

AN APPARATUS FOR FILLING HEAT-INSULATING
MATERIAL INTO A SECTION MEMBER

This invention relates to an apparatus for filling heat-insulating material into grooves on opposite sides of at least
5 one elongate section member and comprising a reversing device for turning the or each section member upside down.

It is a known practice to form a heat insulating sash bar with an extruded hollow metal section member having grooves therein which are filled with heat insulating synthetic resin.

10 In this case, generally the grooves are provided on both sides of the section member, and after a groove on one side is first filled with heat insulating synthetic resin, the section member is reversed or turned upside-down, and the groove on the other side is then filled with heat insulating synthetic resin.

15 In the prior art method, however, the reversing of the section members has been carried out manually and, therefore, production efficiency was low.

According to the invention there is provided an apparatus for filling heat-insulating material into grooves on opposite
20 sides of at least one elongate section member, comprising means for holding the or each section member horizontally, first one said side up and then the opposite said side up, in a given position, means for filling the groove in each side in the given position while that side is up, a reversing device located away from said
25 given position and adapted for turning the or each section member upside down so as to bring the opposite side up after the filling

of the groove in the first side, and means for delivering the or each section member from said given position to said device for turning and delivering the or each section member back to said given position after turning, said reversing device comprising:-

5 a rotation shaft horizontally supported on a fixed support;

a pair of arm members spaced apart along said shaft facing each other and fixed to said shaft at one end of each of said arm members so as to form a three sided rectangle composed of both of said arm members and said shaft;

10 at least one pair of pressing devices located on said pair of arm members at positions facing each other for releasably holding elongated section members therebetween; and

a means to rotate said rotation shaft for rotating said pair of arm members through an angle of 180 degrees from a first
15 horizontal position to a second horizontal position and in the opposite direction in turn.

A preferred embodiment of the present invention brings about the following effects:

(1) section members are reversed accurately without manual
20 operation by rotating a pair of arm members automatically through an angle of 180 degrees around a rotation shaft after the section members are held automatically between the pair of arm members.

(2) since the pair of arm members are rotated through an angle of 180 degrees around a rotation shaft at one end of
25 each arm member, the pair of arm members can rotate back to their original position without interfering with other section members supplied into the reversing device during

the reversing operation, which allows the time required to reverse section members to be shortened, thus improving efficiency.

5 The present invention will be described by way of example with reference to the accompanying drawings which show one preferred embodiment of the invention for illustration purposes only and not for limiting the scope of same in any way. In the drawings:-

10 Fig. 1 is a perspective view of the entire structure of an apparatus for filling heat insulating material into grooves on both sides of elongated section members

in accordance with the invention;

15 Fig. 2 is a view showing the various steps of the process to be conducted by the apparatus of Fig. 1;

Fig. 3 is a perspective view of
a reversing device for section members in
the apparatus of Figs. 1 and 2;

20 Fig. 4 is a sectional view corresponding to section A-A in Fig. 3, showing the function of the reversing device of Fig. 3; and

Fig. 5 is a perspective view of another form of reversing device including additional pairs of pressing devices for holding elongated section members.

Fig. 1 is a perspective view of the entire structure of the apparatus for continuously producing sash bars incorporating the preferred embodiment of the invention. A plurality of extruded hollow sash bars 1

5 are placed on a first carriage 2 one by one at a predetermined time interval by a supplying means not shown. The first carriage 2 includes a movable stand 2b which is moved up and down by a cylinder 2a and is reciprocated transversely of the apparatus by a cylinder 3 and a
10 fixed stand 2c. When the piston rod of the cylinder 2a is extended, the sash bars 1 on the fixed stand 2c are engaged by spacers of the movable stand 2b and are positioned at an equal pitch. Under this condition, when the piston rod of the cylinder 3 is retracted, the sash bars
15 1 are moved transversely by one pitch together with the movable stand. When the piston rod of the cylinder 2a is retracted, the sash bars 1 are out of the spacers of the movable stand and are placed on the fixed stand 2c. With such condition, when the piston rod of the cylinder 3 is
20 extended, the movable stand 2b is returned transversely to its original position for receiving a newly supplied sash bar.

While the sash bars 1 are being moved intermittently on the carriage 2, a heat insulating sheet 15 is inserted
25 into the groove 5 in each of the successive bars 1 by supply rollers 20 and then the opposite ends of the groove 5 are closed by end caps 6 by a cap attaching device 4. The sash bars 1 with the grooves 5 closed by the end caps are successively pushed out of the carriage 2 longitudinally

of the apparatus by a cylinder 7 and passed below an injection device 8 which injects a solution of heat insulating synthetic resin into the grooves 5 in the sash bars 1 one by one.

5 The sash bars 1 with the heat insulating synthetic resin 9 filled in the grooves 5 are then transferred by feed rollers 38 onto a second carriage 10 which is similar to the first carriage 2 and are moved intermittently one pitch by one pitch on the carriage 10 by a movable stand 10 10b, a fixed stand 10c and cylinders 10a, 11 while allowing the resin solution 9 to solidify during such movement to form a heat insulating synthetic resin body 12.

 Thereafter, each two of the thus processed bars 1 are at one time simultaneously pushed out of the second carriage 15 10 longitudinally of the apparatus onto a cutter device 16 by two cylinders 13, 14 and central portions of the bottoms of the grooves 5, 5' are cut away by the cutter device 16 [see Fig. 2(e)]. Thereafter, the sash bars 1 are transferred longitudinally of the apparatus by driving rollers not shown 20 to a reversing device 17 which holds and turns the sash bars 1 upside-down to face the lower grooves 5' of the sash bars upward. The reversed bars are then pushed out of the device 17 longitudinally of the apparatus by two cylinders 18, 19 and by driving rollers 30 to be again placed onto the first 25 carriage 2 where the now upwardly facing grooves 5' of the bars 1 are successively lined with the heat insulating sheet 15 and fitted with the end caps 6 and thereafter filled with the heat insulating synthetic resin 12 at the

injecting zone in the same manner as the processing of the grooves 5. The sash bars 1 with the heat insulating synthetic resin filled in the grooves 5' are then transferred onto the second carriage 10 and are removed from the downstream end of the second carriage by a removing means not shown.

Fig. 2 shows the sash bars 1 in cross-section in the successive processing steps in the order mentioned hereinabove. The sash bar 1 has the cross-sectional configuration as shown in Fig. 2(a) when extruded. In the processing, initially, the sheet 15 is placed onto the bottom of the upper groove 5 of the sash bar 1 as shown in Fig. 2(b), then the opposite ends of the upper groove 5 are closed by end caps 6 and the sheet 15 is held in position by nipping it between the portion of the cap and the bottom of the groove 5 as shown in Fig. 2(c), the solution of heat insulating synthetic resin 9 is injected into the upper groove 5 by the injection device 8 as shown in Fig. 2(d), the central portions of the bottoms of the upper and lower grooves 5, 5' are cut away by the cutter device 16 as shown in Fig. 2(e), the sash bar 1 is turned upside-down to reverse the position of the upper and lower grooves 5, 5' as shown in Fig. 2(f), the sheet 15 is placed onto the bottom of the now upwardly facing groove 5' as shown in Fig. 2(g), the opposite ends of the now upwardly facing groove 5' are closed by end caps 6 and the sheet 15 is held in position within the groove 5' as shown in Fig. 2(h) and the solution of heat insulating synthetic resin 9 is

injected into the groove 5' by the injecting device 8 as shown in Fig. 2(i).

Fig. 3 shows a perspective view of the reversing device comprising: a rotation shaft 21 horizontally supported on a fixed support 38; a pair of arm members 25, 26 spaced apart along the shaft 21 facing each other and fixed to the shaft 21 at an end of each arm member 25, 26 so as to form a three-sided rectangle composed of both of the arm members 25, 26 and the shaft 21; pairs of press-plates 35 facing each other and fixed to piston rods of cylinders 27, 28 which are located horizontally on the pair of arm members 25, 26, respectively; and a pinion 24 fixed to the rotation shaft 21, and a cylinder 22, the piston rod of which has a rack 23 engaging with the pinion 24 thereon.

In Fig. 3, the rotation shaft 21 is rotated through an angle of 180 degrees by vertically reciprocating cylinder 22 through the rack 23 and pinion 24 engagement. The piston rod of each cylinder 27, 28 located on each arm member 25, 26 extends through each arm member and is provided with the press-plate 35 at the end of each piston rod.

Although not shown in the drawing, each cylinder 22, 27, 28 is operated automatically and in a mutually related manner so that sash bars can be turned upside-down as the sash bars are supplied into the device as explained below.

In Fig 3., 29, 30 are driving rollers and 31, 32, 33, 34 are guide rollers. The driving rollers 29 introduce sash bars transferred from the cutter device 16 into the

reversing device with the help of guide rollers 31, 32.

The sash bars introduced into the reversing device are stopped at appropriate positions explained below by brake means (not shown) operated by limit switches (not shown).

5 The driving rollers 30 transfer reversed sash bars to the next station with the help of guide rollers 33, 34. The top portion of driving rollers 29, 30 and guide rollers 34 is cut into a conical shape so as not to interfere with the reversing movement of the sash bars.

10 The operation of the reversing device is explained hereinafter. The piston rod of the cylinder 22 is retracted moving the rack 23 downward, which rotates the shaft 21 counter-clockwise through an angle of 180 degrees moving arm members 25, 26 to a leftward position from their
15 original position in Fig. 3.

Sash bars 1 transferred from the cutter device 16 are introduced into the reversing device by driving rollers 29 and guide rollers 31, 32 and are stopped by brake means mentioned above at locations suitable for being held between
20 the arm members. Then the piston rod of the cylinder 22 is extended moving rack 23 upward, which rotates arm members 25, 26 clockwise through an angle of 180 degrees to their original position, where the arm members are stopped to hold sash bars 1 longitudinally at both of their ends.

25 As is apparent from Fig. 4, the upper grooves 5 of the sash bars have been filled with heat insulating synthetic resin 12. Piston rods of cylinders 27, 28 are extended to hold sash bars 1 longitudinally between the press-plates 35.

The piston rod of the cylinder 22 is then retracted moving the rack 23 downward, which rotates the arm members 25, 26 counter-clockwise through an angle of 180 degrees with the sash bars being held by the arm members. Next, the piston rods of the cylinders 27, 28 are retracted to set free the sash bars, and leave them on guide rollers 33. The piston rod of the cylinder 22 is extended again moving the rack 23 upward, which rotates the arm members clockwise. Then, the driving rollers 30 are rotated to move the sash bars to the next station, namely, onto the first carriage 2. At this time, as is shown by the phantom line in Fig. 4, heat insulating synthetic resin 12 is located at the bottom of the sash bar 1 with the groove 5' located at the top.

Fig. 5 shows another form of reversing device, which is suitable for reversing relatively long sash bars. Arm members 25, 26 are connected with each other by reinforcing members 36. Cylinders 37 are provided on the reinforcing members so that each sash bar held by the cylinders 27, 28 in the longitudinal direction are additionally held by a pair of cylinders 37 in the lateral direction, which allows the sash bars to be held more securely.

Reference is directed to co-pending application
Serial No 2134843
No. 8334043, / (ref. 230P46743) since the inventions
may be used together.



CLAIMS:-

1. An apparatus for filling heat-insulating material into grooves on opposite sides of at least one elongate section member, comprising means for holding the or each section member horizontally,
5 first one said side up and then the opposite said side up, in a give position, means for filling the groove in each side in the given position while that side is up, a reversing device located away from said given position and adapted for turning the or each section member upside down so as to bring the opposite
10 said side up after the filling of the groove in the first side, and means for delivering the or each section member from said given position to said device for turning and delivering the or each section member back to said given position after turning, said reversing device comprising:-
15 a rotation shaft horizontally supported on a fixed support;
a pair of arm members spaced apart along said shaft facing each other and fixed to said shaft at one end of each of said arm members so as to form a three sided rectangle composed of both of said arm members and said shaft;
20 at least one pair of pressing devices located on said pair of arm members at positions facing each other for releasably holding elongated section members therebetween; and
a means to rotate said rotation shaft for rotating said pair of arm members through an angle of 180 degrees from a first
25 horizontal position to a second horizontal position and in the opposite direction in turn.
2. An apparatus as claimed in claim 1 wherein each of said pressing devices is a pressing plate fixed to a piston rod of



an extending and retracting cylinder supported on said arm member.

3. An apparatus as claimed in Claim 1 or 2 wherein said means to rotate said rotation shaft comprises a pinion fixed to said rotation shaft and a cylinder, the piston rod of which has a rack engaging with said pinion thereon.

4. An apparatus as claimed in Claim 1, 2 or 3 wherein said pair of arm members are connected with each other by reinforcing members which include at least an additional pair of pressing devices at positions facing each other for releasably holding additionally in their lateral direction each of said elongated section members which are releasably held in the longitudinal direction by said pair of additional pressing devices.

5. An apparatus as claimed in Claim 4 wherein each of said additional pressing devices is a pressing plate fixed to a piston rod of an extending and retracting cylinder supported on said reinforcing member.

6. An apparatus as claimed in any one of the preceding claims, wherein each said section members are heat insulating sash bars.

7. An apparatus as claimed in any preceding claim wherein said holding means comprises a first carriage.

8. An apparatus as claimed in claim 7 and comprising means for supplying a plurality of said section members one at a time to said carriage and then moving section members sideways on said carriage in stepwise manner to make room for succeeding section members.

9. An apparatus as claimed in claim 7 or 8 wherein a second carriage for holding the or each section member is arranged the far side of the reversing device from the first carriage.



10. Apparatus substantially as described with reference to and as illustrated in the accompanying drawings.
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