



SPECIFICATION

AK-9601

TITLE OF THE INVENTION

MATERIAL FEEDING APPARATUS OF MOLDING MACHINE

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

This invention relates to a material feeding apparatus to be used for a synthetic resin molding machine such as an injection molding machine or an extrusion molding machine and particularly adapted for feeding recycled
10 material that has been crushed into flakes.

2. Background Art

When a flaky or powdery molding material is brought to free fall through a hopper into a molding machine, it can
15 bridge the hopper to give rise to an unstable feeding rate. Therefore, a screw is installed to prevent such a problem and forcibly feed the material.

Japanese Patent Application Laid-Open No. 60-116424 discloses means for stably feeding a resin material that is
20 powdery, flaky, or in the form of a mixture of powder and pellets, wherein sensors are provided to detect the pressure of the resin material at a lower portion of a screw-type force feeder arranged in an extruder and at a base portion of the screw of the extruder and the rate of revolution of the
25 force feeder screw is controlled by the output of the sensors

in such a way that the pressure of the resin material is constantly held to a certain level.

However, flaky recycled materials generally have a large bulk density and pieces of the material being fed can take a variety of postures in the course so that the material can show a variable and fluctuating density. Therefore, the pressure of the material cannot be maintained to a constant level simply by the revolution of the force feeder screw and hence is subjected to fluctuations, requiring a frequent regulation of the rate of revolution of the screw. In addition, the problem of responsiveness makes it very difficult to supply a flaky recycled material on a stable basis even if the rate of revolution of the screw is regulated by detecting the pressure of the molding material.

In view of the above problem, it is therefore the object of the present invention to provide a novel feeding apparatus that can supply a molding machine with a molding material on a stable basis by pushing the material in a related hopper main body under constant pressure even if the material is flaky.

SUMMARY OF THE INVENTION

According to the invention, the above object is achieved by providing a material feeding apparatus of a molding machine comprising a feed barrel having a required

height and arranged under a hopper main body to connect it to a feed channel of the rear end of a heating cylinder provided with a plasticizing screw and a vertically movable plunger member having a diameter small than that of the feed barrel and a flat front end and arranged in the hopper main body, said plunger member being connected to a piston of a pressure apparatus in order to forcibly push the molding material in the feed barrel into the heating cylinder through said feed channel.

With the above described arrangement, as the plunger member is raised, part of the molding material in the hopper main body is allowed to flow into the feed barrel and the feed channel to clog them. Then, the plunger member is lowered to push the molding material in the feed barrel under constant pressure until the molding material in the feed barrel is compressed to show a uniform density and taken into the cylinder as there is no other way for them to move out.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig.1 is a longitudinal cross sectional side view of an embodiment of a material feeding apparatus of a molding machine according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

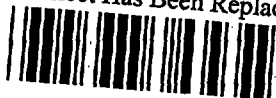
In the accompanying drawing, there is shown a



heating cylinder 1 provided with a freely rotatable plasticizing screw 2 and a feed channel 4 running through a support section 3 integrally formed with the cylinder on the upper wall of the rear end thereof and having a required height. The peripheral wall of the feed channel 4 is tapered so that the inner aperture 4a of the feed channel located vis-a-vis the plasticizing screw has a diameter smaller than that of the outer aperture.

Reference numeral 5 denotes a hopper main body provided with a feed barrel 6 having a required height and the lower end of the feed barrel has a diameter slightly greater than that of the inner aperture of said feed channel 4. The top opening of the hopper is closed by a closure member 7 having a material inlet port.

Said feed barrel 6 has a lower barrel section 6a provided with an anchoring flange 8 and having a lower end portion 6b projecting downward from the flange and having an outer diameter substantially equal to the diameter of said feed channel 4. The inner peripheral wall of the lower barrel section is tapered in an upper area to show a relatively large top opening. The feed barrel also has an upper barrel section 6c connected to the lower end of the hopper main body and having an inner diameter equal to the diameter of the top aperture of the lower barrel section. The upper and lower barrel sections are held in mutual



engagement and securely held to each other by means of screws or the like to make an integral body.

Of the feed barrel 6 fitted to the lower end of the hopper main body 5, the lower end portion 6b of the lower barrel section 6a is held in engagement with the feed channel 4 and in abutment onto the upper surface of the support section 3, the flange 8 being anchored to the support 3 and hence to said heating cylinder 1 by means of bolts 12.

Reference numeral 9 denotes a plunger member for pushing the molding material that is a long rod-like metal member with a flat front end, the diameter of the plunger member being slightly smaller than that of the inner diameter of said feed barrel 6. The plunger member 9 is coupled to the front end of a piston 11 of a pressure apparatus 10 comprising a pneumatic cylinder or a hydraulic cylinder facing downward and arranged at the center of said closure member 7 so that it may vertically move in the hopper main body 5 located right above the feed barrel 6 from a raised position indicated by solid lines to a lowered position indicated by broken lines as the pneumatically or hydraulically driven piston 11 of the pressure apparatus 10 moves from a retracted position to an extended position to forcibly push the molding material in the feed barrel 6 into the feed channel 4 and further into the cylinder under pressure of a constant level.



The diameter of the plunger member 9 is selected as a function of the inner diameter of said feed barrel 6 and the size and the shape of the pieces of the molding material. If the molding material is a crushed flaky recycled material, however, the diameter of the plunger member 9 is preferably made substantially equal to that of the inner of said feed channel 9.

With the material feed apparatus having a configuration as described above, when the plunger member 9 is located at its raised position, part of a lower portion of the molding material fed or thrown into the hopper main body 5 automatically flows into the feed barrel 6 and the feed channel 4 to fill them. If the molding material is a recycled material consisting of crushed flaky pieces having different sizes and different shapes, their postures in the feed barrel 6 may vary and uneven gaps among them may be produced to show a variable and fluctuating density of the material.

Under such a state, the plasticizing screw 2 may not take the material effectively when it is driven to operate. However, as the molding material in the feed barrel 6 is pushed by said plunger member 9 under pressure of a constant level, it is compressed to show a uniform density in the feed barrel 6 and taken into the cylinder effectively as there is no other way for them to move out, even if the



material is a flaky recycled material.

The feed of molding material forced by the plunger member 9 is conducted effectively under pressure of an appropriate level. If the pressure is too high, the molding material may be excessively compressed so that it may not be effectively taken into the cylinder, whereas it may be taken into the cylinder unevenly if the pressure is too low. In an experiment using a plunger member having a diameter of 80mm, a favorable result was obtained with pressure of 5kg/cm².

The plunger member 9 is preferably pushed down through the feed barrel 6 until the front end of the plunger member is located 30mm above the inner aperture 4a of the feed channel 4. Then, part of the molding material in the hopper main body flows into the feed barrel 6 as the plunger member is moved back to its raised position.

Thus, the supply of molding material in the hopper main body is realized on a continuous basis as the plunger member 9 is reciprocatingly and vertically moved in the hopper main body and the molding material would not be forced into the cylinder by the plunger member 9 when the screw stops revolving. The operation of the plunger member 9 can be regulated for stroke and automatic suspension by means of timers and limit switches.

While a long plunger member 9 is used in the above embodiment, it may be replaced by a short plunger or even by



a disc-shaped member that may be covered by the molding material in the hopper main body so that it may give rise to an effect of stirring the molding material as it is raised and lowered in the hopper main body and any possible bridging phenomenon of the molding material may be completely eliminated.

As described above, since a material feeding apparatus of a molding machine according to the invention comprises a feed barrel 6 having a required height and arranged under a hopper main body 5 to connect it to a feed channel 4 of the rear end of a heating cylinder 1 provided with a plasticizing screw 2 and a vertically movable plunger member 9 having a diameter small than that of the feed barrel 6 and a flat front end and arranged in the hopper main body 5, said plunger member 9 being connected to a piston 11 of a pressure apparatus 10 in order to forcibly push the molding material in the feed barrel 6 into the heating cylinder through said feed channel 4, it is not required to have an arrangement of controlling the rate of feeding the material and coordinating it with the rate of revolution of the plasticizing screw by detecting the pressure of the material in the feed channel as in the case of forcing the material to be taken into the cylinder by rotating a screw.

Additionally, since the molding material can be made to flow into the feed barrel and move from the feed



barrel further into the cylinder simply by vertically moving the plunger member, any possible bridging phenomenon of the molding material may be completely eliminated so that the molding material may be supplied on a stable basis even if it is a flaky recycled material.

Finally, since a plunger member having a flat front end is placed right above the feed barrel in the hopper main body and simply connected to a piston of a pressure apparatus for vertical movement, the entire configuration of a material feeding apparatus according to the invention is by far simpler than that of a conventional force feeder provided with a screw. Such an apparatus can be produced at reduced cost because a pneumatic cylinder or a hydraulic cylinder can be used for the pressure apparatus.

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WHAT IS CLAIMED IS:

1. A material feeding apparatus of a molding machine comprising
a feed barrel having a required height and arranged
5 under a hopper main body to connect it to a feed channel of
the rear end of a heating cylinder provided with a
plasticizing screw and
a vertically movable plunger member having a diameter
small than that of the feed barrel and a flat front end and
10 arranged in the hopper main body, said plunger member being
connected to a piston of a pressure apparatus in order to
forcibly push the molding material in the feed barrel into
the heating cylinder through said feed channel.
- 15 2. A material feeding apparatus of a molding machine
claimed in claim 1, wherein the diameter of the plunger
member is made substantially equal to that of the inner of
said feed channel.

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