horizontally, a starting end and a finishing end of the first position limiting edge enable the following conditions so that the relevant hanging panel can be turned from a horizontal position to a vertical position: When the relevant hanging panel is at the starting end of the first position limiting edge, its bottom surface is on the starting end of the first position limiting edge, and when the relevant hanging panel arrives at the finishing end of the first position limiting edge, a gap between the transmission chain and the finishing end of the first position limiting edge only allows the relevant hanging panel to pass through vertically, and the relevant hanging panel is then at an inner side of the finishing end of the first position limiting edge. The bottom surface of the relevant hanging panel is a line when viewed vertically from above, and the finishing end of the first position limiting edge when viewed from above overlaps with that line. By using the first position limiting block which cooperates with the hanging panels hinged with the transmission chain, hanging panels can be turned from a horizontal position to a vertical position. This kind of structure is simple and reliable.

[0090] In another embodiment, the second turning mechanism comprises the second position limiting block, and the second position limiting block comprises a second guiding curved surface. The second guiding curved surface contacts and cooperates with the bottom surface of the relevant hanging panel. The second guiding curved surface gradually twisted from a vertical position facing the transmission chain to a horizontal position facing up-

wardly along the advancing direction of the transmission chain. When the relevant packing bag and the relevant hanging panel are transmitted away from the relevant heat-sealing device, the relevant hanging panel tends to turn downwardly due to gravity force. The bottom surface of the relevant hanging panel keeps contact with the second guiding curved surface during its advancement together with the transmission chain, therefore the position of the relevant hanging panel during its advancement is determined by the second guiding curved surface. As the transmission chain advances forward, the relevant hanging panel also advances forward along the second guiding curved surface. The second guiding curved surface exerts a supporting force to the relevant hanging panel and the relevant hanging panel gradually turns downward and its outer side (i.e. the side faces away from the transmission chain) continues to be lowered down until the relevant hanging panel is horizontally positioned. Since the relevant hanging panel keeps its surface contact with the second position limiting block during the process of being turned downwardly, the second position limiting block can provide better support to the relevant hanging panel. By using the second position limiting block which cooperates with the hanging panels hinged with the transmission chain and by taking advantage of the gravity force imposed to the packing bags and the hanging panels, the hanging panels can be turned from a vertical position to a horizontal position. This kind of structure is simple and reliable.

Claims

1. A tube-sealing, bag-making and filling machine comprising a rack (1), a transmission device (2), two tube feeding devices (3), two bag body feeding devices (4), two heat-sealing devices (5), two filling devices (6), two sealing devices (7) and two bag withdrawing devices (8); the two tube feeding devices (3), the two bag body feeding devices (4), the two heat-sealing devices (5), the two filling devices (6), the two sealing devices (7) and the two bag withdrawing devices (8) are all provided on the rack (1); the transmission device (2) comprises a transmission chain (21), an active chain wheel (22), a passive chain wheel (23) and a main driving mechanism; the active chain wheel (22), the passive chain wheel (23) and the main driving mechanism are all mounted on the rack (1); the transmission chain (21) is mounted to the active chain wheel (22) and the passive chain wheel (23); the active chain wheel (22) and the main driving mechanism are connected for motion transmission; the transmission chain (21) is mounted with plurality of hanging panels (12) arranged in equal intervals; each of the hanging panels (12) is provided with an opening (10) which accommodates a suction tube (9); the tube-sealing, bag-making and filling machine is **characterized in that**: one side of each of the

hanging panels (12) is hinged with the transmission chain (21); along an advancing direction of the transmission chain (21), a forward path (2101) and a return path (2102) of the transmission chain (21) are each provided in sequential order a tube feeding position (221), a bag body feeding position (222), a heat-sealing position (223), a filling position (224), a sealing position (225) and a bag withdrawing position (226); one of the tube feeding devices (3), one of the bag body feeding devices (4), one of the heat-sealing devices (5), one of the filling devices (6), one of the sealing devices (7) and one of the bag withdrawing devices (8) correspond respectively to positions of the tube feeding position (221), the bag feeding position (222), the heat-sealing position (223), the filling position (224), the sealing position (225) and the bag withdrawing position (226) of the forward path (2101) of the transmission chain (21); another one of the tube feeding devices (3), another one of the bag body feeding devices (4), another one of the heat-sealing devices (5), another one of the filling devices (6), another one of the sealing devices (7) and another one of the bag withdrawing devices (8) correspond respectively to positions of the tube feeding position (221), the bag feeding position (222), the heat-sealing position (223), the filling position (224), the sealing position (225) and the bag withdrawing position (226) of the return path (2102) of the transmission chain (21); in between the tube feeding position (221) and the bag body feeding position (222), there is a first turning mechanism for turning the hanging panels (12) from a horizontal position to a vertical position; in between the heat-sealing position (223) and the filling position (224), there is a second turning mechanism for turning the hanging panels (12) from a vertical position to a horizontal position; in between the first turning mechanism and the second turning mechanism, there is a hanging panel slot (15) to maintain the hanging panels (12) in a vertical position.

2. The tube-sealing, bag-making and filling machine as in Claim 1, wherein the first turning mechanism comprises a first position limiting block (13), and the first position limiting block (13) comprises a first position limiting edge; the first position limiting edge contacts and cooperates with bottom surfaces of the hanging panels (12); the first position limiting edge gradually closes towards the transmission chain (21) and gradually rises up along the advancing direction of the transmission chain (21).

3. The tube-sealing, bag-making and filling machine as in Claim 1, wherein the first turning mechanism comprises a first position limiting block (13), and the first position limiting block (13) comprises a first guiding curved surface (131); the first guiding curved surface (131) contacts and cooperates with bottom surfaces

of the hanging panels (12); the first guiding curved surface (131) is gradually twisted from an upwardly facing horizontal position to a vertical position facing the transmission chain (21) along the advancing direction of the transmission chain (21).

4. The tube-sealing, bag-making and filling machine as in Claim 1, wherein the second turning mechanism comprises a second position limiting block (14), and the second position limiting block (14) comprises a second position limiting edge (141); the second position limiting edge (141) contacts and cooperates with bottom surfaces of the hanging panels (12); the second position limiting edge (141) is gradually spaced apart from the transmission chain (21) and is gradually lowered down along the advancing direction of the transmission chain (21).
5. The tube-sealing, bag-making and filling machine as in Claim 1, wherein the second turning mechanism comprises a second position limiting block (14), and the second position limiting block (14) comprises a second guiding curved surface; the second guiding curved surface contacts and cooperates with bottom surfaces of the hanging panels (12); the second guiding curved surface is gradually twisted from a vertical position facing the transmission chain (21) to an upwardly facing horizontal position along the advancing direction of the transmission chain (21).
6. The tube-sealing, bag-making and filling machine as in any one of Claims 1-5, wherein each of the tube feeding devices (3) comprises a vibration disc (32), a tube feeding guiding rail (33), a tube delivery piston cylinder (34) and a tube delivery guiding rail (35); the vibration disc (32), the tube feeding guiding rail (33), the tube delivery piston cylinder (34) and the tube delivery guiding rail (35) are all mounted on the rack (1); a tube exit (36) of the vibration disc (32) is connected with a rear end (331) of the tube feeding guiding rail (33); the tube delivery guiding rail (35) links in continuity with a front end (332) of the tube feeding guiding rail (33); the tube delivery guiding rail (35) gradually approaches to the transmission chain (21) along the advancing direction of the transmission chain (21); a front portion of the tube feeding guiding rail (33) is a linear tube feeding guiding rail section (333); the tube delivery piston cylinder (34) is disposed above the tube feeding guiding rail (33), and the tube delivery piston cylinder (34) is parallel to the linear tube feeding guiding rail section (333); a piston rod (342) of the tube delivery piston cylinder (34) is disposed with a one-way hook (312) which sweeps suction tubes on the linear tube feeding guiding rail section (333); a rear part of the opening (10) of each of the hanging panels (12) is outwardly extended with a tube sweeping portion (11).

7. The tube-sealing, bag-making and filling machine as in any one of Claims 1-5, wherein each of the bag body feeding devices (4) comprises a bag storage unit, a bag transferring unit, a bag body transmission unit, a bag opening unit and a bag body feeding unit; the bag body transmission unit receives a bag body from the bag transferring unit and transmit the bag body to the bag opening unit; the bag storage unit and the bag transferring unit are mounted on the rack (1); the bag body feeding unit comprises a movable seat (424) and a movable seat position switching unit; the movable seat position switching unit is mounted on the rack (1); a power output end of the movable seat position switching unit is connected with the movable seat (424); the bag opening unit is mounted on the movable seat (424).
8. The tube-sealing, bag-making and filling machine as in Claim 7, wherein the bag storage unit comprises a bag storage box (42) and a bag delivery unit; the bag storage box (42) is provided on the rack (1) along a horizontal direction; the bag storage box (42) has a cross-section that matches with the bag body; a front end of the bag storage box (42) is disposed with a bag exit (43); the bag delivery unit comprises a bag delivery panel (44), a bag delivery rodless piston cylinder (45), a bag body sweeping fork (46), a bag body sweeping fork laterally movable piston cylinder (47), an elevation platform (48) and a bag body sweeping fork elevation piston cylinder (49); the bag delivery panel (44) is disposed inside the bag storage box (42); the bag delivery rodless piston cylinder (45) is mounted on the rack (1); a sliding block (451) of the bag body delivery rodless piston cylinder (45) is connected with the bag delivery panel (44); the bag body sweeping fork elevation piston cylinder (49) is vertically positioned; a piston cylinder (491) of the bag body sweeping fork elevation piston cylinder (49) is mounted on the rack (1); the elevation platform (48) is connected with piston rod (492) of the bag body sweeping fork elevation piston cylinder (49); the bag body sweeping fork laterally movable piston cylinder (47) is parallel to the bag body delivery rodless piston cylinder (45); a piston cylinder (471) of the bag body sweeping fork laterally movable piston cylinder (47) is mounted on the elevation platform (48); the bag body sweeping fork (46) is connected with a piston rod (472) of the bag body sweeping fork laterally movable piston cylinder (47).
9. The tube-sealing, bag-making and filling machine as in Claim 7, wherein the bag body transmission unit comprises a bag transmission guiding rail set, a bag sweeping panel (417) and a bag sweeping piston cylinder (418); the bag transmission guiding rail set comprises two bag transmission guiding rails (419) parallel to each other; the bag transmission guiding rails (419) are mounted on the rack (1); the bag

sweeping panel (417) has a bag sweeping portion (420); the bag sweeping portion (420) is disposed in between the two bag transmission guiding rails (419) of the bag transmission guiding rail set; the bag sweeping piston cylinder (418) is parallel to the bag transmission guiding rail set; a piston cylinder (4181) of the bag sweeping piston cylinder (418) is mounted on the rack (1); a piston rod (4182) of the bag sweeping piston cylinder (418) is connected with the bag sweeping panel (417).

10. The tube-sealing, bag-making and filling machine as in Claim 7, wherein the bag opening unit comprises a left gripper piston cylinder (429), a right gripper piston cylinder (430), an upper suction disc (431), an upper suction disc mounting panel (432), a lower suction disc (433) and a lower suction disc mounting panel (434); a piston cylinder (4291) of the left gripper piston cylinder (429) and a piston cylinder (4301) of the right gripper piston cylinder (430) are both mounted on the movable seat (424); the left gripper piston cylinder (429) is disposed at a left side of the movable seat (424); the right gripper piston cylinder (430) is disposed at a right side of the movable seat (424); a left end of the upper suction disc mounting panel (432) is connected with an upper pneumatic grip (4292) of the left gripper piston cylinder (429), and a right end of the upper suction disc mounting panel (432) is connected with an upper pneumatic grip (4302) of the right gripper piston cylinder (430); a left end of the lower suction disc mounting panel (434) is connected with a lower pneumatic grip (4293) of the left gripper piston cylinder (429), and a right end of the lower suction disc mounting panel (434) is connected with a lower pneumatic grip (4303) of the right gripper piston cylinder (430); the upper suction disc (431) is mounted on the upper suction disc mounting panel (432); the lower suction disc (433) is mounted on the lower suction disc mounting panel (434); the upper suction disc (431) and the lower suction disc (433) correspond to each other in position.

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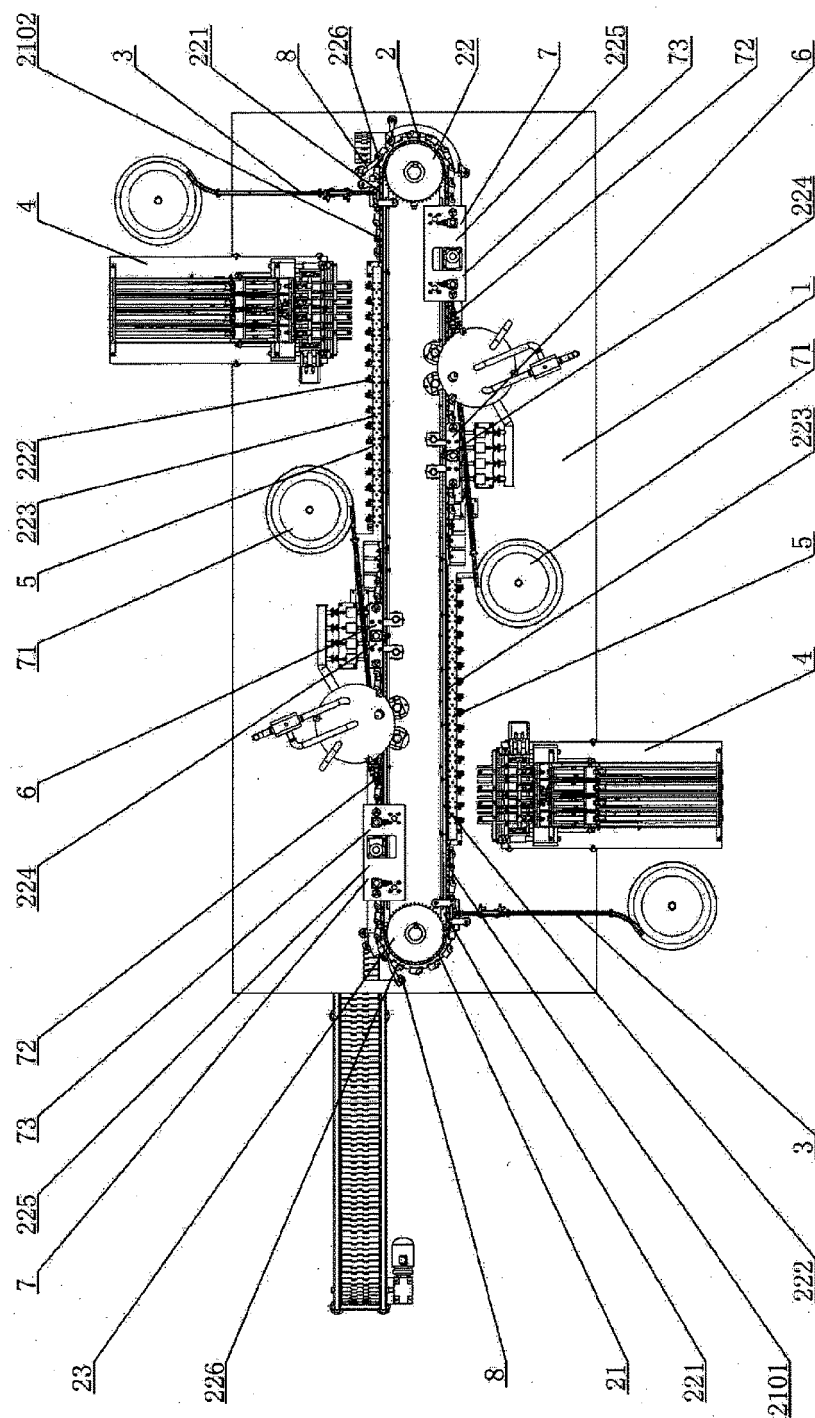


FIG.1

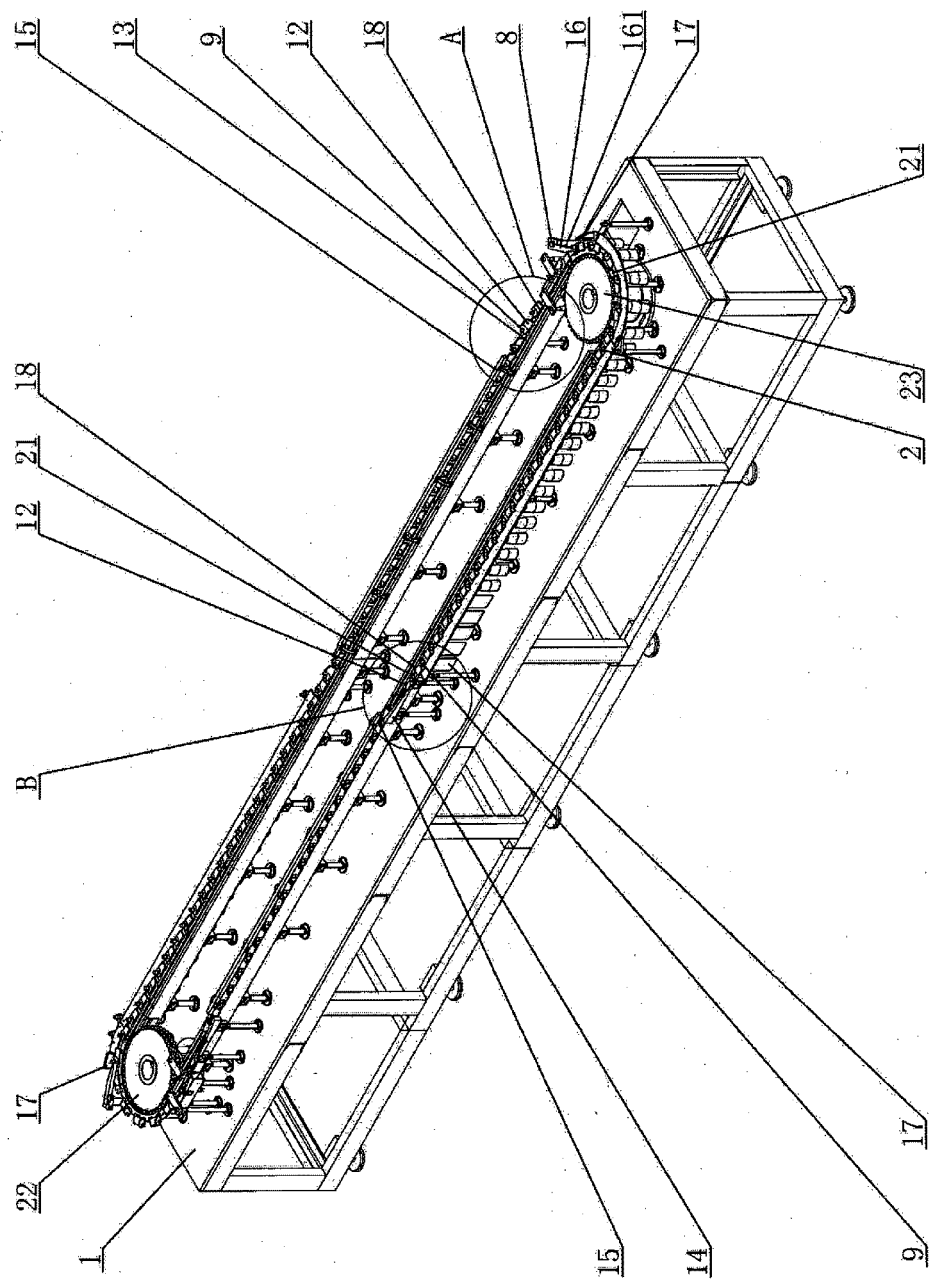


FIG.2

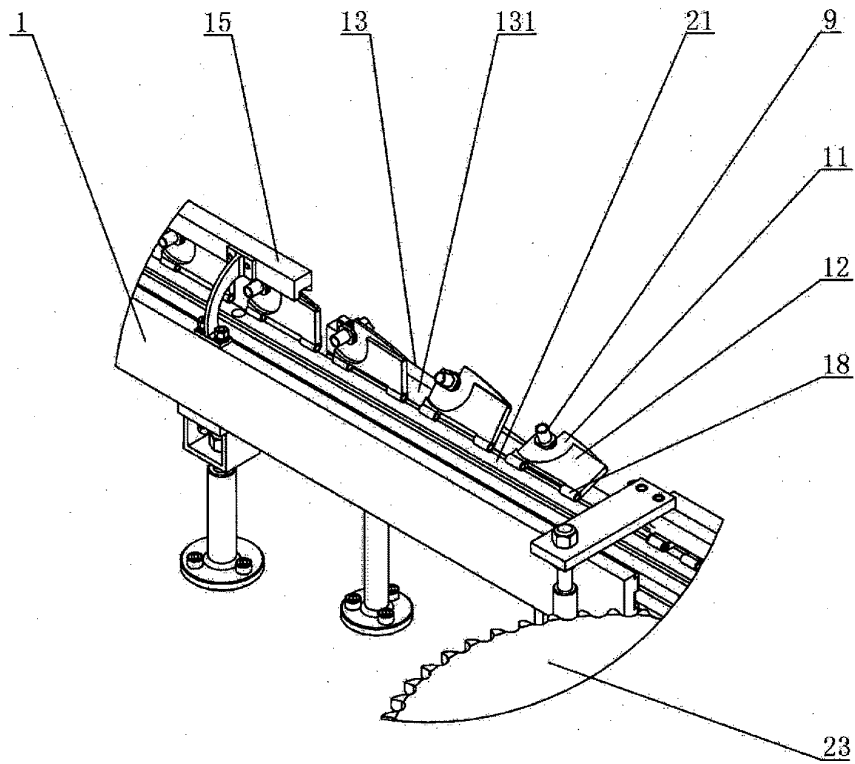


FIG. 3

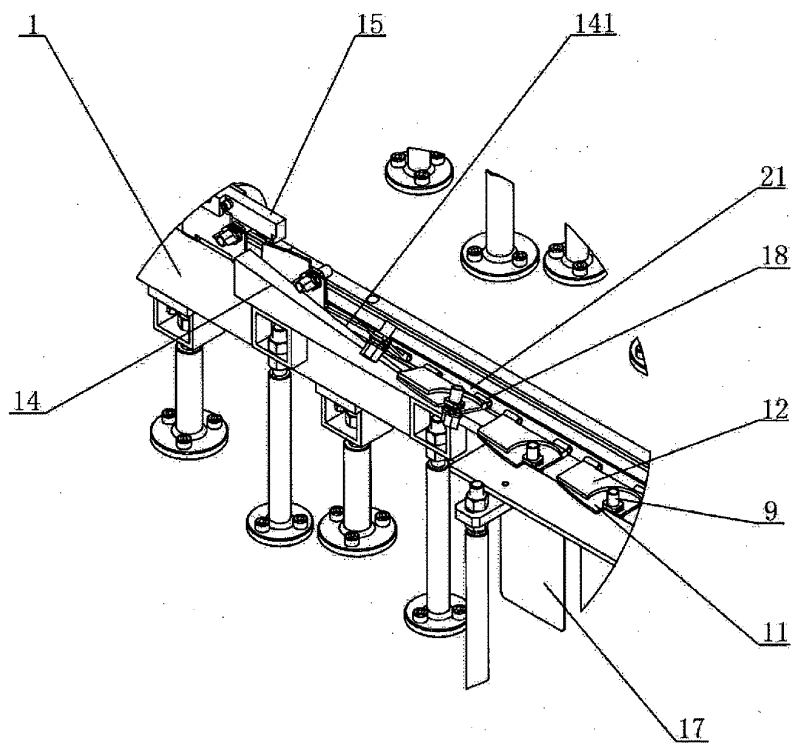


FIG. 4

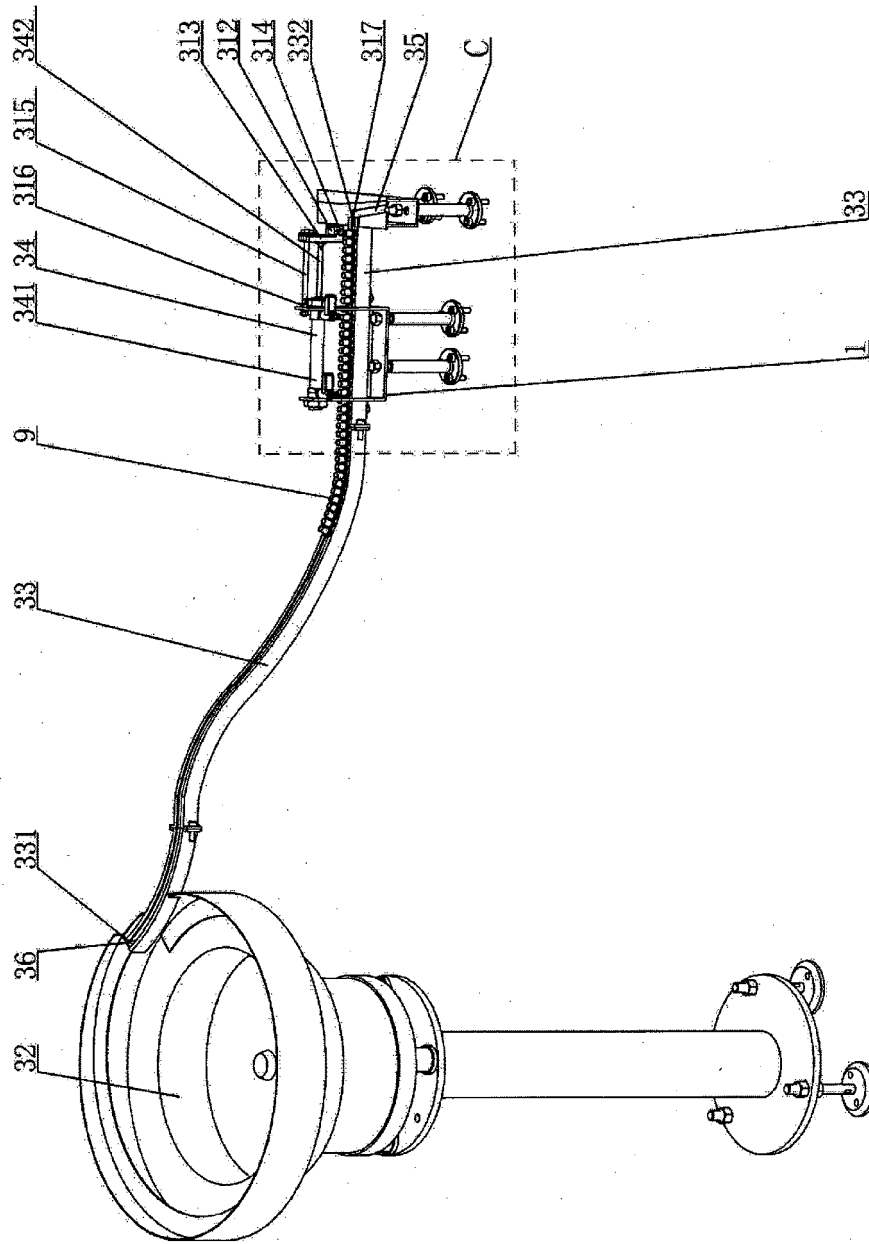


FIG.5

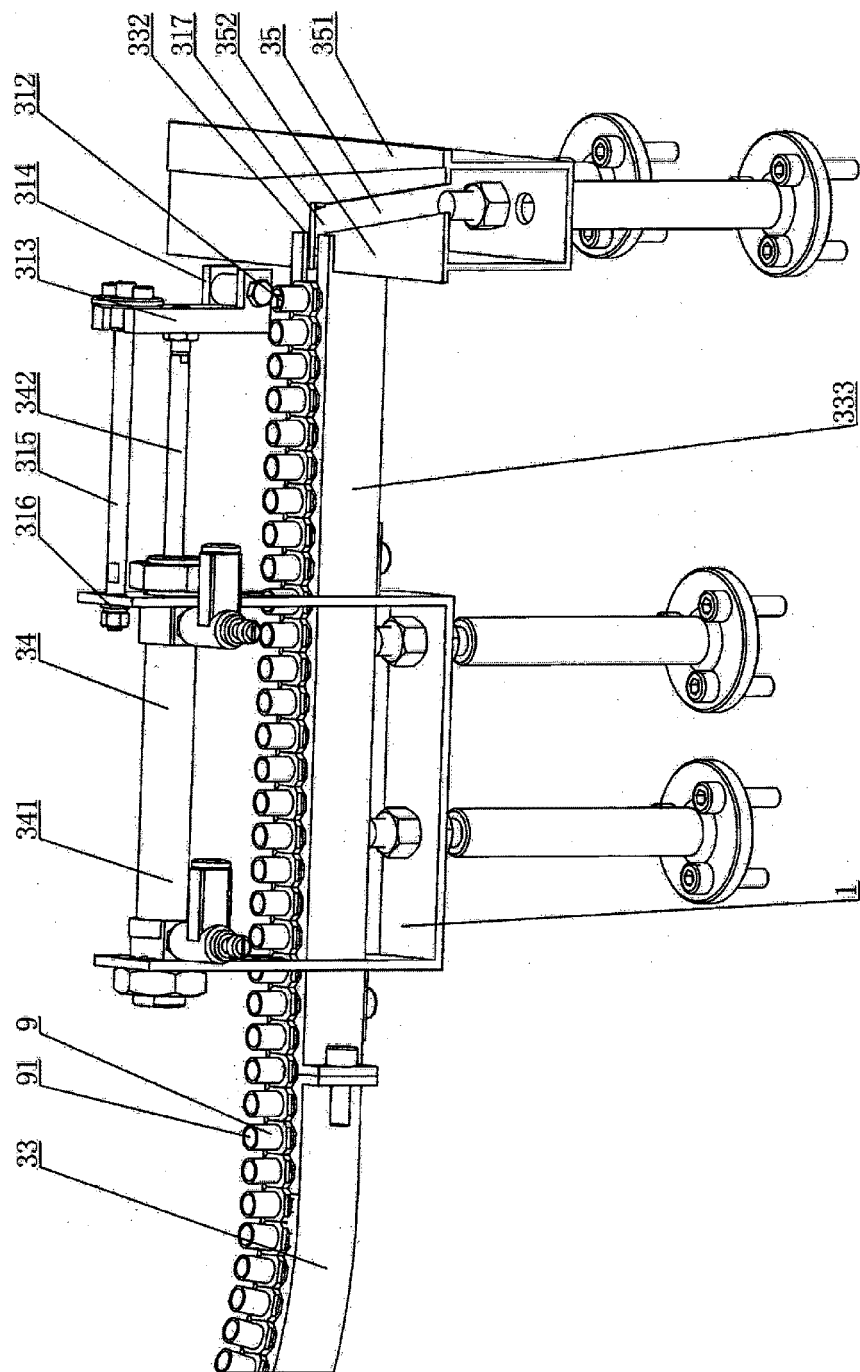


FIG.6

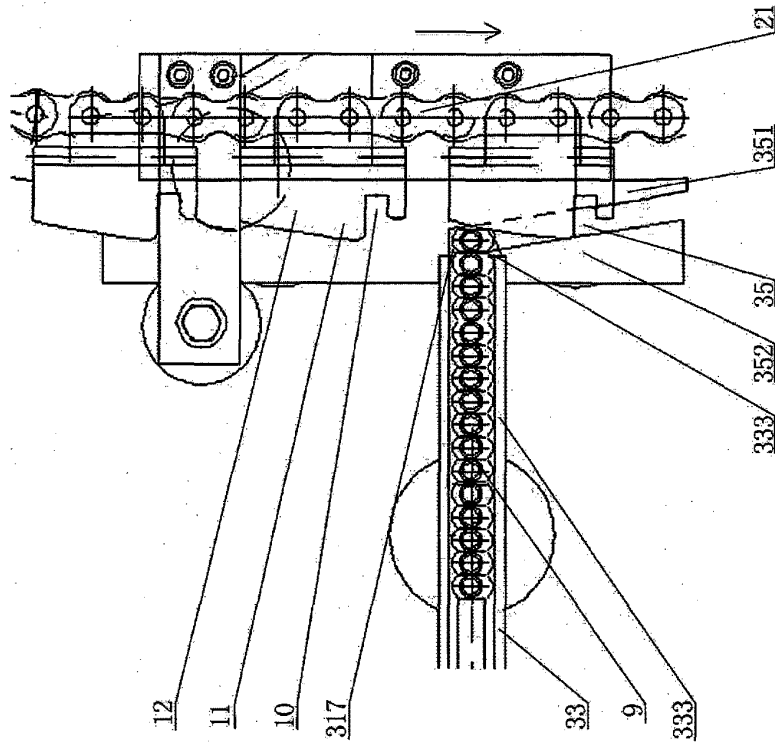


FIG. 7

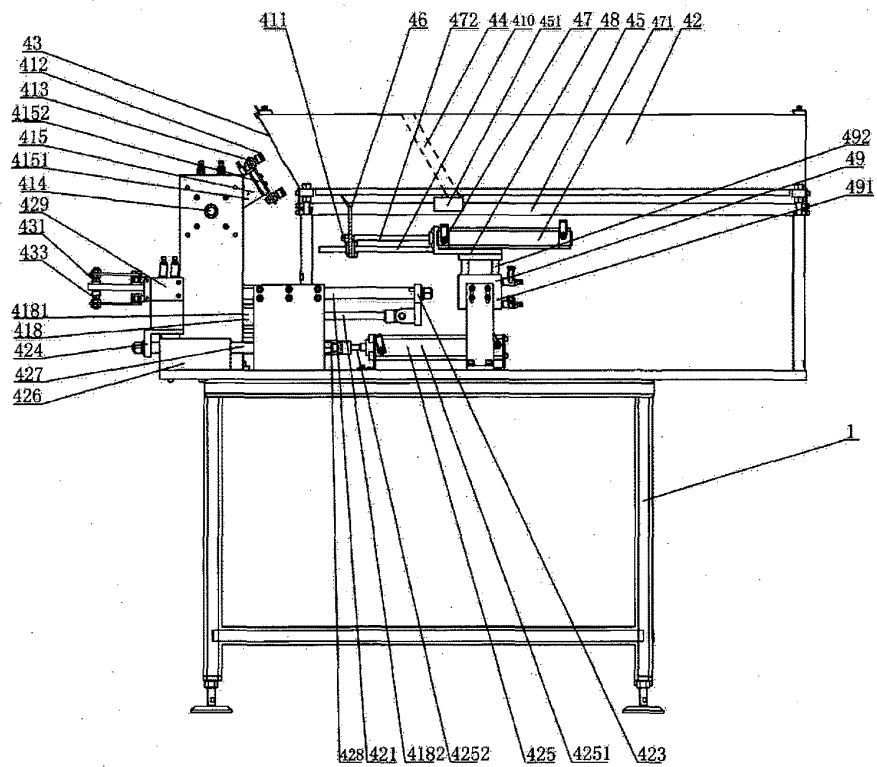


FIG. 8

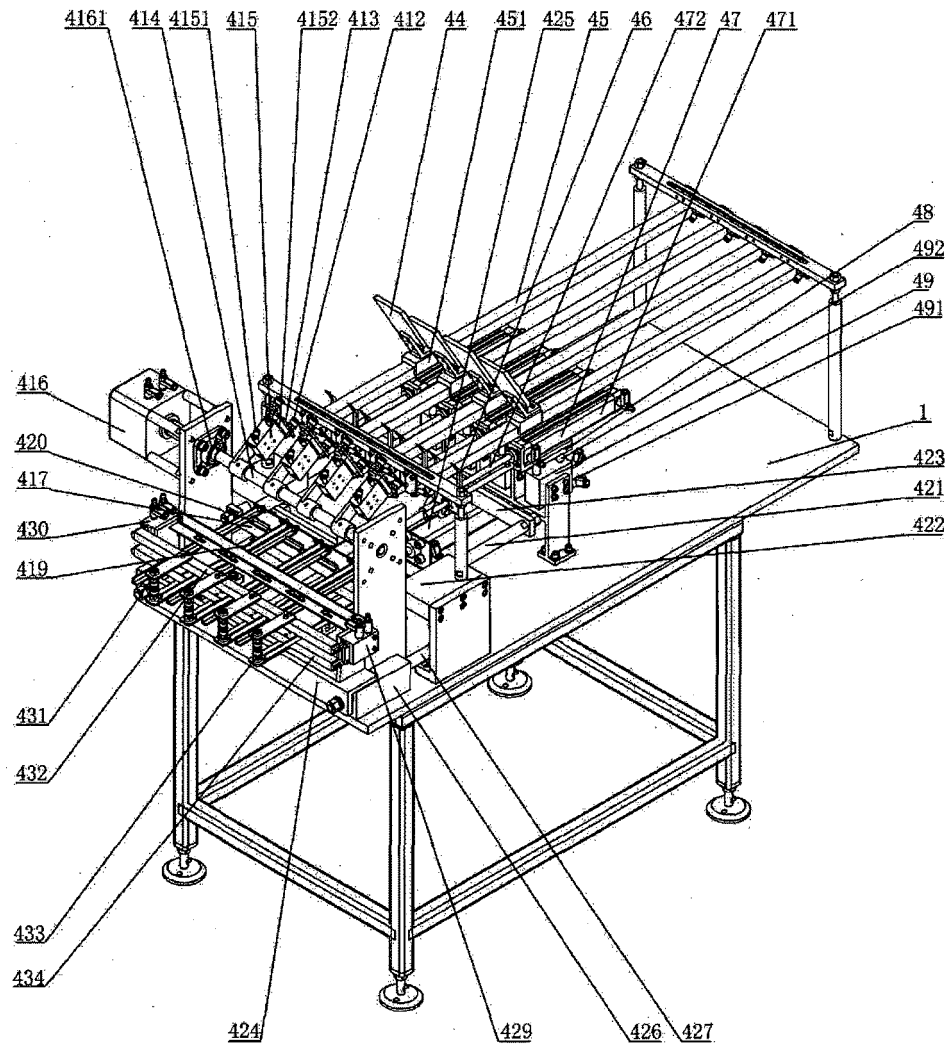


FIG.9

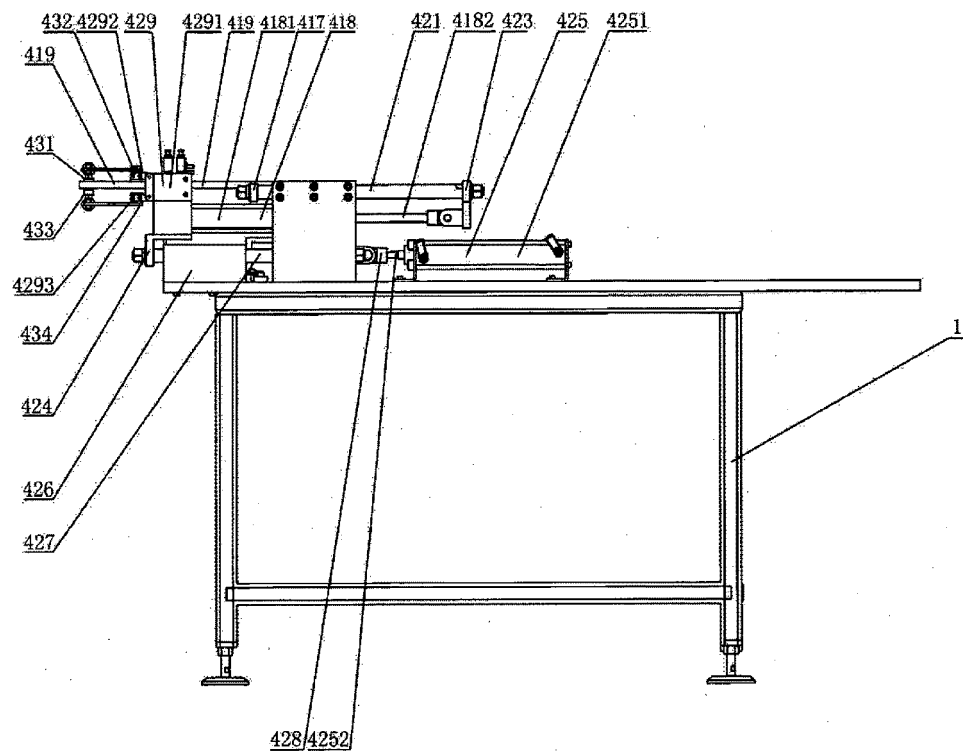


FIG.10

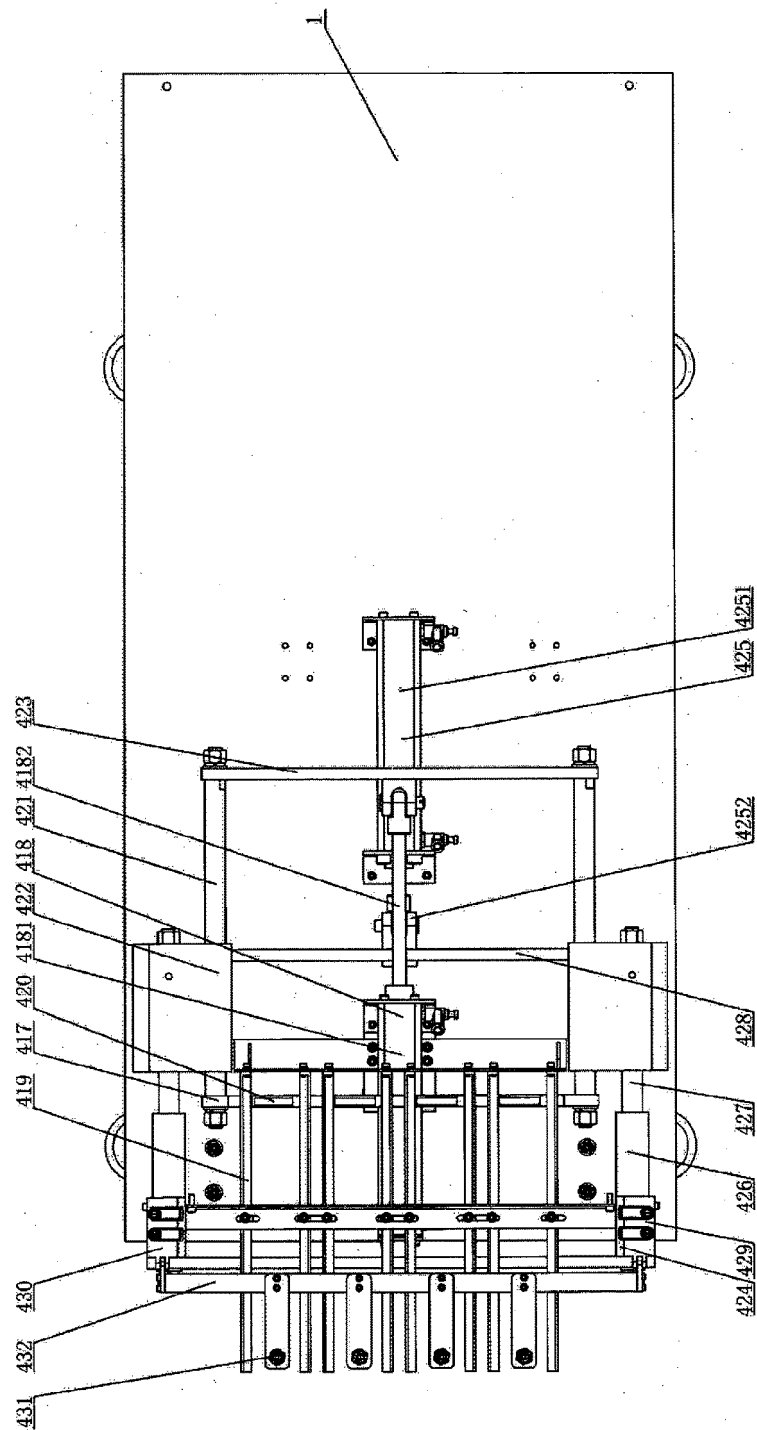


FIG.11

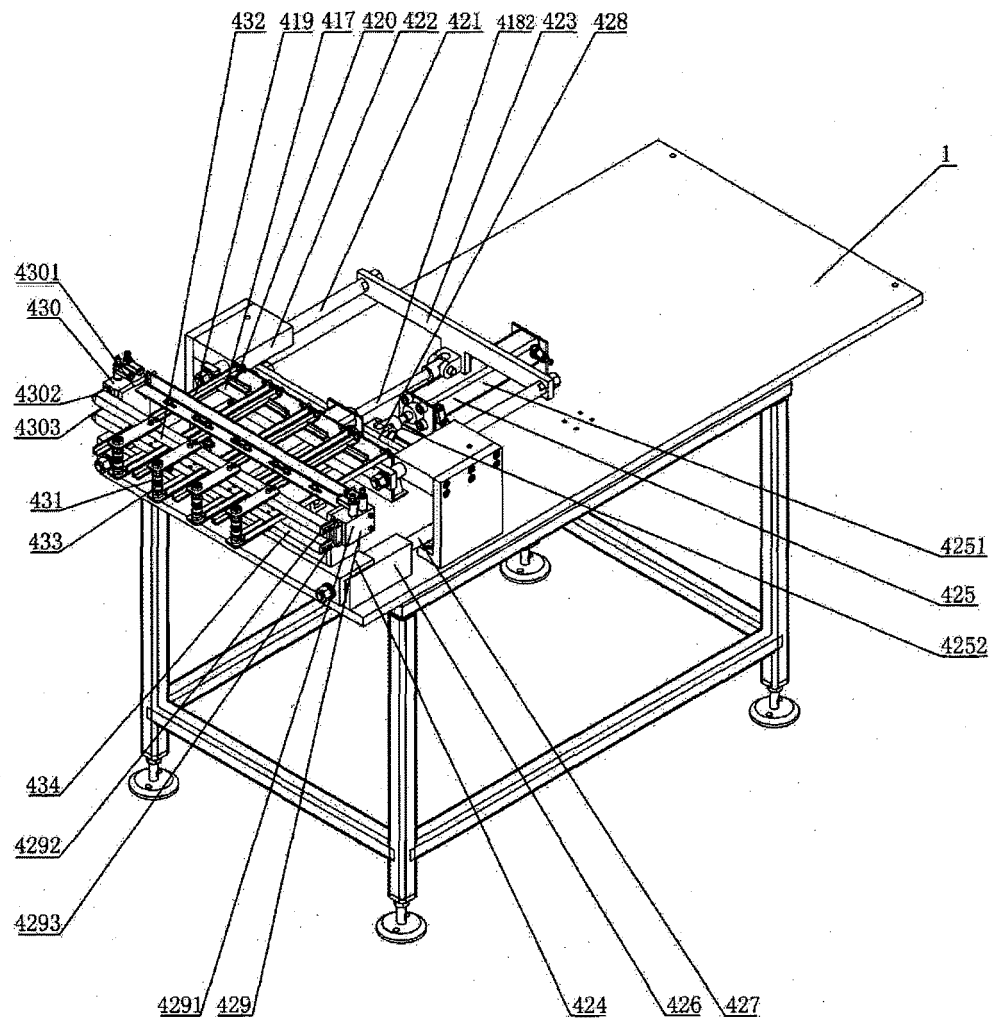


FIG.12

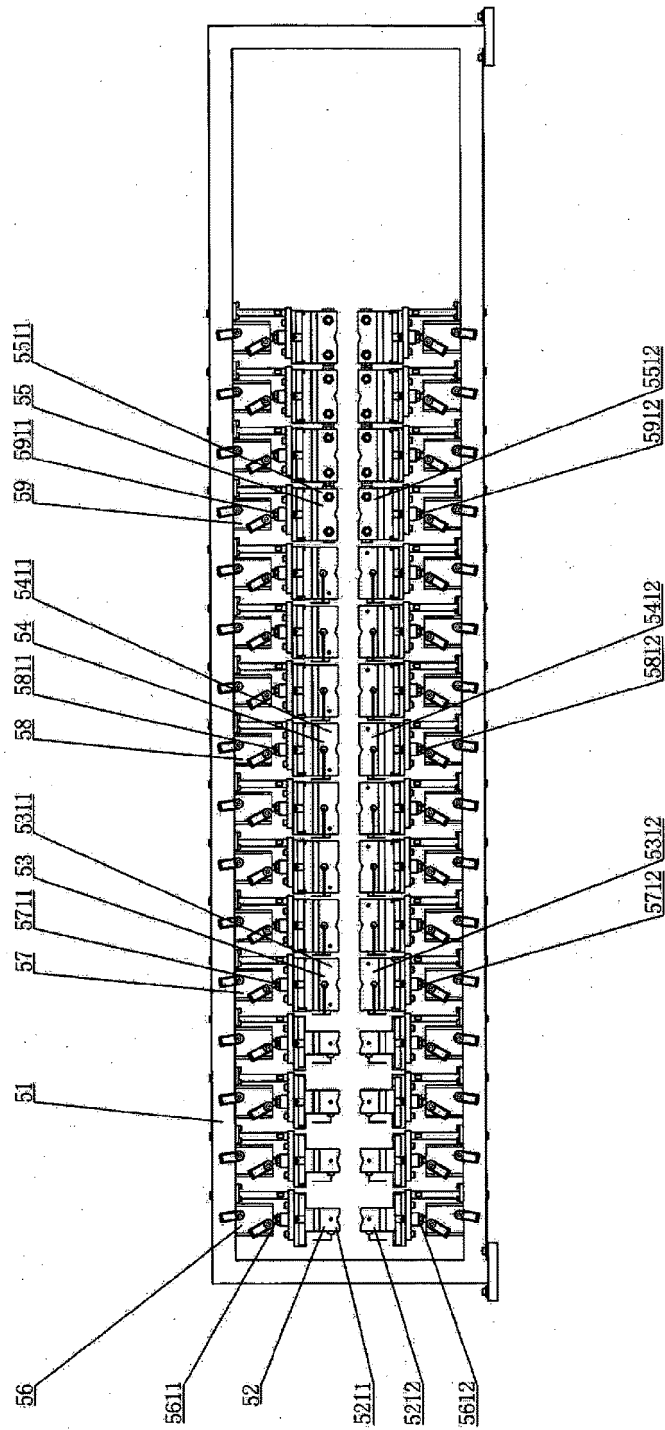


FIG.13

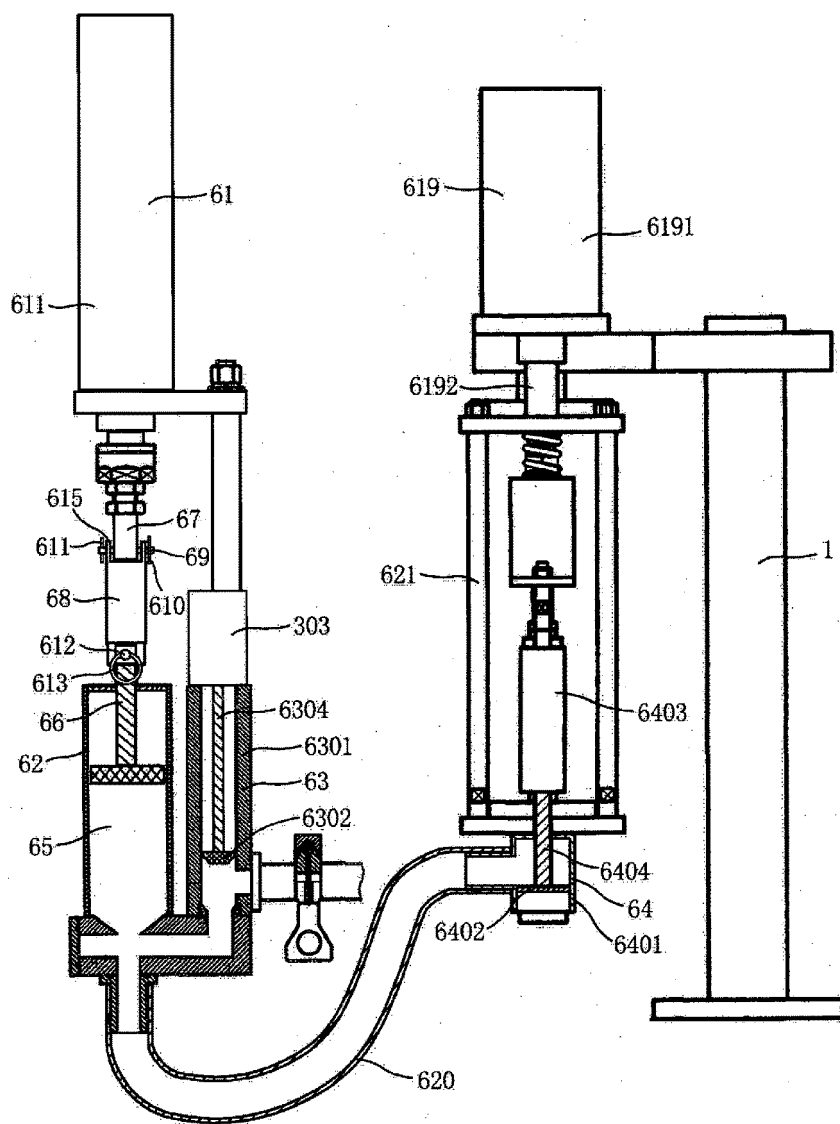


FIG.14

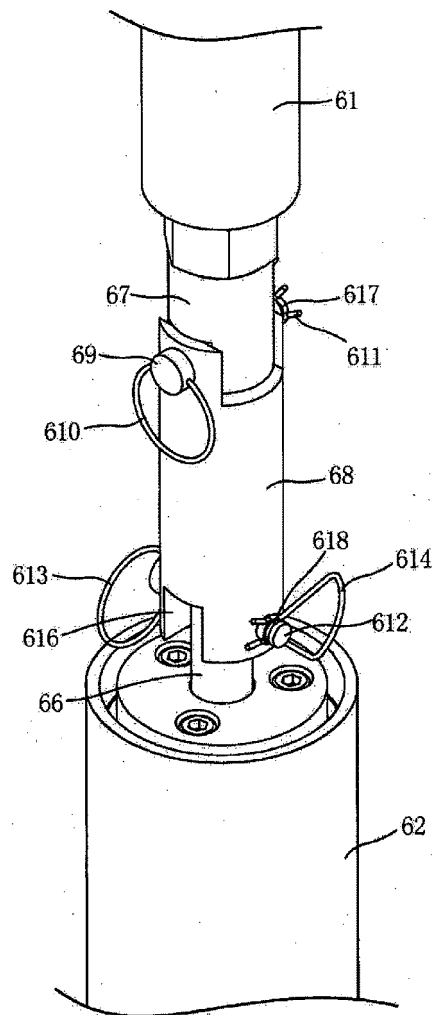


FIG.15

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2011/081439

A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B65B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPODOC, CNPAT, CNKI: GUANGDONG YUEDONG MECHANICAL INDUSTRY CO., LTD.

GUANGDONG YUEDONG HEAT THERMO SEAL TUBE BAG POUCH SACK FILL CONVEY TRANSPORT DELIVER

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 102180276 A (GUANGDONG YUEDONG MECHANICAL INDUSTRY CO., LTD.), 14 September 2011 (14.09.2011), claims 1-10	1-10
A	CN 101670687 A (SHANTOU HONGJU MACHINERY CO., LTD.), 17 March 2010 (17.03.2010), figures 1-3, and corresponding description	1-10
A	CN 201419806 Y (SHINVA MEDICAL INSTRUMENT COMPANY, LTD.), 10 March 2010 (10.03.2010), figure 1, and corresponding description	1-10
A	GB 1125494 A (UPMANN, B.), 28 August 1968 (28.08.1968), the whole document	1-10
A	GB 764796 A (HESSER AG MASCHF), 02 January 1957 (02.01.1957), the whole document	1-10
A	WO 0066433 A1 (HASSIA VERPACKUNGSMASCH GMBH), 09 November 2000 (09.11.2000), the whole document	1-10

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 26 December 2011 (26.12.2011)	Date of mailing of the international search report 02 February 2012 (02.02.2012)
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimengqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer LI, Weiwei Telephone No.: (86-10) 62085325

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/CN2011/081439

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 102180276 A	14.09.2001	None	
CN 101670687 A	17.03.2010	CN 101670687 B	04.05.2011
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Form PCT/ISA/210 (patent family annex) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER

B65B 7/02 (2006.01) i

B65B 51/10 (2006.01) i

B65B 43/42 (2006.01) i

B65B 39/00 (2006.01) i

REFERENCES CITED IN THE DESCRIPTION

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