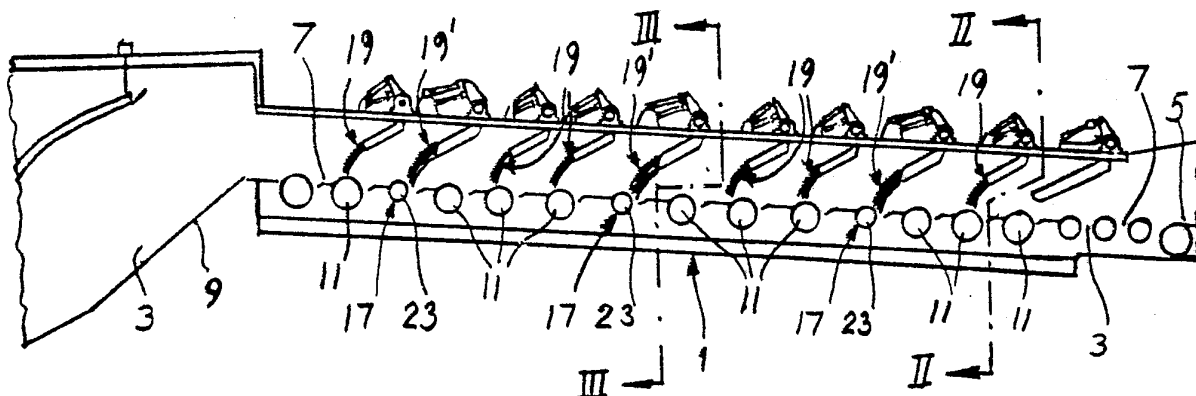




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(54) Title: AN APPARATUS FOR PRETREATING LOGS BY IMPACTS



(57) Abstract

Logs which are difficult to bark can be pretreated by impacts in order to reduce the bond of the bark to the wood prior to a frictional debarking of the logs. In order to avoid the strength problems which arise at the journalling points of beaters journally mounted on a rotor the invention instead uses rotors (11) having preferably block-shaped teeth (13) attached along helical lines to the surface (21) of the rotor (11). The rotors (11) are included in a roller conveyor (7) and are rotated at a peripheral speed of 20-30 m/s which is also 20-30 times greater than the feeding speed of logs through the pretreating apparatus. In order to reduce the speed there are included in the roller conveyor (7) braking rotors (23), such as spiked rollers, and flexible means (19, 19') comprising rubber flaps (27, 27') which press the logs down to the rotors (11 and 23).

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An apparatus for pretreating logs by impacts

3 The present invention relates to an apparatus for pretreating logs
by impacts in order to facilitate subsequent frictional debarking
of the logs, comprising means defining a transport path for trans-
5 porting the logs substantially in their longitudinal direction and
including a plurality of rotors extending substantially transverse
to the longitudinal direction of the transport path, each rotor
comprising a plurality of rotor members mounted to impact against
the bark during the pretreatment, drive means to rotate said ro-
tors at a predetermined speed, and feeding means arranged to feed
10 the logs at a predetermined speed.

Such an apparatus is described in SE B 444,654 and comprises means
defining a transport path for transporting logs substantially in
their longitudinal direction, at least one rotor extending sub-
stantially transverse to the longitudinal direction of the trans-
15 port path and having a plurality of rotor members designed to come
into contact with the bark during the pretreatment, and drive
means to rotate said rotors at a speed within a specific speed
range. The rotor comprises a rotor shaft and said rotor members
comprise a plurality of rigid beaters which are hinged to the ro-
20 tor shaft. As the shaft rotates the beaters assume operating posi-
tions located in a rotary plane substantially parallel to the lon-
gitudinal direction of the transport path, and also impact against
the bark during rotation. The rigid beaters are of such a weight
that within said speed range they impact against the bark to an
25 extent and with a force sufficient to reduce the adhesion of the
bark to the wood by means of fatigue and/or mechanically induced
moisture transport from the inner bark to a meristemic layer lo-
cated between the bark and the wood and holding them together.
This arrangement has proved capable of achieving the desired re-
30 sult, but it is difficult to ensure that the hinged attachment of
the beaters to the rotor shaft is sufficiently strong.

SE 8406632-3 relates to a debarking apparatus having transport

rollers which are distributed in an upper row of spiked rollers and a lower row of smooth rollers. The spiked rollers rotate at a higher speed than the smooth rollers so that they throw the bark removed onto the lower smooth rollers. Since the smooth rollers
5 have a lower speed they do not throw the bark further away but instead they catch the bark and let it drop onto a lower conveyor belt. Since the smooth rollers are arranged in a lower level with respect to the spiked rollers and have a smooth surface they do not have any effect on the feeding of the logs. The feeding of the
10 logs are determined of the spiked rollers and there is nothing to prevent the feeding of the logs. This apparatus is therefore not useful for controlable pretreating logs by impacts in order to facilitate subsequent frictional debarking of the logs.

The object of the present invention is to provide a pretreating
15 apparatus operating in a controlable manner by means of impacts, which is capable of giving the desired result of treatment without any strength problem being arisen.

According to the invention, this object is achieved in that feeding means are arranged to feed the logs at said predetermined
20 speed substantially without influence of the peripheral speed of the impacting rotor members; that flexible means are arranged to yieldingly press the logs against the feeding means in order to provide more effective feeding engagement and also against the rotors in order to prevent any essential reduction in impact action
25 due to the impacts tending to force the logs away from the rotors; that the impacting rotor members consist of wear-resistant teeth attached to the surface of the rotor along a helical line or lines, causing the logs to rotate about its longitudinal axis; that the peripheral speed of the teeth is at least seven, preferably
30 about twenty to thirty times greater than said predetermined feeding speed; and that the radial height of the teeth is adapted to a selected peripheral speed of the teeth, said predetermined feeding speed, the pressure exerted by the flexible means and to the dryness of the logs so that the teeth impact against the bark

in an extent which is sufficient to reduce its bond to the wood by fatigue and/or mechanically induced moisture transport from the inner bark to a meristemic layer located between the bark and the wood and holding them together.

5 Replacing the rotor provided with hinged beaters by a rotor provided with wear-resistant teeth attached to the surface of the rotor solves said strength problem and reduces also the cost of the rotor. A further reduction in costs is achieved in that the impacting rotor need not be movably suspended above the transport
10 path of the logs to adapt to various thicknesses of logs. Instead it may be arranged stationary such as a support roller in the transport path, flexible means, such as rubber flaps, being arranged to yieldingly press the logs against the impacting rotor.

15 Other features of the pretreating apparatus according to the invention will be apparent below as the invention is described further with reference to the accompanying drawings.

Figure 1 is a schematic view from the side of a proposed embodiment of the new pretreating apparatus according to the invention.

20 Figures 2 and 3 are cross-sectional views along the lines II-II and III-III, respectively, in Figure 1.

Figure 4 is a front view of one end of an impacting rotor forming a part of the new pretreating apparatus.

Figure 5 is an end view of the impacting rotor.

25 Figures 6 and 7 are side views of flexible means included in the pretreating apparatus mounted to yieldingly press the logs against feeding means such as a braking rotor, and against the impacting rotor.

The apparatus shown in the drawings, for facilitating subsequent

frictional debarking of logs by pretreating them by means of impact, comprises means 1 which define a transport path for transporting the logs, not shown, substantially in its longitudinal direction. As in the embodiment shown, the means 1 may comprise a plurality of different conveyors, such as a chain or belt conveyor 5, the rollers in a roller conveyor 7 and a channel 9, through which the logs after being pretreated in the apparatus slides into a barking drum, not shown. The apparatus also comprises a plurality of rotors 11 forming a part of the roller conveyor 7 and extending substantially transverse to the longitudinal direction of the transporting path 3, each rotor comprising a plurality of rotor members 13 designed to impact against the bark during the pretreatment, and drive means 15 (Figure 2) to rotate said rotors 11 at a predetermined speed. In the preferred embodiment shown, there are ten rotors 11 arranged in groups of three rotors following each other and a single rotor 11 at the end of the pretreating path. All rotors 11 are built into the roller conveyor 7 so that the logs pass the rotors 11, supported thereby, during treatment of the bark by the rotor members 13.

According to the invention feeding means 17 are arranged to feed the logs at a predetermined speed, substantially irrespective, i.e. without influence of the peripheral speed of the impacting rotor member 13. Flexible means 19 are arranged to yieldingly press the logs against the feeding means 17 to provide more reliable and effective feeding engagement and against the rotors 11 thus preventing any great reduction in the action of impacts as a result of the impacts otherwise tending to force the logs away from the rotors 11. Furthermore, the impacting rotor members consist of wear-resistant teeth 13 attached to the surface 21 of the rotor 11 along at least one helical line, causing the logs to rotate about its longitudinal axis. The peripheral speed of the teeth 13 is at least seven, preferably about twenty to thirty times greater than the predetermined feeding speed, and the radial height of the teeth 13 is adjusted to the peripheral speed of the teeth 13, the predetermined feeding speed, the pressure from the

flexible means 19 and to the dryness of the logs so that the teeth 13 impact sufficiently hard against the bark to reduce its bond to the wood in known manner by fatigue and/or mechanically induced moisture transport from the inner bark to a meristemic layer located between the bark and the wood and holding them together.

In the preferred embodiment shown there are three sets of feeding means 17, each comprising a braking rotor 23 located transversely to the direction of feed of the logs, and means 25 given the rotor 23 a peripheral speed substantially corresponding to the predetermined speed of feed. Suitably, the braking rotor 23 consists of a spiked roller of conventional design. The spiked roller is built into the roller conveyor 7 in such a manner that the logs are carried by the spiked roller. Suitably, each spiked roller is preceded by three impacting rotors 11 and followed by at least one impacting rotor 11. The roller conveyor 7 comprising the impacting rotors 11 and the braking spiked rollers 23 is inclined upwardly in the direction of feeding. As shown in Figure 1 the braking spiked rollers 23 have a smaller diameter than the impacting rotors 11. The inclination and the diameters are adapted with respect to each other so that a rotor 11 and a roller 23 adjacent each other at their lower points tangentially contact an imaginary, substantially horizontal plane.

As shown in Figures 6 and 7 the flexible means 19 are used in two variants in the preferred embodiment. That according to Figure 6 is used with the braking spiked roller 23 and that according to Figure 7 with the impacting rotors 11. The two variants are similar in principle and the same designations have therefore been used in both figures, but with the addition of a prim sign in Figure 7. The flexible means 19 and 19' both comprise trailing, suspended flaps 27, and 27', respectively, of a cloth or sheet of wear-resistant rubber several centimeters in thickness. The flap 27 in Figure 6 consists of four layers of rubber sheeting five centimeters thick, giving a total thickness of twenty centimeters,

whereas the flap 27' in Figure 7 consists of only two layers of the same sheeting.

5 The rubber flaps 27 and 27' are carried by support means 29 and 29', respectively, arranged to permit lifting of the flaps from a normal working position. The support means 29 and 29' are in the form of hinged hatches. When the flaps 27 and 27' are in their normal operating position, the hatches 29 and 29' extend obliquely downwards and backwards. With the aid of a hydraulic cylinder 31, 31', or similar means, the hatches can be pivoted about their upper edge to substantially horizontal position as indicated by the dash dotted lines in Figures 6 and 7. The rubber flaps 27 and 27' are then lifted up from contact with the logs being pretreated. The spiked rollers 23 are then unable to retard the logs which, impacted by the rotors 11, will be accelerated and rapidly fed out from the pretreating apparatus. When the apparatus is empty and the pressure in the hydraulic cylinders 31 and 31' is lowered, the hatch 29, 29' will be returned by its own weight to its operating position. A rubber buffer 33, 33', provides a gentle stop when the hatch returns to its operating position.

20 In order to increase the capacity of the pretreating apparatus it is made sufficiently wide to permit a plurality of logs to be pretreated simultaneously, side by side. In this case it is suitable for the rubber flaps 27 and 27' to be cut as shown in Figures 2 and 3, to provide several substantially individually flexible flap portions.

25 Figures 4 and 5 show that the teeth 13 attached on the surface 21 of the rotor 11 are suitably substantially block-shaped. They consist of tempered boron steel or other suitable material with high wear-resistance. They may have a height of approximately 25 mm, length 50-60 mm and thickness about 20 mm, for instance. The blocks 13 are shown attached to the surface 21 along two substantially diametrically opposed helical lines with a pitch of about 0.25 m/turn. The distance between the blocks 13 along the helical

line is somewhat greater than twice the length of the block, and seen in axial direction along the rotor 11 the blocks along one helical line are located in the spaces between the blocks along the other helical line. There may be, for instance, twelve blocks 13 along each turn of the helical line, and all blocks with the exception of those located nearest the ends of the rotor 11 are secured to the rotor surface 21 in such a manner that the longitudinal axis of the block forms an angle of between 15 and 45 degrees, preferably about 30 degrees, with respect to a radial plane to the rotor 11. This ensures that the logs are turned about their longitudinal axes.

The speed of the rotor 11 is preferably such that the blocks 13 have a peripheral speed of 20-30 m/s. A relatively low peripheral speed gives the logs time to fall down closer to the rotor surface 21 before being lifted again by the next block 13, thus giving greatly increased feeding effect which places greater demands on the braking motor 23. A suitable feeding speed is about 1 m/s up to about 1.5 m/s.

After some time in operation, when the front edge of the blocks 13 has become so worn that it is difficult to achieve the desired effect, the rotors 11 can be removed from the pretreating apparatus, turned axially and re-inserted in order to rotate in the opposite direction so that the previous rear edge of the blocks now will become the front edge. In this way the service life of the rotors is doubled.

C L A I M S

1. An apparatus for pretreating logs by impacts in order to facilitate subsequent frictional debarking of the logs, comprising means (1) defining a transport path (3) for transporting the logs substantially in their longitudinal direction and including a plurality of rotors (11) extending substantially transverse to the longitudinal direction of the transport path (3), each rotor (11) comprising a plurality of rotor members (13) mounted to impact against the bark during the pretreatment, drive means (15) to rotate said rotors (11) at a predetermined speed, and feeding means (17) arranged to feed the logs at a predetermined speed, characterized in that feeding means (17) are arranged to feed the logs at said predetermined speed substantially without influence of the peripheral speed of the impacting rotor members (13); that flexible means (19) are arranged to yieldingly press the logs against the feeding means (17) in order to provide more effective feeding engagement and also against the rotors (11) in order to prevent any essential reduction in impact action due to the impacts tending to force the logs away from the rotors (11); that the impacting rotor members (13) consist of wear-resistant teeth (13) attached to the surface (21) of the rotor (11) along a helical line or lines, causing the logs to rotate about its longitudinal axis; that the peripheral speed of the teeth (13) is at least seven, preferably about twenty to thirty times greater than said predetermined feeding speed; and that the radial height of the teeth (13) is adapted to a selected peripheral speed of the teeth (13), said predetermined feeding speed, the pressure exerted by the flexible means (19) and to the dryness of the logs so that the teeth (13) impact against the bark in an extent which is sufficient to reduce its bond to the wood by fatigue and/or mechanically induced moisture transport from the inner bark to a meristemic layer located between the bark and the wood and holding them together.

2. An apparatus according to claim 1, c h a r a c t e r -
i s e d in that the teeth (13) are substantially block-shaped.
3. An apparatus according to claim 1 or 2, c h a r a c t e r -
i s e d in that the feeding means (17) comprise at least one
5 braking rotor (23) extending transversely in relation to the di-
rection of feed, and means (25) giving the braking rotor a periph-
eral speed substantially corresponding to said predetermined feed-
ing speed.
4. An apparatus according to claim 3, c h a r a c t e r -
10 i s e d in that the braking rotor consists of a spiked roller
(23).
5. An apparatus according to claim 3 or 4, c h a r a c t e r -
i s e d in that the rotors (11) provided with teeth and the brak-
ing rotor (23) contact tangentially at their lower points an imag-
15 inary, substantially horizontal plane.
6. An apparatus according to any of claims 3-5, c h a r a c -
t e r i s e d in that it comprises at least one rotor group in
which several of said rotors (11) provided with teeth are located
before and at least one rotor (11) provided with teeth after the
20 braking rotor (23).
7. An apparatus according to any of claims 1-6, c h a r a c -
t e r i s e d in that the flexible means (19, 19') comprise
trailing, suspended flaps (27, 27') of a sheet or cloth of wear-
-resistant rubber several centimeters in thickness.
8. An apparatus according to claim 7, c h a r a c t e r -
25 i s e d in that the rubber flaps consist of several layers of
said sheet, giving a total thickness of approximately 0.1 m at the
rotors (11) provided with teeth and twice that thickness at said
feeding means (17).

9. An apparatus according to any of claims 1-8, c h a r a c -
t e r i s e d in that it is sufficiently wide to permit a plural-
ity of logs to be pretreated simultaneously, side by side.

5 10. An apparatus according to claims 8 and 9, c h a r a c -
t e r i s e d in that the rubber flaps (27, 27') are cut to pro-
vide a plurality of substantially individually flexible flap por-
tions.

10 11. An apparatus according to claim 8 or 10, c h a r a c -
t e r i s e d in that the rubber flaps (27, 27') are carried by
support means (29, 29') arranged to permit lifting of the flaps
(27, 27') from a normal operating position.

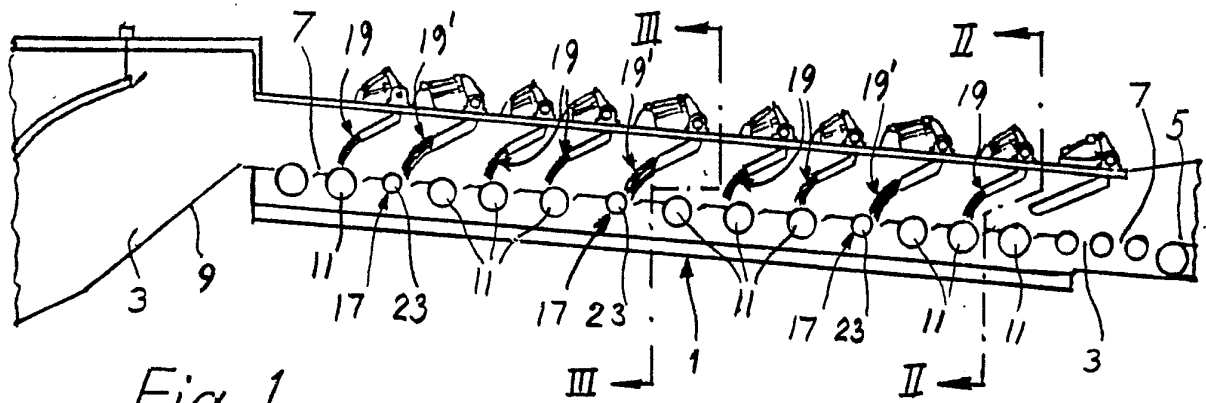


Fig. 1

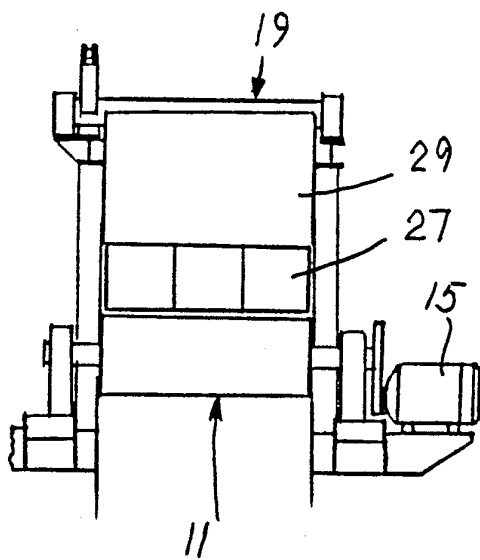


Fig. 2

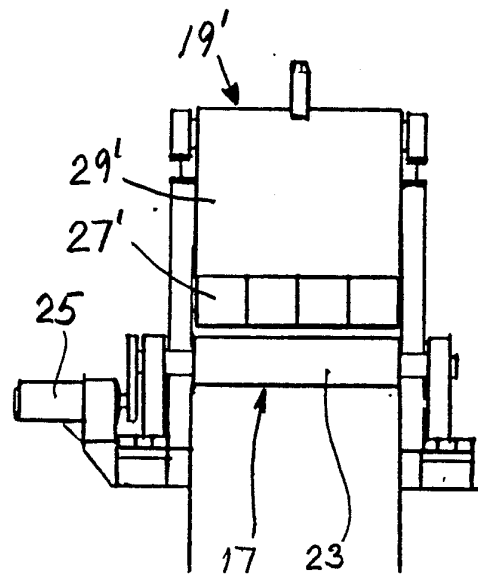


Fig. 3

Fig. 4

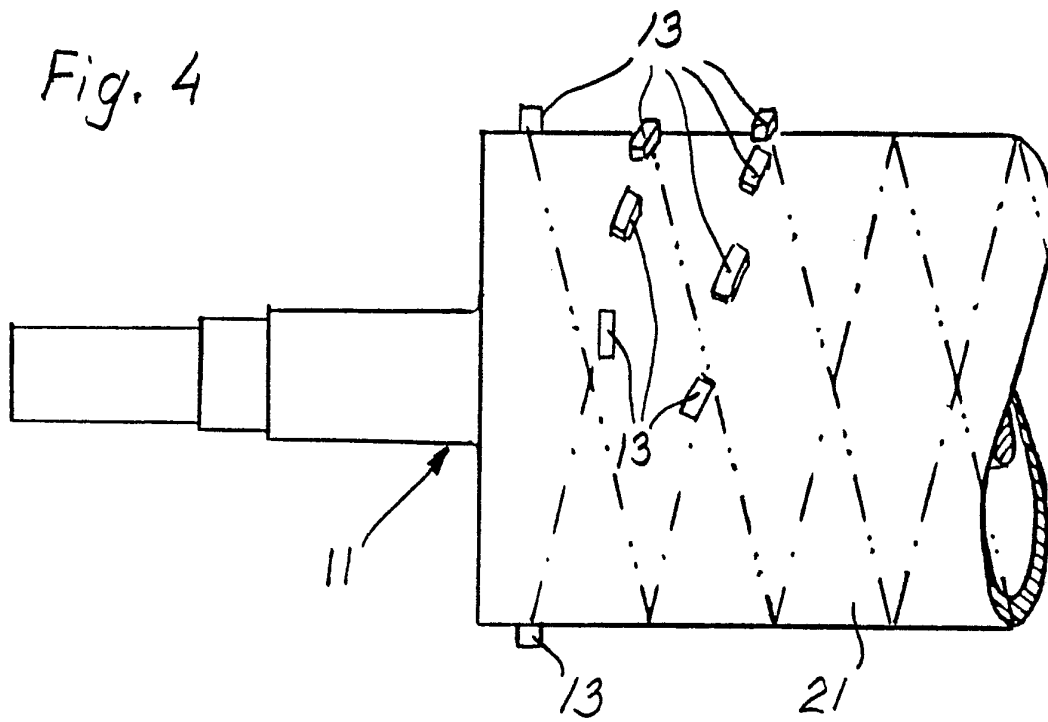


Fig. 5

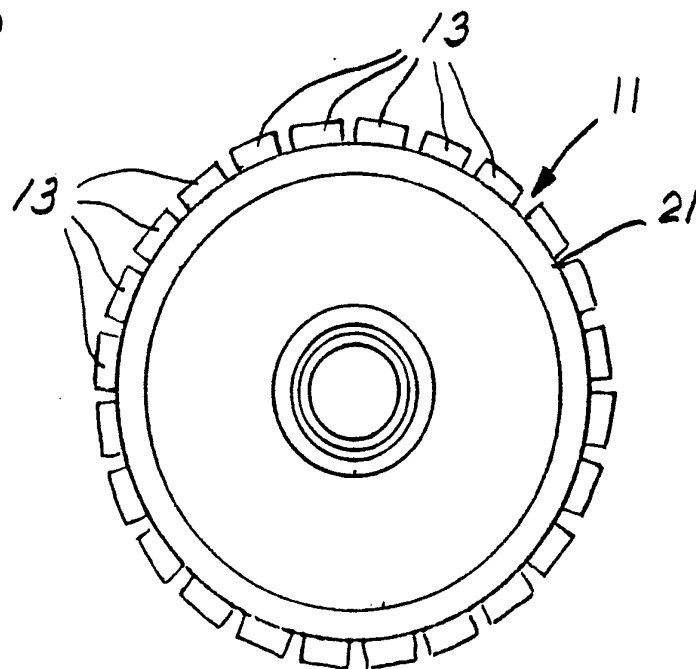


Fig. 6

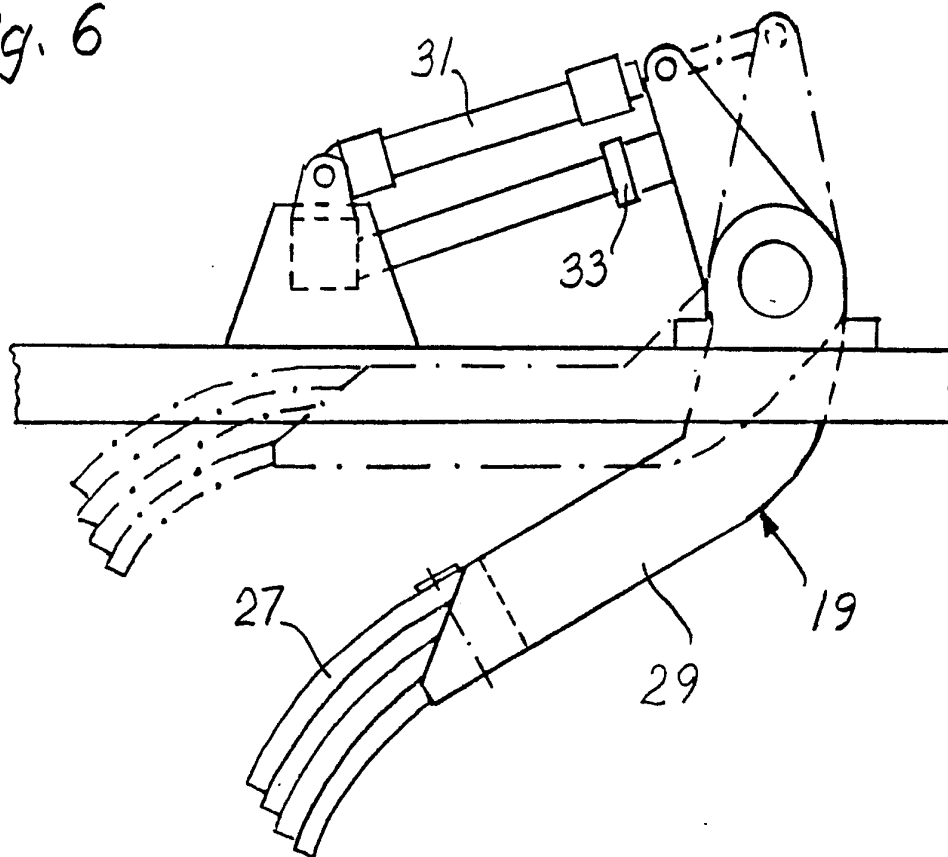
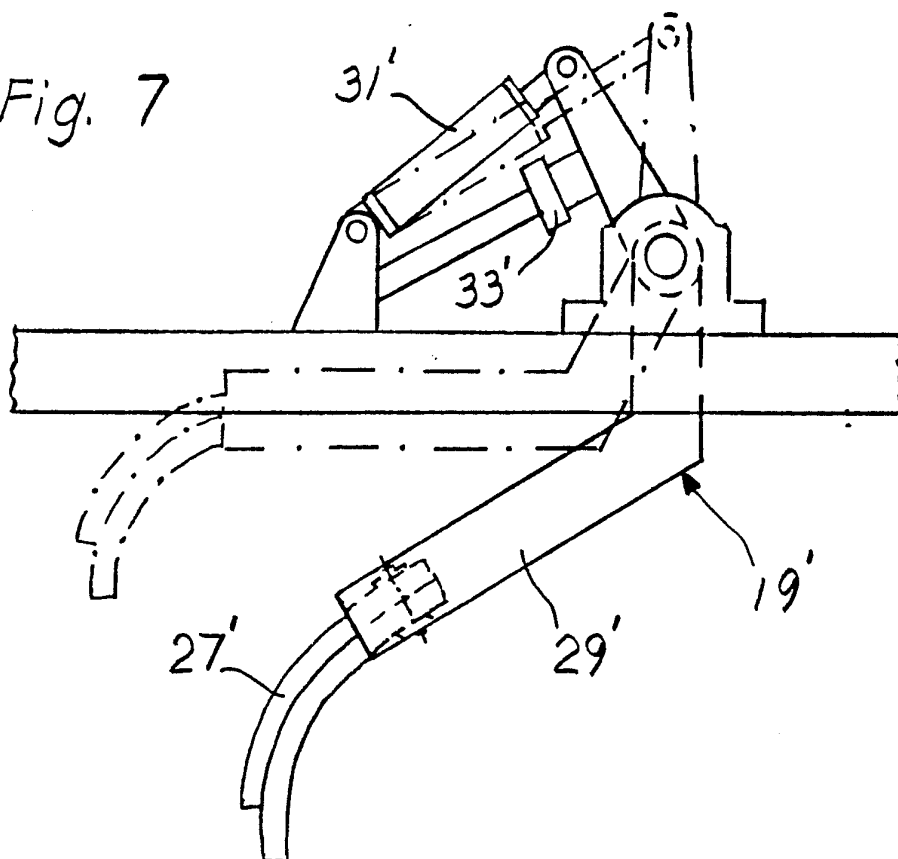


Fig. 7



INTERNATIONAL SEARCH REPORT

PCT75E87/00244

International Application No

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC B 27 L 1/00 4		
II. FIELDS SEARCHED		
Minimum Documentation Searched 7		
Classification System	Classification Symbols	
IPC 4 US C1	B 27 L 1/00 <u>144</u> :2, 3, 335-343	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched 8		
SE, NO, DK, FI classes as above		
III. DOCUMENTS CONSIDERED TO BE RELEVANT 9		
Category 9	Citation of Document, 11 with indication, where appropriate, of the relevant passages 12	Relevant to Claim No. 13
X	SE, A, 8406632-3 (KONE OY) 31 June 1985	1-11
Y	SE, B, 444 654 (KMW AB) 28 April 1986	1-11
Y	SE, B, 324 991 (SANDVIKENS JERNVERKS AB) 15 June 1970	1-11
A	SE, C, 147 444 (BERGGREN E.A.) 26 October 1954	1-11
Y	FI, B, 56 135 (KONE OY) 12 April 1978	1-11
Y	US, A, 2 876 812 (C.D. WALDRON) 10 March 1959	1, 7
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IV. CERTIFICATION		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
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International Searching Authority		Signature of Authorized Officer
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