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(54) **Plastics shredding unit**

(57) This invention is a device for shredding plastic materials with diverse length, width, and thickness, in particular multilayer textile waste.

The shredding unit consists of two sub-units, the first of which comprises a feeder table (1) coupled with a chain conveyor that feeds pieces of the material (2) with variable thickness and softness into the zone of clamp blocks (5) controlled by a pneumatic actuator (6). When lowered, the blocks press the material to the threshold (7) at the edge of which there is located the operating zone of the cutting wheel (8). The material protruding beyond the threshold (7) is held up by a slidable threshold (9) coupled

with the cutting wheel (8) in its reciprocating motion. When the material passes through this first unit it is slit into pre-shredded output (10) with fixed width and random length and thickness.

The pre-shredded output (10) is transported into the operating zone of notched feed rollers (12) in the shredding unit's second sub-unit which is set at the right angle to the first unit. Each clamp block (13) in the second unit is controlled by a separate pneumatic actuator (14) for accurate adjustment of each unit pressure while the second cutting wheel cuts the pre-shredded output (15).

Both shredding units are synchronised with one another and keep up the same stream of the shredded material.

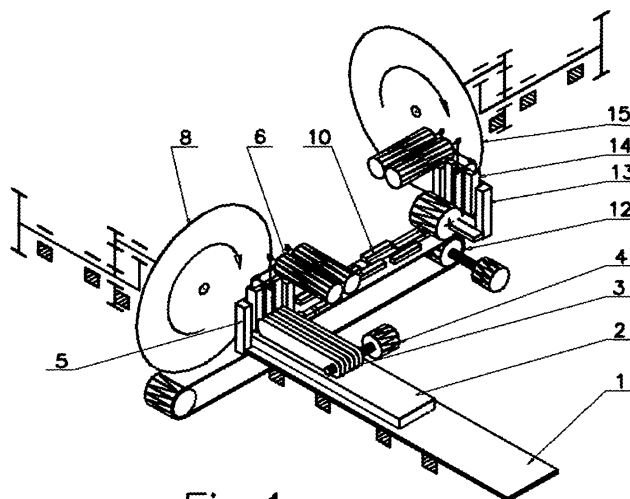


Fig.1

Description

[0001] This invention is a device for shredding plastic materials with diverse length, width, and thickness, in particular multilayer textile waste.

[0002] The patent application no. P-381390 contains a description of the method of shredding waste from multilayer plastics with low melting point and low hardness, and the shredding unit for waste from multilayer plastics with low melting point and low hardness. The shredding unit consists of a feeder table fitted with feed rollers and serially located clamping elements and a cutting wheel with planetary motion, which cutting wheel rotates together with a roller around its own axis and around the axis of a cranked roller on which it is mounted. The input is periodically fed with the use of two rollers, one of which is periodically rotated by a ratchet mechanism. The input is clamped between the table and the actuator-controlled clamping elements.

[0003] The invention's design enables shredding of multilayer materials, especially textile waste with the thickness from 0,5 to 40 mm, into cubes with the assumed width and length dimensions not smaller than 5x5mm. The shredding unit consists of two coupled shredding sub-units located perpendicularly to one another, either of which comprises feeding, clamping, cutting, and output removal systems.

[0004] Both shredding sub-units have separately adjusted speed, pressure, and input protrusion beyond the cutting wheel and are synchronised with one another, and thus keep up the same stream of the shredded material. The first shredding sub-unit has a feeding system that consists of a feeder table and several endless saw chains mounted on self-aligning parallel guides.

[0005] The clamping system consists of cyclically raised and lowered blocks controlled by pneumatic actuators that also adjust the blocks pressing power.

When lowered, the blocks press to the table threshold the material, a part of which protrudes beyond the threshold, where the size of that protrusion is also adjustable.

[0006] The cutting system comprises a slidable threshold that keeps up the protruding material and is coupled with the cutting wheel in its reciprocating motion so that the threshold slightly forestalls the cutting wheel in the course of the cutting process.

[0007] Under the threshold of the first shredding sub-unit there is a transporter which, together with a couple of notched feed rollers, constitutes the feeding system of the second shredding sub-unit.

[0008] The second shredding sub-unit comprises a clamping system that consists of a table and separately controlled clamp blocks and a cutting system with another slidable threshold coupled with the second cutting wheel.

[0009] Under the threshold of the second sub-unit's table there is located a chute which receives the shredded output.

[0010] The shredding unit enables the input to be cut

twice in different directions and helps to produce shredded output with the dimensions that approximate the two assumed dimensions of each element, which is the condition of its further processing.

[0011] In particular, the shredding unit can be applied for shredding soft and thin elements, as well as multilayer materials with diverse structures and different properties of each layer, since such elements are held up tight on the cutting wheel's attack.

[0012] The invention is shown in the drawing, where **Fig.1** shows a schematic diagram of the shredding unit, **Fig.2** - a schematic diagram of the input feeding system in the first shredding sub-unit.

[0013] The plastics shredding unit consists of two sub-units, the first of which comprises a feeder table 1 onto which fed is the input material to be shredded 2. Apart from the table 1, the sub-unit employs a chain input guiding system 2 comprised of endless saw chains 3 mounted on self-aligning parallel guides 4. The saw chains 3, with variable height and length of the links, ensure adequate adherence and stable transport of pieces of the material with variable thickness and softness into the operating zone of the clamping system comprising clamp blocks 5 controlled by a pneumatic actuator 6. When the input material is moved forward 2, the clamp blocks 5 are raised and then lowered to press the input down to the threshold 7, at the edge of which there is located the operating zone of the cutting wheel 8. The input material's protrusion beyond the threshold is adjustable, whereas it has been assumed beneficial for that protrusion to be not smaller than 5 mm. The protruding input material 2 is kept up by a slidable threshold 9, coupled with the cutting wheel 8 in its reciprocating motion. Such a solution ensures effective cutting of even thin and soft material, since it is kept up tight on the cutting wheel's attack 8, which ensures adequate angle of attack and prevents the material from folding. The slidable threshold 9 is so configured with the cutting wheel 8 that the threshold slightly forestalls the cutting wheel in the course of the cutting process. When the material passes through this first sub-unit it is slit into pre-shredded output (10) with fixed width and random length and thickness.

[0014] The pre-shredded output 10 is received by the transporter 11 located under the threshold 7 and carried to the second shredding sub-unit which is set at the right angle to the first sub-unit. The transporter 11 that feeds the second shredding sub-unit is half-pipe shaped, which ensures relatively parallel arrangement and density of the pre-shredded output 10 within the middle part of the transporter. This is important for the further cutting process, because it stiffens the structure of the shredded material by thickening it and prevents scattering.

[0015] The pre-shredded output 10 is transported to the operating zone of notched feed rollers 12. Their task is to regularly feed the material into the operating zone of the second clamping system and under the clamp blocks 13. This system is a reproduction of that in the first shredding sub-unit, save any necessary changes in-

tended to adjust it for cutting the pre-shredded output. Each clamp block **13** in the second system is controlled by a separate pneumatic actuator **14** for accurate adjustment of each unit pressure while the second cutting wheel cuts the pre-shredded output **15**. Both shredding sub-units are synchronised with one another and keep up the same stream of the shredded material. The shredded output with the pre-set width and length dimensions falls down into the chute located under the thresholds and is received by the receiver container.

Claims

1. The device for shredding plastic materials with multilayer structures and diverse dimensions, comprising input feeding systems and clamping systems with pneumatic actuator-controlled clamping elements that immobilise the shredded material while it is cut by the cutting wheel is *unique* in that it has two shredding sub-units perpendicular to and synchronised with one another, which sub-units keep up the same stream of the input material and have separately adjusted speed, pressure, and input protrusion beyond the cutting wheels **(8)** and **(15)**, and enable processing of shredded multilayer output materials, especially from textile waste, into cubes with the assumed width and length dimensions.
2. The shredding unit, pursuant to claim 1, is *unique* in that the first shredding sub-unit comprises a chain input guiding system comprising at least several spring-loaded endless saw chains **(3)** with variable height and length of the links and mounted on self-aligning parallel guides **(4)**, as well as a slidable threshold **(9)** coupled with the cutting wheel **(8)** in its reciprocating motion in such a manner that the threshold slightly forestalls the cutting wheel in the course of the cutting process.
3. The shredding unit, pursuant to claim 1, is *unique* in that the second shredding sub-unit is fed by a half-pipe shaped transporter **(11)** and fitted with notched feed rollers **(12)** and clamp blocks **(13)** controlled by separate pneumatic actuators **(14)**.

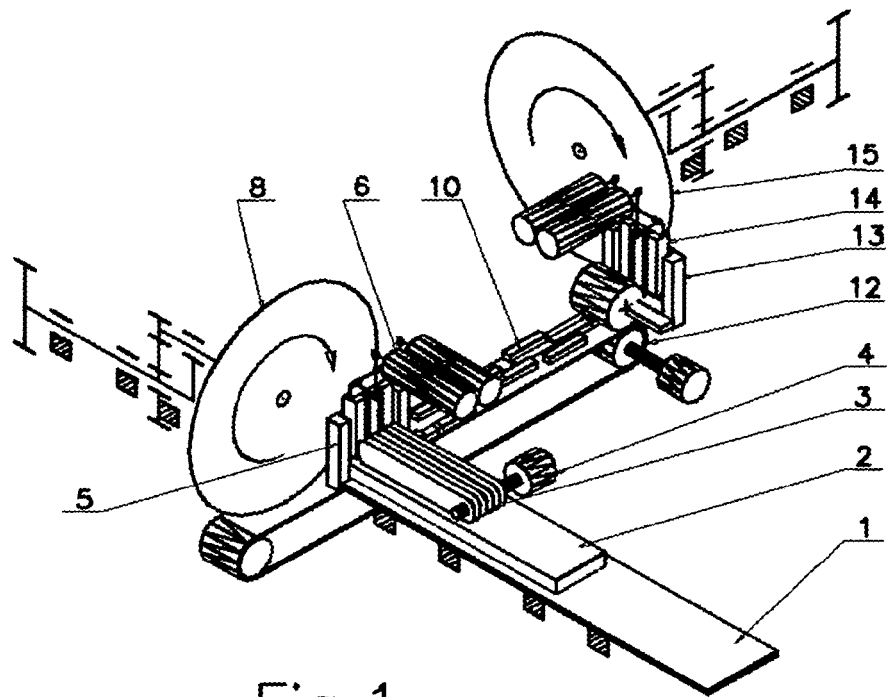


Fig.1

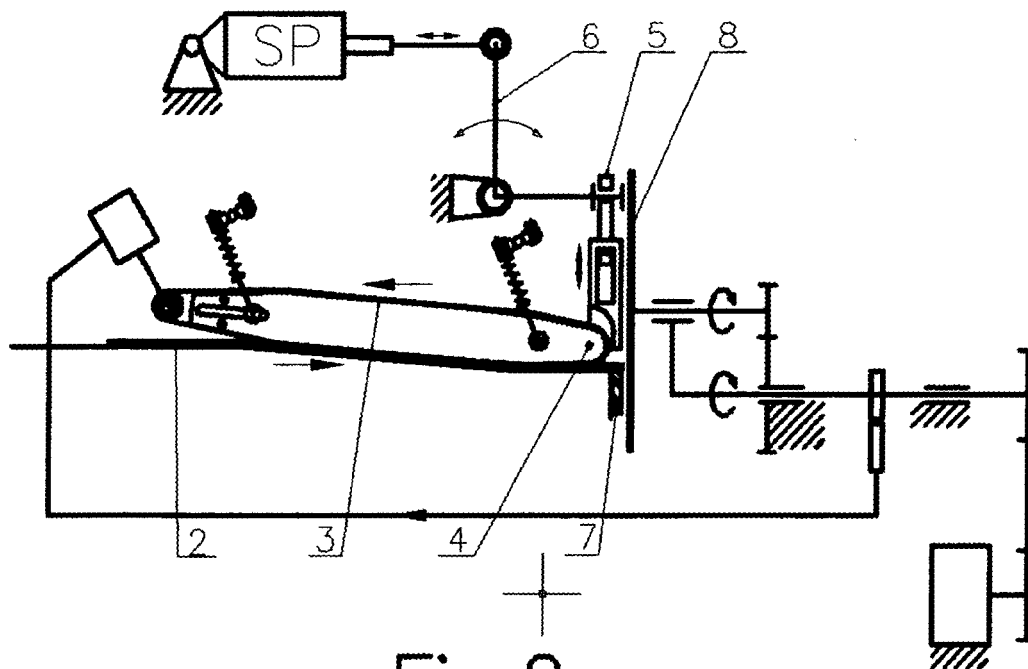


Fig.2



EUROPEAN SEARCH REPORT

Application Number
EP 10 46 0007

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 931 630 A2 (MAGURIT GEFRIERSCHNEIDER GMBH [DE]) 28 July 1999 (1999-07-28)	1,2	INV.
A	* the whole document *	3	B26D1/16
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			TECHNICAL FIELDS SEARCHED (IPC)
			B26D B02C B27B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 22 July 2010	Examiner Canelas, Rui
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503.03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 10 46 0007

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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22-07-2010

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