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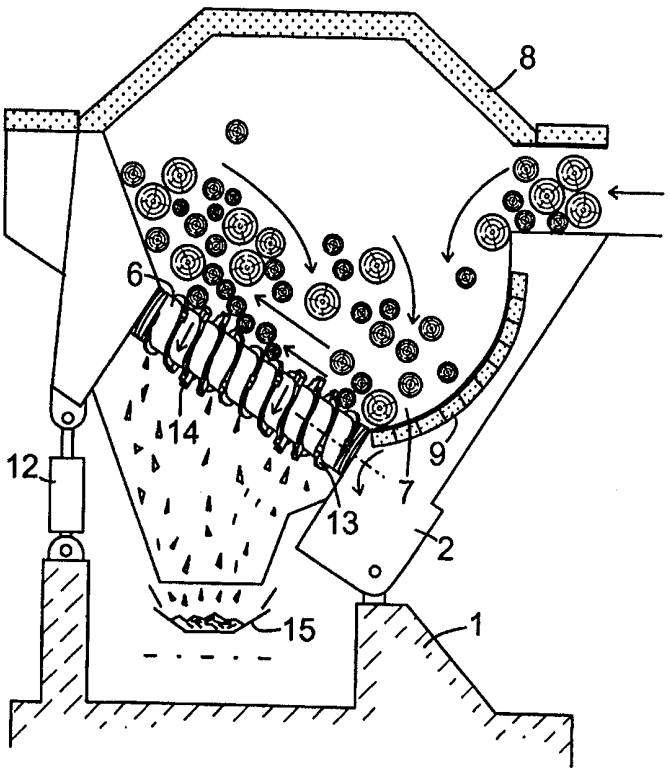
(54) Title: WOOD WORKING MACHINE

(57) Abstract

This invention relates to a method for working wood like pulp wood, saw timber or similar elongated wood parts, a working machine being at hand, which comprises a trough designed like a tunnel, which trough has a feeding in end and a feeding out end for the wood and in which are arranged a plurality of rotors, provided with means on its jacketsurface, the purpose of which is to debark the wood at least partially. According to the invention the method is characterized by the combination of following steps: the wood during the working is taken by the rotors (6) from a portion of the trough (2) on a first level to a side-displaced portion of the trough on a second, higher level, wherefrom the wood falls down to the lower level, whereby tumbling of the wood is brought about at the same time as a further working of the wood can be made; the wood during the working is taken by the rotors from the feeding in end (3) of the trough (2) to its feeding out end (4). The invention also relates to a working machine for carrying out the method.



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WOOD WORKING MACHINE

This invention relates to a method for working wood like pulp wood, sawtimber or similar elongated wood parts, a working machine being at hand, which comprises a trough designed like a tunnel, which trough has a feeding in end and a feeding out end for the wood and in which are arranged a plurality of rotors, provided with means on its jacket surface, the purpose of which is to debark at least partially of the wood.

The invention also relates to a working machine for carrying out the method.

Machines are previously known which have been designed with longitudinal rotors with strong heels, intended to work the bark of the wood. In order that the machine shall function satisfactory, it has been designed in that way that the feeding in end of the trough has been placed essentially higher than its feeding out end. Due to that fact, the transport of the wood through the machine has been made on a downward slope. This fact regarding the position of the trough means partly that the wood has to be lifted to a high position at the feeding in end, partly to be lifted up a good distance at the feeding out end in order to be able to be smoothly fed into a following chipper, saw station or the like.

Another drawback with the known machine is that the mentioned rotor heels work the wood across the fibre direction, whereby wood damages and fibre losses become great.

The purpose with the present invention is to bring about an adjustable, lenient working of the wood, which makes the treatment of wood, which is hard to work as well as easy to work possible. Furthermore, the transport through the trough from its feeding in end to its feeding out end is preferably made on an upward slope, i.e. a longitudinal centre line through the trough from the feeding in end to its feeding out end inclines upwards. Due to that fact, the feeding of the wood into the trough is made on a low level and the feeding out to a following working station, for instance a chipper, is made an a relatively high level.

This purposes have been achieved by the fact that the invention has got the features mentioned in the claims.

A preferred embodiment of the invention shall be described more closely below with reference to the accompanying drawings, where **Fig. 1a** shows the wood working machine from the side, **Fig. 1b** shows the machine from above, **Fig. 2** shows a part of a longitudinal section, taken in parallel with the upperside of the rotors, and **Fig. 3** shows a section through the machine, taken along the line III-III in fig. 1b.

With reference to the drawings is shown there the wood working machine, which has a trough 2 in the form of a tunnel which is articulately suspended in a frame 1, the trough having a feeding in end 3, and a feeding out end 4 for the wood. At the feeding in end 3 there is a feeding in opening 5 for the wood. The trough 2 has a great number of helical rotors 6 (see figs. 2, 3) at its lower part 7 and is provided with an openable cover 8 at its upper part in front of the feeding in opening 5 for reduction of dust and noise. Over the feeding in opening 5 itself there is no cover, whether fixed or openable. Due to that fact, the feeding of wood into the trough is facilitated. A side portion of the trough has a suitably designed wall 9.

The helical rotors 6, the one and of which is connected to the lower portion 10 of the wall 9 is provided with means and are inclined upwards in the direction from the lower portion 10 of the wall 9. This inclination of the helical rotors 6 are steplessly adjustable by the fact that the trough 2 can be steplessly pivoted about a suspension point 11, which can be a shaft, that is parallel with the longitudinal direction of the trough, by means of for instance a piston cylinder 12 or a screw jack. This means that the trough 2 can take different angle positions in relation to a transverse, horizontal line, drawn through the machine.

The helical rotors 6 are provided with screw threads 13 on its jacket surface. This fact plus the fact that the rotors are obliquely positioned in relation to a transverse line through the machine make possible that the wood falls down between the threads and are given a movement from below and upwards (see fig. 3) at the same time as a debarking of the wood is made. At least certain parts of the screw threads are provided with flails 14 or similar means, which are intended to damage the bark, whereby the debarking is made more effective.

According to a preferred embodiment the helical rotors 6 are driven by one or more electric motors and have a length of about 2 m. The rotors 6 have a diameter of 600 mm and a pitch of about 800 mm. The rotors 6 are further arranged

with an initial inclination so that they by means of the lifting cylinder can take an angle position in relation to the transverse horizontal line between 25° and 45°.

For collection of bark and wastage is a conveyer 15 arranged under the wood working machine.

The wood working machine functions in that way that when wood in bundles or continuously is laid down into the trough 2 of the machine, it is influenced by the threads 13 of the helical rotors 6 so that it is lifted up and begins to rotate (tumble) in the trough 2 at the same time as it is driven upwards. Due to that fact, worked wood from its uppermost position will fall back to the bottom portion of the trough and once again begin to be worked. During the rotation of the rotors 6, the wood will not only be lifted upwards but of course be brought forwards towards the feeding out end 4 of the trough.

When continuously feeding wood in bundles into the trough, the tumbling will even out the wood to a continuous wood string which under a continuous tumbling is transported through the machine with a velocity which depends on the adjusted inclination of the rotors. Due to that fact, the degree of working can be adapted to the need, since the residence time of the wood in the machine is on the whole controlled by the inclination.

Due to special design of the rotors and the position of these ones, the great advantage is achieved that the debarking is made along the wood and not in its transverse direction. Due to that fact the debarking becomes lenient to the wood.

The invention is of course not limited to the mentioned and shown embodiment but can be modified within the scope of the following claims.

Claims

1. A method for working wood like pulp wood, sawtimber or similar elongated wood parts, a working machine being at hand, which comprises a trough designed like a tunnel, which trough has a feeding in end and a feeding out end for the wood and in which are arranged a plurality of rotors, provided with means on its jacket surface, the purpose of which is to debark the wood at least partially, c h a r a c t e r i z e d by the combination of the following steps:

- The wood during the working is taken by the rotors (6) from a portion of the trough (2) on a first level to a side-displaced portion of the trough on a second, higher level, wherefrom the wood falls down to the lower level, whereby tumbling of the wood is brought about at the same time as a further working of the wood can be made;

- The wood during the working is taken by the rotors from the feeding in end (3) of the trough (2) to its feeding out end (4).

2. A method according to claim 1, c h a r a c t e r i z e d in that the position of the trough (2) in the machine can be changed in such way that the angle between the longitudinal axis of the rotors (6) and a transverse horizontal line through the machine becomes adjustable, whereby working of wood, which is hard to work as well as easy to work, is made possible.

3. A machine for working wood like pulp wood, saw timber or similar elongated wood parts, the machine comprising a trough designed like a tunnel, which trough has a feeding in end and a feeding out end for the wood, and in which are arranged a plurality of rotors provided with means on its jacket surface, the purpose of which is to debark the wood at least partially, c h a r a c t e r i z e d by the combination of the following features:

- The rotors (6) have such a position that their longitudinal direction forms an angle with a transverse horizontal line through the machine and are designed with helical threads (13) on its jacket surface, which are arranged in such a way that during the rotation of the rotors (6), the wood can partly be taken from a portion of the trough on the first level to another, side-displaced portion on a second, higher level, wherefrom the wood falls down to the lower level, whereby tumbling of the wood is brought about at the same time as a further working of the wood can be

made, partly be taken in the direction towards the feeding out end (4) of the trough (6);

- The rotors (6) are arranged in that way that the angle between the longitudinal axis of the rotors (6) and the longitudinal direction of the trough (2) is less than 90°, whereby the wood falls down between the threads (13) and is made a movement obliquely upwards and forwards in a more effective way.

4. A machine according to claim 3, c h a r a c t e r i z e d in that the trough (2) is designed in that way that it is steplessly pivotable about a shaft (11), which is parallel with the longitudinal direction of the trough, which means that the trough can take different angle positions in relation to a transverse horizontal line through the machine, and which also means that the angle between the longitudinal direction of the rotors (6) and the transverse horizontal line through the machine can be steplessly changed, whereby the flow of wood through the machine can be steplessly controlled.

5. A machine according to claim 3 or 4, c h a r a c t e r i z e d in that it is designed in that way that the longitudinal centre line through the trough (2) from the feeding in end (3) to its feeding out end (4) is inclined upwards, whereby the transport of wood through the trough (2) is made on an upward slope.

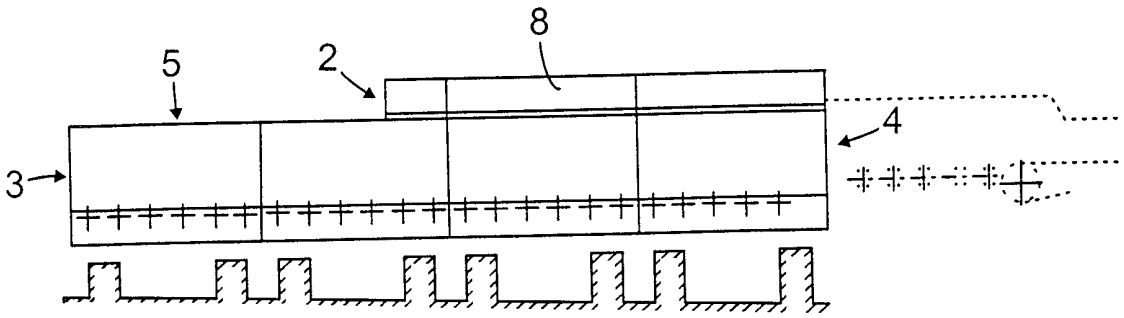

FIG.1A

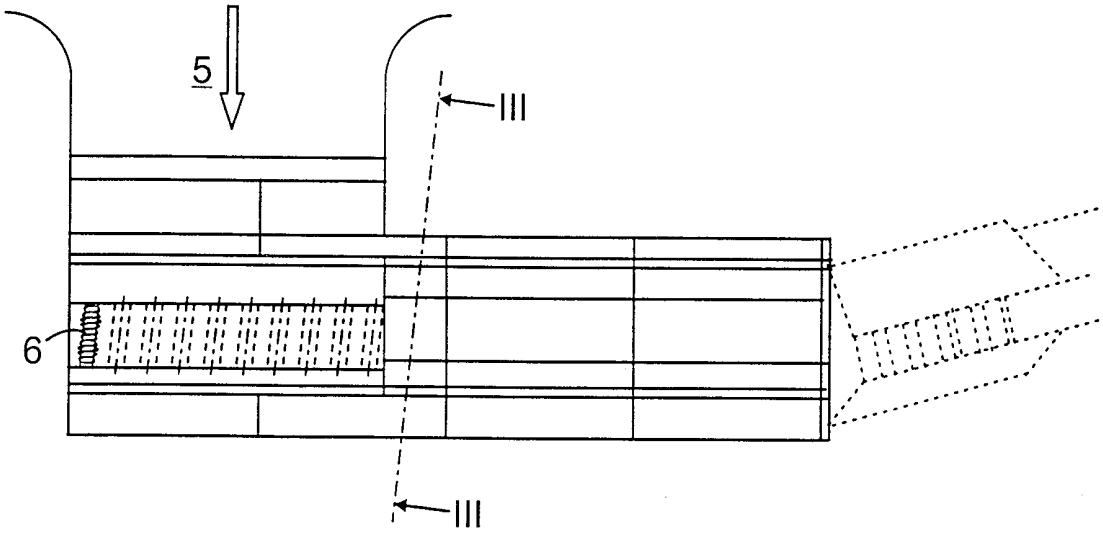

FIG.1B

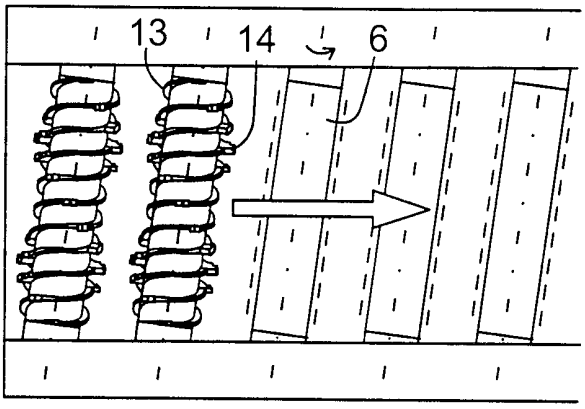

FIG. 2

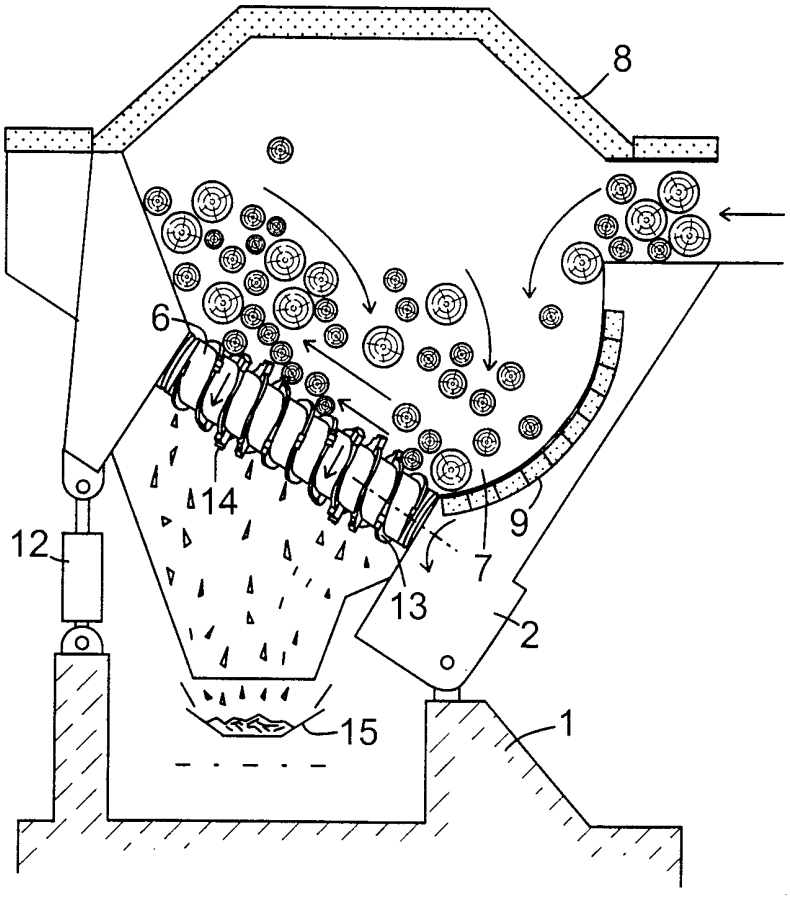

FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 99/00412

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B27L 1/02
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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B27L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	SE 144422 A (T.O. HILLBOM), 30 December 1953 (30.12.53), column 1, line 22 - column 2, line 3; column 3, line 35 - line 53, figures 1,2	1,3
Y	--	2,4,5
Y	Derwent's abstract, No K-3693 E/31, week K31, ABSTRACT OF SU, 870142 (FOREST POWER MECHN INST), 7 October 1981 (07.10.81)	2,4
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SE 89542 A (A.G. JOHANSSON ET AL), 22 June 1937 (22.06.37) --	1-5
A	US 4180109 A (HEIKKINEN), 25 December 1979 (25.12.79) --	1-5
A	US 5063981 A (JONKKA), 12 November 1991 (12.11.91) --	1-5
A	US 5630453 A (ISHIZAWA), 20 May 1997 (20.05.97) --	1-5
A	Derwent's abstract, No L-8014 B/51, week L51, ABSTRACT OF SE, 655528 (FOREST POWER MECHN INST), 8 April 1979 (08.04.79) --	1-5

INTERNATIONAL SEARCH REPORT

Information on patent family members

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International application No.
PCT/SE 99/00412

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
SE 144422 A	30/12/53	NONE	
US 4685498 A	11/08/87	CA 1225309 A	11/08/87
		JP 1742353 C	15/03/93
		JP 4020761 B	06/04/92
		JP 60165203 A	28/08/85
		JP 1624998 C	18/11/91
		JP 60165204 A	28/08/85
		JP 63000205 B	06/01/88
		DE 3524837 A	20/02/86
		FI 852752 A	13/01/86
		JP 1766402 C	11/06/93
		JP 4036048 B	15/06/92
		JP 61024407 A	03/02/86
		SE 459565 B,C	17/07/89
		SE 8503440 A	13/01/86
		JP 61040105 A	26/02/86
		JP 61086203 A	01/05/86
SE 89542 A	22/06/37	NONE	
US 4180109 A	25/12/79	FI 56135 B,C	00/00/00
		FI 762899 A	12/04/78
		JP 53081349 A	18/07/78
		PT 65807 B	12/05/78
US 5063981 A	12/11/91	AT 123390 A	15/04/94
		AT 398399 B	25/11/94
		CA 2018414 A	03/01/91
		FI 83181 B,C	28/02/91
		FI 893230 A	04/01/91
		FI 894387 A	04/01/91
		FI 901423 D	00/00/00
		FR 2649636 A	18/01/91
		SE 504274 C	23/12/96
		SE 9002193 A	04/01/91
		AT 182690 A	15/02/96
		AT 401493 B	25/09/96
		CA 2024334 A	19/03/91
		FI 83609 B,C	30/04/91
		FI 894708 D	00/00/00
		FR 2652033 A,B	22/03/91
		SE 507411 C	25/05/98
		SE 9002888 A	19/03/91
		US 5134929 A	04/08/92
US 5630453 A	20/05/97	AU 699977 B	17/12/98
		AU 6568396 A	27/11/97
		BR 9604616 A	23/06/98
		CA 2182831 A	25/11/97
		CN 1166397 A	03/12/97
		EP 0808699 A	26/11/97
		JP 10052805 A	24/02/98
		NZ 299419 A	26/02/98