

PRODUCING PELLETS FROM STRAND

This invention relates to producing pellets from extruded strand by cutting the strand with a rotary cutter.

In a known pellet-making machine, the pellets are produced by cutting strand, which has previously been cooled in a water bath, using a fixed blade and a co-operating rotary cutter.

However, as the heat generated by cutting strand raises the temperature, the cutting of the strand becomes inaccurate, and then gradually becomes impossible.

The problems arise because the synthetic resin strand material sticks to the hot rotary cutter and to the fixed blade, thereby causing poor cutting action and non-uniformity in the size of the cut pellets. Furthermore, static electric charge is induced, thereby causing the pellets to agglomerate.

In the known pellet-making machine, a plurality of strands extruded from the extruder are passed through the cooling bath to cool them sufficiently before they are cut by the rotary cutter into pellets; thereafter the hot, cut pellets are tipped into the water bath to cool them.

When the strands are fed and cut in the first

stage, the shape of the pellets is not constant, and non-uniform pellets are formed, thereby resulting in a poor product.

An object of the present invention is to provide a pellet-making machine for producing pellets from strand and which can easily cut strand extruded from an extruder to produce pellets of uniform size and shape.

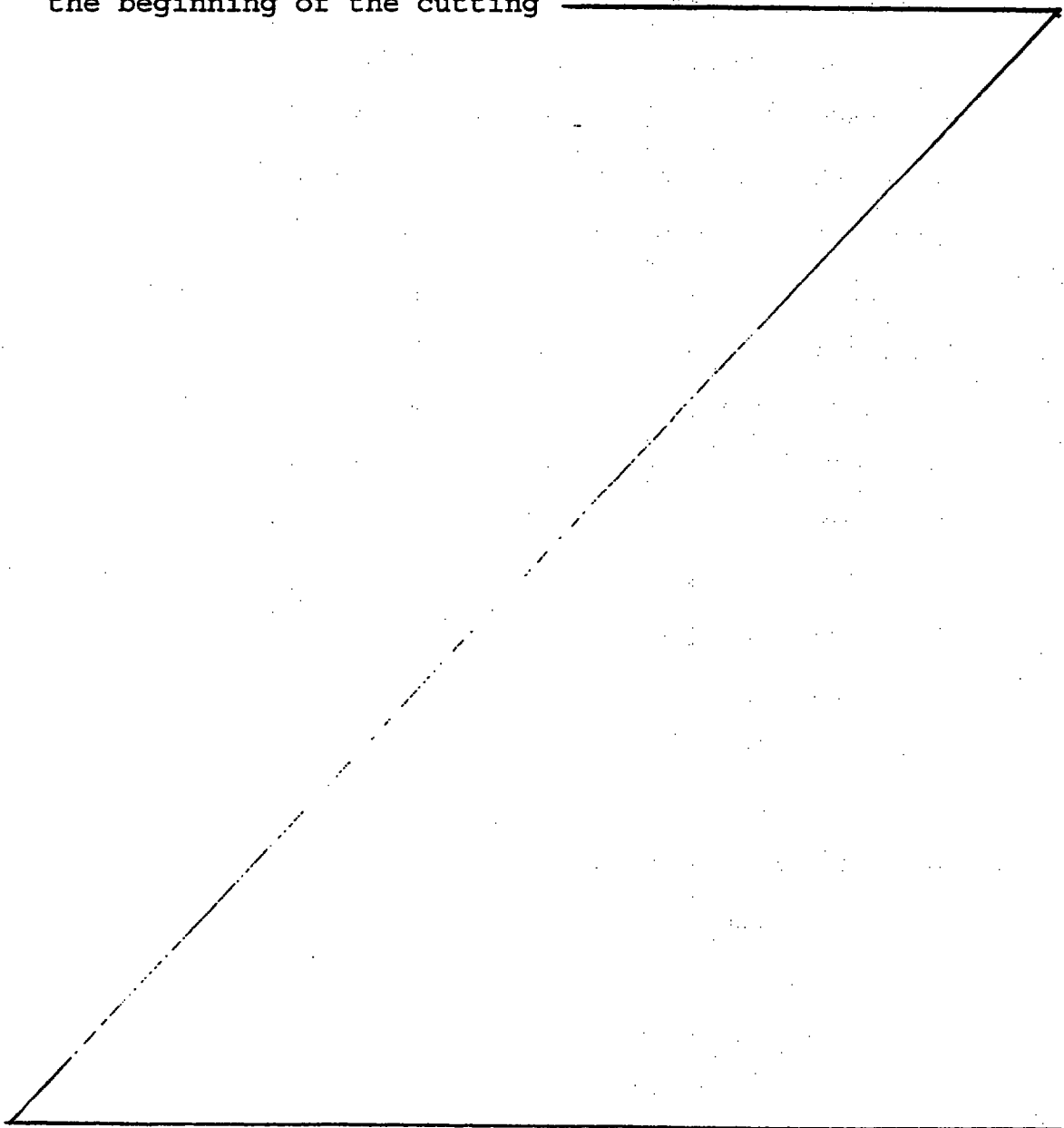
According to the present invention, a pellet-making machine for producing pellets from strand is provided, which comprises a rotary cutter having a cooling chamber; a fixed blade disposed opposite to said rotary cutter; a delivery means for delivering strand extruded from an extruder to said rotary cutter and said fixed blade; a hollow shaft having said rotary cutter mounted thereon and including a fluid inlet port and a fluid outlet port arranged to allow a flow of fluid to be passed through the cooling chamber provided within said rotary cutter; and a fluid supply tube extending into the hollow shaft and defining a fluid supply passage for delivering the flow of fluid to the fluid inlet port and a fluid outlet passage for discharging the flow of fluid from the fluid outlet port in said hollow shaft.

Strand extruded from a die mounted in a head of an extruder is cut by the rotary cutter which is cooled by the flow of water therethrough. The rotary cutter is thus prevented from adhering to the synthetic resin strand material; cutting efficiency and blade durability are increased; and static electricity generated by the rotary

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cutter is eliminated to provide easier handling of the pellets.

Furthermore, a scrap product outlet may be located in the inclined floor of a pellet exhaust chute, and a guide cover is pivotably mounted for movement between an open position in which waste product is directed through the outlet and a closed position in which the cover forms part of the floor of the chute. Non-uniform pellets produced at the beginning of the cutting



operation can thus be diverted from the pellet exhaust chute, and do not become mixed with good quality pellets produced subsequently.

One embodiment of a pellet-making machine according to this invention for producing pellets from strand will now be described with reference to the accompanying drawings in which

Fig. 1 is an explanatory diagrammatic elevation of an installation incorporating the pellet-making machine;

Fig. 2 is a front view of the pellet-making machine partly broken away to show the interior construction;

Fig. 3 is a plan of the rotary cutter assembly, partly broken away;

Fig. 4 is a side view of the rotary cutter assembly shown in Fig. 3 and illustrating the relationship of the rotary cutter, fixed blade, and feed and press rollers;

Fig. 5 is a partial enlarged longitudinal cross-section of the rotary cutter assembly;

Fig. 6 is an enlarged vertical cross-section of the rotary cutter assembly; and

Fig. 7 is a vertical cross-section of the pellet exhaust chute.

Fig. 1 shows an installation incorporating a pellet-making machine according to the invention, the

installation comprising an extruder 2 for forming strand 1, a cooling bath 3 to cool the extruded strand 1, a drain blower device 4 to drain the cooled strand 1, a pellet-making machine 5 according to the invention, and a rotary-type sieve 6 connected continuously to said pellet-making machine 5. The strand 1 is cut by the action of a rotary cutter 7 against a fixed blade 9 in the pellet-making machine 5, and the cut pellets are sieved and removed through the rotary-type sieve 6.

The pellet making machine 5 located in line in said installation is provided with an operating panel 5a mounted on the front and, at the top, with a chamber 8 receiving the rotary cutter 7. The chamber 8 is provided with a downwardly-inclined exhaust chute 13 of U-shaped cross-section located beneath the rotary cutter 7.

Within the chamber 8 is provided a vertical post 9a, the upper end of which supports a fixed blade 9 kissing the rotary cutter 7.

A feed roller 10 is disposed within the chamber 8 on the forward side of the fixed blade 9 and is provided with a roughened working surface, the roller 10 being supported by a rotary shaft 10 having a pulley 10b mounted at one end thereof. A press roller 11, supported by a rotary shaft 11a, is disposed above the feed roller 10 and in contact therewith; and a delivery

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roller 12 to remove the strand 1 from said drain blower 4 is positioned in advance of said feed roller 10 and press roller 11.

A receiving plate 40 to receive defective portions of strand 1 is disposed below the strand path between the delivery roller 12, and the feed and press rollers 10,11. Hence, the strand 1, having been passed through the delivery roller 12, is fed by the feed roller 10 and the press roller 11 towards the rotary cutter 7, and is cut thereby to form pellets 1a.

The rotary cutter 7 has a cutting blade 7a mounted on the outer periphery thereof which is provided with teeth having points formed of super hard alloy; a hollow rotary shaft 14 axially located within the rotary cutter 7, as shown in Fig. 5; and a cooling chamber 7b formed between the rotary cutter 7 and the rotary shaft 14. Each end of said hollow rotary shaft 14 is journaled in a bearing 15.

The rotary cutter 7 is secured by nuts 16 to the hollow rotary shaft 14, being provided with a suitable stop, and O-rings 17 are interposed between the hollow rotary shaft 14 and the rotary cutter 7 to form a seal therebetween.

The hollow rotary shaft 14 has an axial cavity which is closed at one end and open at the other end, and in which is received a water supply tube 20 with its

open end spaced from the closed end of the hollow rotary shaft 14, the water supply tube 20 being supported in the cavity by an annular partition 19 having a smooth coating of, for example, nylon. The water supply tube 20 is stationary and is supplied through a water supply port 20a. The hollow rotary shaft 14 defines with the supply tube 20 a water supply passage 18 and a water exhaust passage 18a, the passages being separated by spacing means, for example the partition 19; radial inflow holes 21 drilled through the shaft 18 allow flow from the water supply passage 18 into the chamber 7b, and similar exhaust holes 22 allow flow from the cooling chamber 7b into the exhaust passage 18a. The hollow rotary shaft 14 is provided at one end with a pulley 23 which communicates through a belt 25 with a pulley 24 which is rotated by a motor M, controlled through operation of the operating panel 5a on the pellet-making machine 5.

The pulley 10b mounted on one end of the feed roller shaft 10a is connected by a belt 38 to a pulley 37, which is in turn connected by a belt 35 to a pulley 34, connected via a crossed belt 33 to the pulley 34 of the motor M.

A connector 27 having a water outlet 28¹, such as a T-shaped connector, is connected to the open end of the hollow rotary shaft 14 through a coupling 26. An alternative water outlet may be formed by using a rotary

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joint, and water may be also exhausted through a water exhaust guide, without using the joint, as the pressure of the exhaust water is quite low; in this last case, it is not of course necessary to use the connector 27.

The pellet exhaust chute 13 shown in Figs. 2 and 7 is located in the lower portion of the rotary cutter 7 and is provided with an inclined floor 13a down which pellets 1a may slide, and with a hinged cover 28. A waste product outlet 29 is provided at the lower end of the inclined floor 13a and has its inlet 29a controlled by a trap 30 pivotably mounted on a shaft 30a for movement between a closed position shown in full line and an open position shown in chain-dot. An arm 32 is connected to the shaft 30a and terminates in a weighted handle 31 which holds the trap 30 in the closed position and in the open position.

Operation of the operating panel 5a to start the motor M causes consequent rotation of the feed roller 10 in a feed direction, and of the rotary cutter 7. Strand 1 delivered from the delivery roller 12 is fed by the lower feed roller 10 and upper press roller 11 between the fixed blade 9 and the rotary cutter 7, where it is cut into pellets 1a. At the same time, cooling water supplied to the rotary cutter 7 from the water supply tube 20 flows through the cooling chamber 7b to reduce the temperature of the rotary cutter 7, the water

subsequently being exhausted through the water outlet 28. As the pellets 1a cut by the rotary cutter 7 have a non-uniform shape during the initial stage of cutting, diversion means, for example the trap 30, is moved to a vertical position by the handle 31 so as to block the pellet exhaust chute 13, the trap 30 being kept in the open position by the weight of the handle 31, to cause all the waste pellets 1a to drop through the waste product outlet 29 for collection in a suitable receptacle. When the pellets 1a assume a uniform shape, the trap 30 is returned to the closed position, thus ensuring that only good pellets 1a are passed to the rotary-type sieve 6.

By the use of the above-described embodiment of the invention, the strand is cut by the cooled rotary cutter; the pellets are produced by continuous and consistent cutting in a pre-determined uniform shape; and poor pellets can be kept separate from good pellets. Thus, even if poor pellets are produced, control of product quality is rendered easy and convenient.

The partition wall which is received within the cavity of the hollow rotary shaft for supporting the water supply tube, serves the additional purpose of separating the cooling water passage from the warm water passage. Since the wall of the hollow rotary shaft has inflow holes and exhaust holes drilled therethrough, and the rotary cutter is formed with an internal cooling

chamber which is closed by being sealed to the hollow rotary shaft, the rotary cutter is prevented from over-heating by cooling water flowing on the inside of the cutter, and consequently achieves an excellent cutting performance to form good quality pellets; further, the rotary cutter is safeguarded against heat deformation and thus keeps a constant clearance between itself and the fixed blade; yet further, generation of static electricity by the rotary cutter is eliminated thus permitting easy handling of the pellets.

As the non-uniform pellet outlet is disposed in the path of the pellet exhaust chute and the trap is mounted for pivotal movement between an open and a closed position, the non-uniform pellets produced during the initial stages of an operational run can easily be diverted by simple movement of the trap.

CLAIMS:

1. A pellet making machine for producing pellets from strand, comprising:

a rotary cutter having a cooling chamber;

a fixed blade disposed opposite to said rotary cutter;

a delivery means for delivering strand extruded from an extruder to said rotary cutter and said fixed blade;

a hollow shaft having said rotary cutter mounted thereon and including a fluid inlet port and a fluid outlet port arranged to allow a flow of fluid to be passed through the cooling chamber provided within said rotary cutter; and

a fluid supply tube extending into the hollow shaft and defining a fluid supply passage for delivering the flow of fluid to the fluid inlet port and a fluid outlet passage for discharging the flow of fluid from the fluid outlet port in said hollow shaft.

2. A machine as claimed in Claim 1, in which the water supply tube and the hollow shaft together define a fluid outlet passage for removing, in use, fluid issuing through the outlet port.

3. A machine as claimed in Claims 1 or 2, in which said fluid supply tube is supported within the hollow shaft by spacing means which also serve to separate the fluid supply passage from the fluid outlet passage.

4. A machine as claimed in any preceding Claim and further comprising a pellet exhaust chute arranged to receive pellets produced by the rotary cutter, the chute being provided with diversion means for diverting waste



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product to a waste product outlet.

5. A machine as claimed in Claim 4, in which the diversion means comprise a trap which in a closed position forms part of the floor of the chute and in an open position allows waste product to pass through the waste product outlet.

6. A machine as claimed in Claim 5, in which the trap in the open position is arranged to block the chute.

7. A machine as claimed in Claim 1 and substantially as hereinbefore described.

8. A pellet-making machine substantially as hereinbefore described with reference to the accompanying drawings.
