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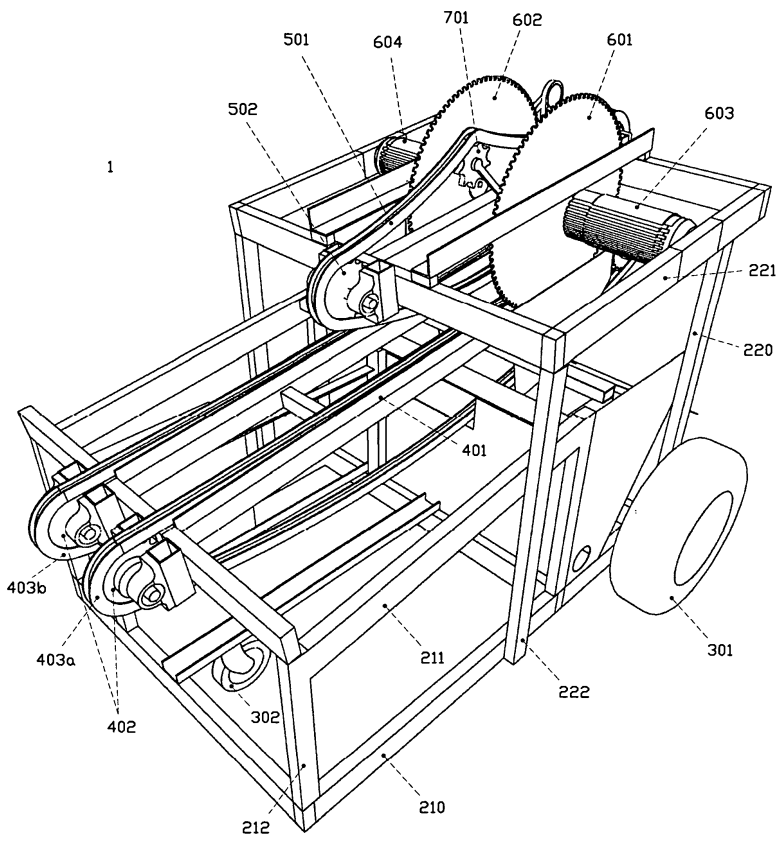
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(54) **A sawing device for firewood trunks**

(57) A sawing device(1) for sawing automatically irregular shaped firewood trunks in almost equally sized trunks, consisting of a frame(2) with sawing blades (601,602), first toothed chain transporting means(4) and second toothed chain transporting means(5), extending above said first transporting means(4) and provided with pressing means(7) in order to guide firewood trunks through said sawing blades(601,602).

fig.2



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Description

Field of the invention

[0001] This invention concerns a device for sawing automatically wood trunks in such a way that they will be cut in almost equally sized firewood by continuous feeding said trunks, moving transversally on a conveying device to sawing blades.
More particularly this invention describes a device that enables to saw continuously irregular shaped firewood trunks by a manual or automatic feeding and to position said firewood trunks on a conveying device in such a way that said trunks will be pressed down in order to saw them in almost equally sized firewood trunks.

Background of the invention

[0002] Mainly for heating domestic spaces, non renewal energy sources, fossil fuels, like petroleum, gas or cokes will be used. Besides these, electricity, that can be generated by combustion of cokes or by nuclear energy is another source.
Currently, the use of renewal energy sources, like solar energy for heating circulating water is growing, but is still limited.
The price of said fossil fuels is strongly dependent of a fluctuating energy market, which makes the energy usage enormously dependent of the price, knowing that said fossil fuels are exhausting.
[0003] On the other hand, the capacity of renewal energy sources is still insufficient profitable to introduce them universally.
Many consumers in domestic environments using a supplementary energy source, besides said traditional energy generation means. The use of a small heating stove or an open fireplace with firewood or pellets is very popular. On one hand it offers temporarily the opportunity to change to burn firewood as a single or an additional heating source to bridge cold peaks and on the other hand it can serve as sociable domestic heating source.
[0004] Sawing firewood is a relatively labour intensive and time consuming activity. The cleaved wood trunks are delivered with a length of approximately 1,20 m and need to be sawed to a length of about 30 cm.
The consumer can choose to saw the trunks on size himself or order them already sawed. In the former case, the consumer will use an axe or a chain saw to cut the trunks on size. In the latter case, the supplier will saw the trunks on size. The supplier needs to size said trunks as many as possible in the shortest time.
[0005] Sawing devices to saw automatically firewood, are generally known in the state of the art.
A few problems arise herewith. There is a difference between sawing devices whereby the consumer needs to saw the trunks one-by-one himself by placing them on a conveying device or by feeding multiple trunks simultaneously in order to saw them automatically.
[0006] EP1992461 describes such a device of the first type, whereby safety risks have to be considered for inserting and sawing the trunks. The user inserts the wood trunks one by one into the sawing apparatus, provided with a safety hood in order to prevent that his hands could touch the sawing blade during operation.
[0007] DE1225840 describes an automatic sawing device, that enables to saw multiple wood trunks, fed by a conveying belt with separating means in order to saw said trunks by multiple sawing means, provided on different distances between the conveying belts.
[0008] This invention concerns an automatic sawing device, solving a few problems.
The first problem concerns the speed of feeding and the number of wood trunks that will conveyed simultaneously to the sawing means.
Sawing said trunks in equally sized firewood serves another problem. When the trunks are badly positioned on the conveying device, it increases the risk of sawing said trunks in irregular sized firewood with loss as result.
Another important problem concerns the irregular shape of the firewood trunks during continuous feeding nearby the sawing blades. Said sawing device could be blocked or sawn unequally due to sliding or tilting wood trunks.
Finally, the sawing device needs to be compact and mobile in order to install it on the preferred location.
[0009] It is known in the prior art to use gripping means, like in EP515333 wherein a rotating drum is provided with gripping arms with cutting teeth, in order to guide the trunks through the cutting blades. Such arms are already known for clamping wood blocks in EP400530. US4277999 uses pushing bodies, provided on a conveying chain, in order to guide wood blocks through a rotating sawing blade.
In EP956932, V-shaped bodies with teeth on their inner side, are used to convey wood blocks.
Wood blocks are pushed against half open bodies for conveying them on an inclined conveying belt according to EP418174.
The foregoing devices use additional pushing bodies, mounted on the conveying device, in order to convey and position the wood blocks. Consequently the number of wood blocks on the conveying device is limited due to the number and the fixed distance of said pushing bodies.
[0010] Still, in other automatic sawing devices wood blocks will be lined against a plate, like in US4507998. This device is further provided with a steel band between the sawing blades in order to push down the wood blocks.
Lateral guiding means for wood blocks are known from DE102004049699.
US4501178 describes inclined conveying chains interacting with the sawing blade, which enables to push the sawed blocks from said sawing blade in order to prevent further contact with the sawing teeth.
The foregoing devices concern positioning means for the wood blocks, interacting with the sawing blade.
[0011] EP1674221 has a pair of transporting means for conveying planks through a sawing blade, consisting

of upper and lower transporting means, driven by separated motors and wherein the transporting means are provided with a friction liner. It saws flat planks and both transporting means are driven by separated motors.

[0012] US1561476 concerns a device for transporting wooden planks through a gang of rotary saws. It comprises a flexible belt, consisting of wooden slats and friction strips. Said belt is pressed above the wooden planks by a series of spaced roller weights or bearing rollers.
US2117641 describes a device for holding boards or strips pressed to be delivered to cutting blades. It concerns a flexible belt made of rubber.
FR920772 illustrates a device for holding wooden blocks during cutting on a transport belt. It uses sacks, filled with sand or plumb granules to press said flexible belt against the wooden blocks.
The foregoing documents describe holding devices for sawing regular wooden planks or blocks, but not for irregular shaped firewood trunks.
These documents alone or combined do not teach us to solve the problem for positioning irregular shaped firewood trunks through cutting blades by a chain belt with teeth, that will be pressed against said trunks by using adjustable pressing rods in order to regulate said pressure.
Moreover, our invention uses just a single motor to drive the upper and lower transporting belts.

Summary of the invention

[0013] This invention concerns an automatic sawing device for sawing irregular shaped trunks of firewood, provided with first transporting means, transporting continuously firewood trunks transversally according to at least two sawing blades and second transporting means with pressing means, provided above said first transporting means in front and through the sawing blades in order to grip and guide the wood trunks through the sawing means, targeted to cut equally sized firewood trunks.
This sawing device uses toothed transporting chains for transporting said trunks through the sawing device. Transporting and conveying means in this invention are considered as the same and will be used arbitrary.

[0014] This invention is **characterised in that** the upper and lower transporting means guide the trunks through the sawing device, in order to position the trunks and saw them in equally sized firewood, independent of their shape.
The pressing means, provided in the upper transporting means, serve to press continuously on the trunks. Consequently, this has the advantage that the trunks do not need to be put straight transversally on the lower transporting means.
This invention is further characterised by using a single motor for driving both transporting means.
This device enables to feed continuously, manually or automatically trunks, without blocking the device due to sliding or tilting. The trunks do not need to be positioned on a fixed distance on said lower transporting means.
This sawing device is compact, which serves to install it in a small space and easy to displace to another location.
A supplementary conveying belt can be added to the lower transporting means for feeding automatically the trunks to the transporting means.

Brief description of the drawings

[0015] This invention will be described more in detail with the adjoined drawings.

Figure 1 : side view of the sawing device
Figure 2 : side upper view of the sawing device
Figure 3 : side back view of the sawing device
Figure 4 : side view with upper transporting means

Description of the preferred embodiments of the invention

[0016] According to figure 1, the sawing device(1) consists of a frame(2), additionally provided with wheels(3), first transporting means(4) for conveying trunks to sawing means(6) and in front of said sawing means(6), second transporting means(5) above the trunks, provided with pressing means(7) in order to convey and position the trunks through the sawing means(6).
Said sawing device(1) is provided with control means(8) for driving the motors. Control means(8) serves to activate and stop said motors of the sawing means(6) as well as for the transporting means(4,5).
First(4) and second transporting means(5) are driven by a single motor(1101), like illustrated on figure 3, supported by a transmission(11). The sawed firewood will be separated by an inclined guiding plate(9) after sawing.
Figure 1 further illustrates a sawing device(1) provided with a cavity(10) for collecting sawdust and wood fibres with the option to attach a suction device. Said cavity(10) could be a rigid container or a flexible bag.

[0017] The frame(2), according to figure 2, consists of an under frame(210) to mount first transporting means (4), composed of horizontal(211) and vertical(212) beams and an upper frame(220) with horizontal(221) and vertical(222) beams to mount a second transporting means(5) with at least two sawing means(601,602). The upper frame(220) is mounted above the lower frame (210).

[0018] Sawing means(601,602) consist of, regarding a first embodiment, toothed circular sawing blades, according to the figures. Said sawing blades(601,602) are driven by motors(603,604), mounted on frame(221). According to this embodiment, at least two sawing blades (601,602) are provided, but dependent of the length of the trunks, a third sawing blade could be applied, not shown on the figures. Sawing means(6) could be alternatively a wire saw or a chain saw, not shown on the figures.
According to figure 2, sawing means(601,602) are

mounted on the upper frame(220). Alternatively, said sawing means(601,602) could be mounted on the lower frame(210) between transporting chains(403a,403b). The motors(603,604) for driving said sawing means (601,602) could also be mounted on the lower frame (210).

[0019] First transporting means(4) consist of two transporting chains(403a,403b) for conveying wood trunks transversally to the sawing means(6). Transporting chains(403a,403b) are running from the input, at one end of the frame(210) to behind the sawing blades(601,602). At the frame(210), close to said input, transporting chains (403a,403b) are running over wheels(402). Wheels(406) at output, behind the sawing blades(601,602) are not shown on this figure, but on figure 3. Guiding means(401) are provided to position centrally the transporting chains (403a,403b).

[0020] Second transporting means(5) consist, according to figure 2, of a transporting chain(501), running over wheel(502), mounted on the front side of frame(220), extending between the sawing blades(601,602) to the back side of frame(220), provided with wheel(503).

Second transporting means(5) with transporting chain (501) is provided with pressing means(7). These pressing means(7) consist of bodies(701), according to this embodiment, with a wheel to tension the transporting chain(501). According to figure 4, four pressing bodies (701,702,703,704) are provided. Pressing means(7), according to this embodiment, consist of a length adjustable bar and provided with a wheel, to interact with said transporting chain(501). The length and the position of said bar could be controlled in order to regulate the tension on said transporting chain(501). According to an embodiment of this invention, said pressing means(7) are hydraulic or pneumatic adjustable cylinders, in order to regulate the tension. This is not shown on the figures.

Further, the number of pressing means(7) could be dependent of the type of transporting means(501) and the preferred tension on said transporting means(501).

[0021] In a preferred embodiment, the transporting chains(403a,403b,501) consist of a toothed chain (404,405) like illustrated on figure 3. Said chain is composed of chain links(404), provided with teeth(405), in order to grip the wooden trunks between the upper transporting means(501) and the under transporting means (403a,403b). Said toothed transporting chains(403a, 403b,501) are running over toothed chain wheels (402,406,502,503). Moreover, the pressing means(7) are also provided at the end of the bar with a toothed wheel, like shown on the figures.

Due to this configuration, the chain wheels are gripping in the chain links(404) of the transporting means(501). When three sawing blades(6) are used, two upper transporting means(5) will be provided between the sawing blades(6), which is not shown on the figures.

According to figure 2, optionally transporting wheels (301,302) are provided on the frame(210,220) in order to displace the sawing device(1).

Figure 3 illustrates driving means of the first and second transporting means(403a,403b,501), driven by motor (1101), on the underside of frame(220). Said motor (1101) is provided with a wheel(1102), driving an axle (1105) with wheel(1103), on which a driving belt(1104) runs between both wheels(1102,1103).

Driving axle(1105) is provided with wheels(406) in order to run the under transporting means(403a,403b). Further, said axle(1105) is provided with a wheel(1106), driving wheel(1109), mounted on axle(1110) and pressing driving belt(1108) on wheel(1109). Said driving belt (1108) runs further over wheel(1107). Driving wheel (1109) on axle(1110) drives a wheel(503) to move upper transporting means(501).

By using a single motor(1101), both transporting means (4,5) are driven by axles(1105,1110) with belts (1104,1108).

The wheels(1102,1103,1106,1107,1109) are preferable chain wheels and the driving belts(1104,1108) could be drive chains.

[0022] Furthermore, the sawing device(1), according to figure 3, is provided with a guiding plate (9), comprises a vertical plate(902) and an inclined part(901). The guiding plates(9) are located laterally on the underside of the sawing blades(601,602). The vertical plate(902) is situated under the sawing blades(601,602), attached to the inclined part(901), extending longitudinally or sideways of the sawing device(1). Due to this configuration, sawed trunks will glide laterally along the guiding plates(9), longitudinally of the device(1).

[0023] Regarding figure 4, the operation of the sawing device(1) will be explained.

A wooden trunk will be fed by under transporting means (4), driven by motor(1101) with transmission(1104) to drive axle(1105). Said axle(1105) drives a wheel(503) by belt(1108) in order to run the upper transporting means (5).

The wooden trunk will be clamped in front of the sawing blades(601,602) by upper transporting means(501), extending in front of the sawing blades(601,602). Upper transporting means(5) run over wheels(502,503) and will be tensioned by pressing means(701,702,703,704). Upper transporting means(5) will be pressed against the wooden trunk in order to position and guide it over the sawing blades(6). The wooden trunk will be straightened and equally fed over the sawing blades(601,602). Sawed trunks are ejected by the guiding plate(9), laterally along the sawing device(1).

[0024] The sawing device(1) can be provided with a safety screen in order to protect the user. Said safety screen can be provided close to the sawing blades(6) and/or the whole transporting device(4). This screen can be a housing, enclosing completely or partially the sawing device(1) and completely or partially transparent. This is not shown on the figures.

[0025] Feeding firewood trunks to the first transporting device(4) can be manually or automatically by adding a mobile conveying belt. In the latter, said transporting belt

will be placed close to the sawing device(1) in order to feed continuously trunks.

Claims

1. A sawing device(1) for sawing automatically irregular shaped firewood trunks, consisting of a frame(2), optionally provided with wheels, first transporting means(4), mounted on the under frame(210) of frame(2) and second transporting means(5), provided with pressing means(7) on the upper frame(220) of frame(2), extending in front of and between the sawing means(601,602) above said first transporting means(4), control means(8) for driving motors (603,604,1101) of sawing means(6) and transporting means(4,5) and a guiding plate(9) **and characterised in that** both transporting means(4,5) consist of a toothed chain with pressing means(7) on chain (501), comprising a number of length adjustable bars (7) with a chain wheel, interacting with the chain links of said toothed chain(501).

2. A sawing device(1) for sawing automatically irregular shaped firewood trunks according to claim 1 **and characterised in that** said pressing means(7) with length adjustable bars and chain wheel can be adjusted by hydraulic or pneumatic means in order to regulate the tension of transporting chain(501).

3. A sawing device(1) for sawing automatically irregular shaped firewood trunks according to at least one of the previous claims **and characterised in that** both transporting means(4,5), respectively with driving axle(1105) and driving axle(1110) are driven with a single motor(1101).

fig.1

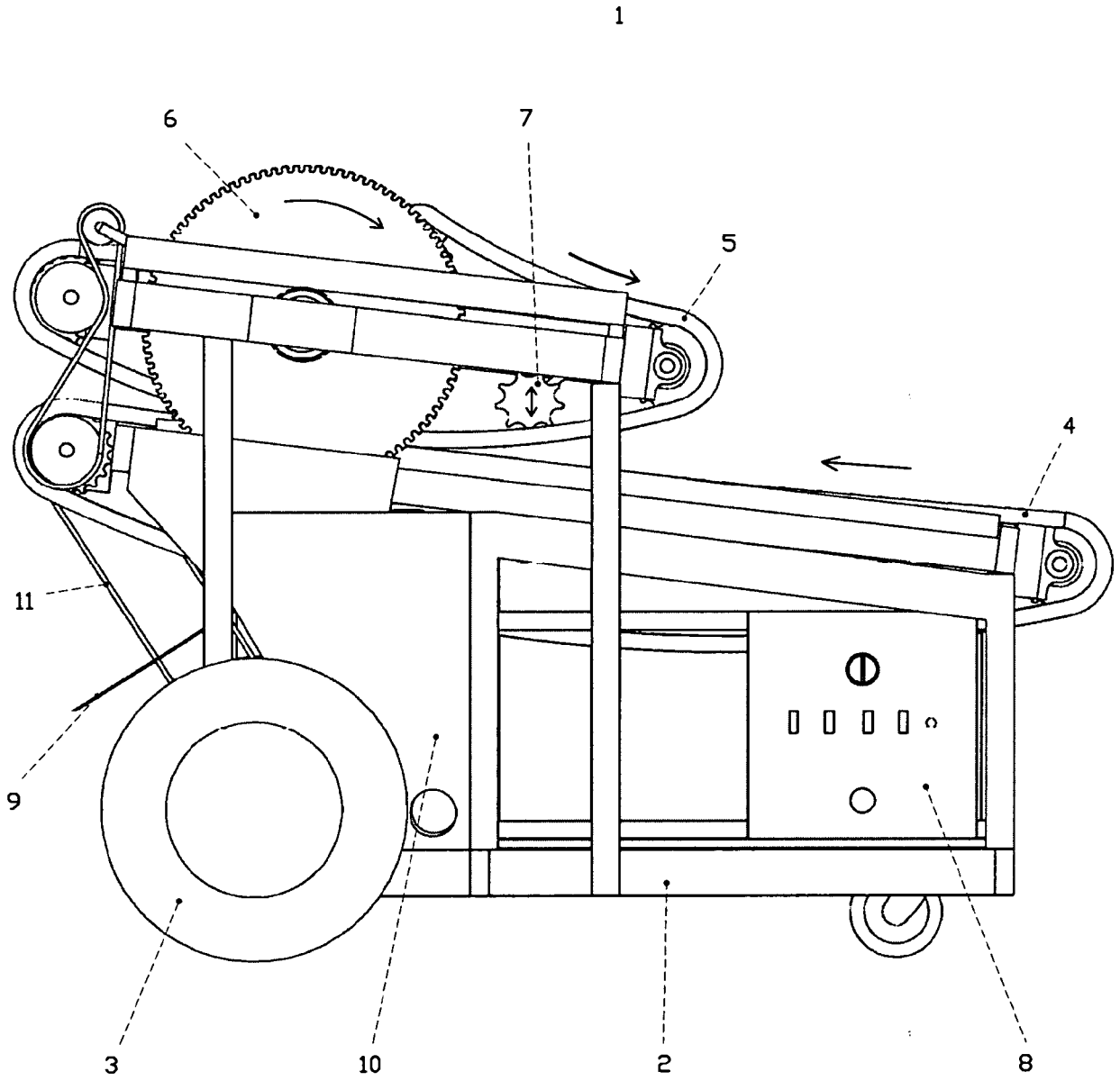


fig.2

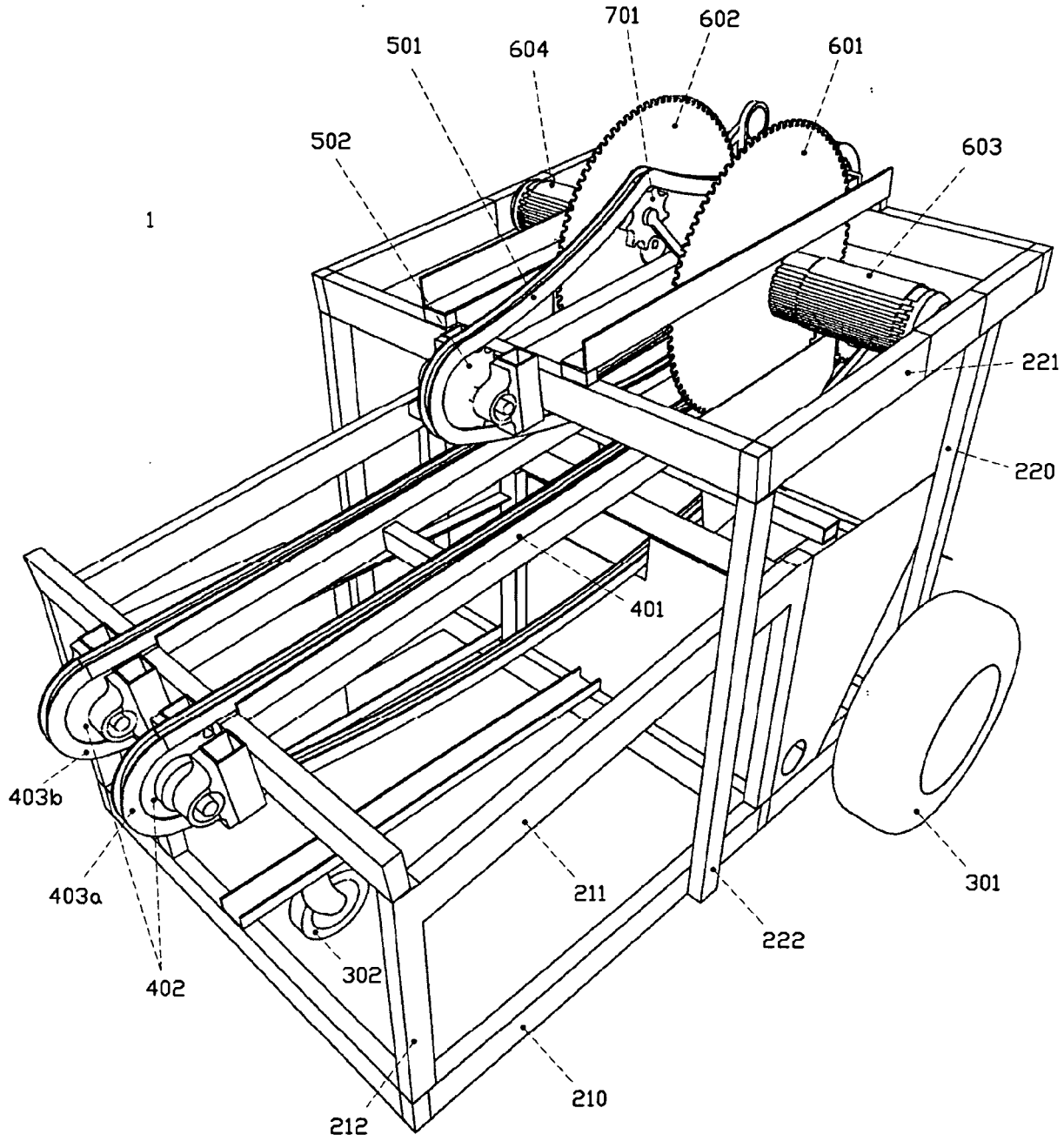

1
501
604
701
602
601
502
603
221
220
401
403b
403a
402
302
211
222
301
212
210
I

fig.3

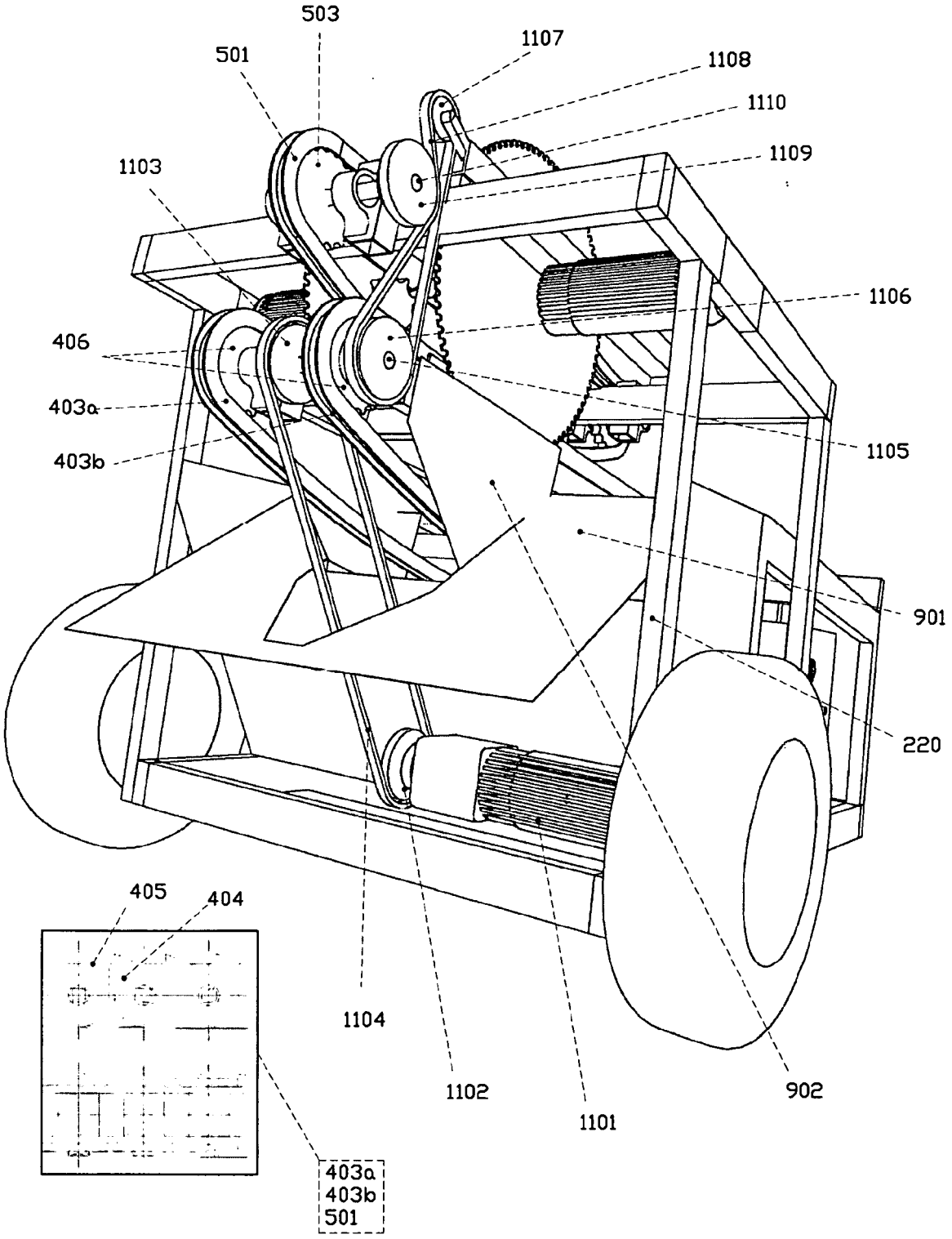
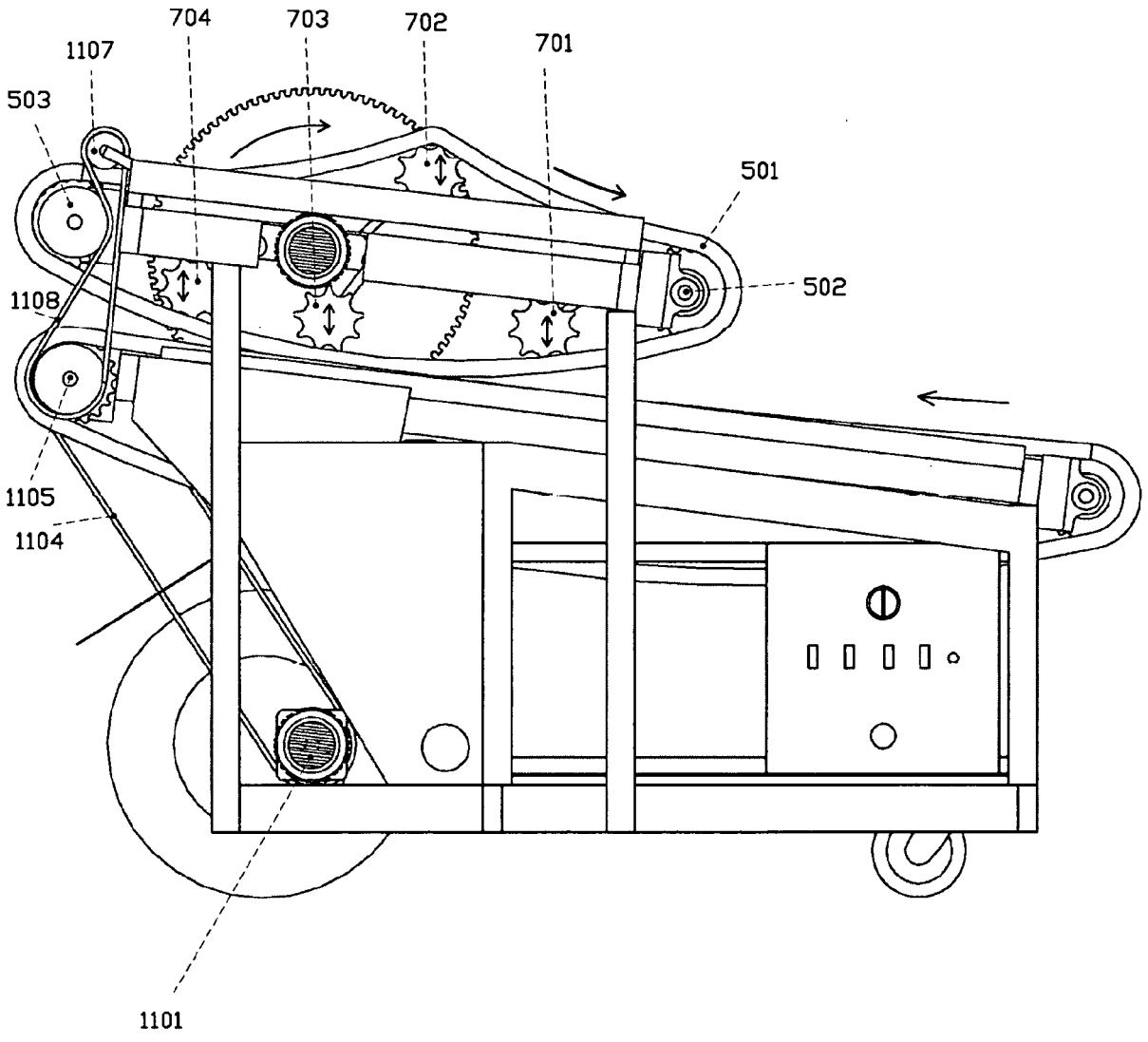

503
501
1107
1108
1110
1109
1103
1106
406
403a
403b
1105
901
220
902
1104
1102
1101
405
404
403a
403b
501

fig.4



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EUROPEAN SEARCH REPORT

Application Number
EP 10 44 7013

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			TECHNICAL FIELDS SEARCHED (IPC) B27B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 July 2010	Rijks, Mark

CATEGORY OF CITED DOCUMENTS

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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