

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 one elongate section member and comprising a reversing device for turning the
5 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 filled with heat insulating synthetic resin first, the section member is reversed or turned upside-down, then the groove on the other side is filled with heat insulating synthetic resin.

15 As a device for turning section members upside-down, a reversing device for section members has been proposed in copending Japanese Utility Model Application NO. 195325/82 which has been assigned to the assignee. According to Japanese Utility Model Application No. 195325/82, a reversing device for section members is provided which
20 comprises: 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; pairs of pressing devices located on said pair of
25 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 arms members through an angle of 180 degrees from a first horizontal position to a second

horizontal position and in the opposite direction in turn.

This device, however, is not desirable from the layout standpoint in which continuity of the transfer line for section members is desired, since the section members are moved for a considerable distance in the lateral direction when they turned upside-down. Further, there are additional problems brought back by the device since the area or the space occupied by the transfer line is increased, the speed of turning the section members upside-down is limited, and the reversing device itself needs to be big in size, etc.

According to the invention there is provided 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, 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 given position and adapted for turning the or each section member upside down so as to bring the opposite 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:-

a pair of wheels located concentrically and spaced mutually apart, each wheel having an aperture at the center thereof for the section member to pass through;

a fixing means located around said aperture in each of said wheels for fixing said section member to said wheel;

at least one pair of driving means for rotating said pair of wheels in a synchronized manner; and

a control means for restricting the angle of rotation of said pair of wheels to 180 degrees.

At least with a preferred embodiment of the present invention there are or can be achieved the following effects:

- 5 (1) Since the section member is located at the center of the pair of wheels, the section member stays on the unchanged axis before and after being turned upside-down, which serves to maintain the continuity of the transfer line for the section members.
- 10 (2) Since the section member is reversed or turned upside-down only by the rotation of a pair of wheels, there is no other motion such as a swing during the reversing operation, which helps to minimize the area or space occupied by the hole transfer line for the section members.
- 15 (3) Since the section member is reversed or turned upside-down by the rotation of a pair of wheels with the section member being held at the center of the pair of wheels, the reversing speed can be increased as compared with the reversing operation using a swing motion.
- 20 (4) Since the major constituent component of the reversing device is a pair of rotation wheels, the device can be made smaller in size as compared with a swing type reversing device.

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 purpose only, but not 25 for limiting the scope of same in any way. In the drawings:-

Figure 1 is a perspective view of the entire structure of an apparatus for filling heat insulating material into grooves on both

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sides of elongated section members embodying the invention;

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

Figure 3 is a front view of the reversing device in the apparatus
5 of Figure 1; and

Fig. 4 shows side views of the device of Fig. 3 explaining its operation.

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

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 moved intermittently one pitch by one pitch on the carriage 10 by a movable stand 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 of the thus processed bars 1 is pushed out of the second carriage 10 longitudinally of the apparatus onto a cutter device 14 by a cylinder 13 and center portions of the bottoms of the grooves 5, 5' are cut away by the cutter device 14 [see Fig. 2(e)]. Thereafter, the sash bar 1 is transferred longitudinally of the apparatus by belt device means 18, 19 to a reversing device 17 which holds and turns the sash bar 1 upside-down to face the lower groove 5' of the sash bar upward. The reversed bar 1 is then pushed out of the device 17 longitudinally of the apparatus by the next sash bar which is moved toward the device 17 while the bottoms of its grooves are being cut to be again placed onto the first carriage 2

where the now upwardly facing groove 5' of the bar 1 is 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, at first, 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 14 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).

5 Fig. 3 shows a front view of the reversing device as viewed from the cutter device side. The reversing device comprises a pair of wheels 21 (only one is shown in Fig. 3), each wheel having teeth on the outer peripheral surface and an aperture 22 through which a section member is allowed to
10 pass at the center, and the pair of wheels being connected with each other by brackets 23 [see Fig. 4(a)]; pressing rollers 25 and cylinders 24 for moving the pressing rollers, the rollers and cylinders being located around the aperture 22 so as to allow a sash bar to be fixed to and set free
15 from the pair of wheels at their center; and a pair of driving gears 26 to support and drive the pair of wheels 21. The pair of driving gears 26 are connected with each other by a rotation shaft 37 [see Fig. 4(a)], and are driven by a motor 27 through a belt 36. The pair of wheels 21 are
20 supported by and placed on the pair of driving gears 26 and idler gears 28 in such a way that the teeth on the outer peripheral surface of each wheel engage with both the driving gear 26 and the idler gear 28.

Support blocks 35 support the rotation shaft 37
25 of the pair of driving gears work to prevent the movement of the pair of wheels in their axial direction. Since the reversing device is assembled on a base plate 31 which is supported on a foundation 34 through a height adjusting

mechanism comprising a link mechanism 32 and a driving device 33 for the link mechanism, the height of the apertures 22 can be adjusted so that the apertures are aligned with the sash bar transfer line.

5 The function of the reversing device is explained hereinafter referred to Fig. 4. As shown in Figs.4(a) and 4(b), a sash bar coming out of the cutter device 14, while being held between driving belts 18, 19 and simultaneously having the central portions of
10 the bottoms of the grooves thereof cut away, is transferred toward the right by feed rollers 16 so as to be inserted into apertures 22 at the center of the pair of wheels. As shown in Fig.4(c), when the forward end of the sash bar blocks the light passage of a photo-electric tube
15 switch 39, cylinder rods of cylinders 24 extend, pressing the rollers 25 onto the sash bar. The sash bar is thus fixed to the pair of wheels at their center.

 By the function of a timer, the pair of wheels 21 are then rotated through an angle of 180 degrees, turning
20 the sash bar so that the groove 5' faces upwards. Limitation of the rotation angle of the pair of wheels 21 to 180 degrees is done by the contact of a contact point 30 with a micro switch 29 as shown in Fig. 3. When the reversing of a sash bar is completed, cylinder rods of
25 cylinders 24 retract moving rollers 25 away from the sash bar. The sash bar which has now been set free starts to move toward the right, being pushed by the next sash bar coming out of the cutter device as shown in Fig. 4(e) and Fig.4(f). The reversed sash bar

is then placed on the first carriage 2 again to fill the groove 5' with heat insulating material before the sash bar is completed.



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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, first
5 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 given position and adapted for turning the or each section member upside down so as to bring the opposite said side up after the filling
10 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:-
 - a pair of wheels located concentrically and spaced mutually
15 apart, each wheel having an aperture at the center thereof for the section member to pass through;
 - a fixing means located around said aperture in each of said wheels for fixing said section member to said wheel;
 - at least one pair of driving means for rotating said pair
20 of wheels in a synchronized manner; and
 - a control means for restricting the angle of rotation of said pair of wheels to 180 degrees.
2. An apparatus as claimed in claim 1 wherein said pair of wheels are connected with each other by means of brackets.
- 25 3. An apparatus as claimed in claim 1 or 2 wherein said aperture is square.
4. An apparatus as claimed in claim 3 wherein said fixing means are located on each side of said square aperture.



5. An apparatus as claimed in any preceding claim wherein each of said fixing means comprises a cylinder and a pressing roller connected to a piston rod of said cylinder.
6. An apparatus as claimed in any preceding claim wherein said pair of driving means are a pair of driving gears engaging with teeth provided on the outer peripheral surfaces of said pair of wheels.
7. An apparatus as claimed in claim 6 wherein said pair of driving gears are connected with each other by means of a rotation shaft.
8. An apparatus as claimed in claim 7 wherein said pair of wheels are prevented from movement in the axial direction thereof by support blocks supporting said rotation shaft of said pair of driving gears.
9. An apparatus as claimed in claim 6, 7 or 8 wherein said pair of driving gears are driven by a motor through a belt.
10. An apparatus as claimed in any one of claims 6 to 9 wherein said pair of wheels are supported by said pair of driving gears and a pair of idler gears.
11. An apparatus as claimed in claim 10 wherein said pair of driving gears and said pair of idler gears are supported on a height adjustable base plate.
12. An apparatus as claimed in any preceding claim wherein said control means includes a contact point and a micro-switch for determining the rotation angle of said pair of wheels and for stopping said rotation.
13. An apparatus as claimed in any preceding claim adapted for said section member to be a heat insulating sash bar.
14. An apparatus as claimed in any preceding claim wherein said holding means comprises a first carriage.
15. An apparatus as claimed in claim 14 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.

16. An apparatus as claimed in claim 14 or 15 wherein a second carriage for holding the or each section member is arranged the far side of the reversing device from the first carriage.

5 17. An apparatus substantially as described with reference to and as illustrated in the accompanying drawings.

