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(54) **A MACHINE FOR REDUCING ROOTS OF LOGS**

VORRICHTUNG ZUM REDUZIEREN DER WURZELENDEN VON BAUMSTÄMMEN

MACHINE DESTINEE A COUPER LES RACINES DE RONDINS DE BOIS

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Description

[0001] This invention relates to a machine for root reduction of logs comprising a framework, a support device arranged on the framework, logs being placeable on the support device in a position with a root end portion of the log in question protruding freely from the support device, and a cutter for processing the root end portion of the log protruding from the support device, the support device comprising means for causing the log to rotate while the root end portion is being processed.

[0002] Root reducing machines of the type devised above are described in SE 7712493-1 and SE 8203956-1. The main object of machines of this type is to cut away the swellings, so-called root bulbs or root legs, existing on the root end portion of the log prior to separation of especially root logs in a sawmill in order to prevent problems during subsequent handling in the sawmill caused by these swellings.

[0003] The support device and the means for causing the log to rotate are stationarily arranged in both of the above-mentioned Swedish patent applications. The cutter is movably arranged in SE 7712493-1 so that it may be transferred towards a log located in the support device and from the same. A number of ejector elements are distributed along the longitudinal direction of the support device for removal of the log from the support device after an executed root reduction, said ejector elements being movable between a rest position below the log and an ejecting position raised in relation to the rest position.

[0004] The machine is in SE 8203956-1 except for the support device also provided with carrier members, by means of which a log resting on the same may be elevated and lowered. The cutter is intended to be stationarily mounted except for its rotatability, wherein lowering of the carrier members with a log resting there upon is intended to bring the root end portion of the log to a processing position in relation to the cutter. The support device has means for causing the log to rotate. The log is discharged to the support device at the end of the lowering motion of the carrier members, said support device thereby bringing the log into a rotating motion so that processing the circumference of the root end portion may take place. The carrier members comprise rolls or similar allowing longitudinal transportation of the log along the carrier members in their upper position.

[0005] The above-described machines have shown to be technically and commercially very successful.

[0006] A root reducing machine according to the preamble of claim 1 is known from EP 0 447 166 A1. This machine is provided with a support device comprising several support elements separated along the longitudinal direction of a log supported on the support device, each support element forming a substantially V-shaped seat for the log and being provided with a driving means for causing the log to rotate. Each support element is pivotal in relation to the framework of the machine so as to allow a variation of the inclination of the support elements in relation to the longitudinal axis of a log supported on the support device. By adjustment of this inclination, the feeding velocity of the log in the direction towards the cutter is controllable. The log can also be moved backwards in the opposite direction by a suitable inclination of the support elements. A number of ejector elements are distributed along the longitudinal direction of the support device for removal of the log from the support device after an executed root reduction, said ejector elements being movable between a rest position below the log and an ejecting position raised in relation to the rest position.

OBJECT OF THE INVENTION

[0007] The present invention is aiming at further development of the machine of the type described in the introduction so that it may be simplified with a maintained good production ability and hence become less expensive or alternatively may be brought to operate with an increased production rate.

SUMMARY OF THE INVENTION

[0008] Said object is achieved according to the invention by a machine having the features of claim 1.

[0009] Thus, by the unit comprising the support device and the rotation means being made movable in relation to the framework according to the invention, conditions are created for utilizing this movability for transferring the log between different levels. Thus, specific components are not required for this purpose any more. Specific ejector elements were necessary for the ejection of a log from the support device in e.g. SE 7712493-1. These ejector members may according to the present invention be eliminated and the mobility of the support device itself may instead be utilized for log removing purposes.

[0010] Specific carrier members, which are movable in the height direction, were arranged according to SE 8203956-1 in order to place a log in the stationary support device and once again lift the log from the same. The need for such separate carrier members will according to the present invention be replaced by the movable arrangement of the support device so that thereby an obvious simplification is obtained.

[0011] The ability of the support device to be used for log removing purposes by means of its mobility has already been mentioned. The unit is according to claim 2 further suitably adjustable to a position suitable for receipt of logs by means of the power exerting arrangement, the unit being movable downwards from said position to a log processing position. It is thereby preferred that the unit consisting of the support device and rotation means is arranged to move the log into contact with the rotating cutter during the movement downwards to the log processing position according to claim 4.

[0012] The embodiment of the support device according to the invention gives rise to possibilities to arranging the cutter substantially stationarily except for its rotatability. This implies a simple and cost-effective embodiment. It is however pointed out that the cutter if desired may be made movable so that it is moved into contact with the log during or after the log having been adjusted into its intended processing position. It is also pointed out that it would be possible to arrange the cutter adjustable so that it may be adjusted into a position (claim 7) in which the natural conicity of the log is substantially maintained, but also into positions which more or less deviates from this ideal condition if the circumstances would necessitate it.

[0013] Further characteristics of the machine according to the invention will arise from the following patent claims and the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] With reference to the appended drawings, a more specific disclosure of an embodiment example of the invention will follow hereinafter.

[0015] In the drawings:

Fig 1 is a view from the side of the machine according to the invention,

fig 2 is a view of the machine seen from above,

fig 3 is a view of the machine seen from the left in fig 1,

fig 4 is a cross-section through the machine along the line IV-IV in fig 1,

fig 5 is a cross-section along V-V in fig 1,

fig 6 is a schematical end view illustrating the machine in a log receiving position,

fig 7 is a view similar to fig 6, but illustrating the machine in a lower processing end position and

fig 8 is a view similar to fig 6 and 7 of the machine in a log removal position.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

[0016] The machine according to the invention for root reduction of logs comprises a framework 1, a support device 2 arranged on the framework, logs being placeable on the support device in a position with a root end portion of a log in question protruding freely from the support device 2, and a cutter 3 for processing the root end portion of the log protruding from the support device, the support device 2 comprising means 4 for causing the log to rotate while the root end portion is being processed.

[0017] The support device 2 and the rotation means 4 form a unit 5, which is movably connected to the framework 1 (see especially figs 6-8) and this unit is operable, by means of a power exerting arrangement 6, between different positions wherein a log 7 supported on the support device is located on different levels in the machine.

[0018] The unit comprising the support device 2 and the rotation means 4 is pivotally connected to the framework 1 around an axis 8 extending substantially parallel to the longitudinal direction of a log placed on the support device 2.

[0019] The unit 5 is adjustable to a position suitable for receipt of logs by means of the power exerting arrangement 6, which is illustrated in fig 6, said unit 5 being movable downwards from said position to a log processing position. The unit 5 is arranged to move the log 7 into contact with the rotating cutter 3 during the movement downwards to the log processing position. The circumference of the cutter 3 is in fig 7 illustrated with a dotted line. The position of the unit 5 in fig 7 is intended to be a processing end position, in which the unit 5 is located in such a lowered position that a lower mantle line of the log 7 is tangent to the periphery of the cutter in the region of the cutter 3 so that thereby the natural conicity of the log in the region above the root swellings is substantially maintained after the root reducing process. A log lying on the support device 2 is being processed by the cutter 3 on substantially the same side as the log is supported on by means of the support device, i.e. substantially from below. This implies that the cutter 3 is so located in the region of the machine intended for the root end portion that it affects the root end portion from below. This means in other words that the cutter should be arranged to cut away such root swellings located outside the natural conicity of the log in question.

[0020] It is, although the cutter 3 could be movable or adjustable according to the description above, preferred that it is substantially stationarily arranged in the illustrated embodiment example, except for the rotatability of the cutter. The constitution of the cutter 3 only needs to fulfil the criterion that it is able to process the log along the natural mantle line thereof such as it is present in the log region lacking root swellings, which implies that the cutter certainly advantageously may be substantially cylindrical as in the illustrated embodiment, but this is not a demand and the cutter could instead have a conical shape. Instead of one single cutter, a plurality of separate cutters could also cooperate so that they together are able to cut away root swellings located outside the normal conicity of the log except for the discussed root swellings.

[0021] A motor 9 is according to a preferred embodiment included in the unit 5 movable in relation to the framework 1 for driving the rotation means 4.

[0022] The support device 2 comprises at least two and in the example three support elements 10, 11, 12

separated along the longitudinal direction of the log, wherein at least one and in the example two of the support elements, namely the elements denoted 10 and 11, are co-ordinated with rotation means arranged to drive the log around. An individual support element forms a substantially V-shaped seat 13 for the log, which is most clearly illustrated in fig 3-7.

[0023] A motor for driving the cutter 3 is illustrated in fig 1 and 2 with reference numeral 14. It has suitable processing members on its periphery, which are formed as bits. The machine may in the region around the cutter have screenings denoted 15 in fig 1 in order to avoid spreading of cuttings removed by the cutter.

[0024] The machine has a pressure device generally denoted 16 for pressing a log against the support elements 10-12 of the support device. This pressure device 16 comprises in the example pressure members 17 intended to be pressed against the log for pressing it against the support device. Said pressure members 17 are in the example formed by wheels or rolls. These pressure members may be driven or non-driven and they may also have another character than wheels or rolls. The wheel members 17 could e.g. be formed as the pressure yoke provided with chains and chain wheels described in SE 7712493-1.

[0025] The pressure members 17 are carried by an arm 18, which is movably connected to the framework 1 of the machine. This movable connection is in the example realized as pivotability about a shaft denoted 19, which extends substantially horizontally and transversely to the longitudinal direction of the log in the machine. By arranging the arm 18 so that it will extend substantially parallel to the longitudinal direction of the log, i.e. substantially parallel to the longitudinal direction of the machine, the arm 18 will thus move in a vertical plane directed parallel to the longitudinal direction of the machine and the log. A power exerting arrangement 20, e. g. realized in the form of a piston-cylinder mechanism, operating between the framework and the arm 18 serves for pivoting the arm 18.

[0026] The pressure device 16 is arranged in a way that the pressure members 17 thereof will affect the log in the region between the outermost pressure elements 10, 12 of the pressure device 2. It is thereby preferred that the pressure members 17 will affect the log in the region between those two support elements 10, 11 of the support device 2 which are located closest to the cutter 3.

[0027] It is in fig 3 illustrated how the support element 12 is formed, which is located furthest away from the cutter 3. It comprises more exactly a sheet-like carcass 21, wherein rotatable wheels or pulleys 22 are arranged on the carcass forming the substantially V-shaped seat 13. Although it would be possible to form this V-shaped seat with only two wheels or rolls, somewhat similar to what is illustrated at the top by means of the pressure members 17, a plurality of wheels or rolls are arranged in the example and more exactly so that a relatively "true" V-shape is obtained. It is suitable that the wheels or rolls are located in carriers 23, which in turn are secured to the carcass sheet 21.

[0028] The support element denoted 11 is in fig 4 illustrated in more detail. It also comprises a carcass sheet, which here is denoted 24. The V-shaped seat 13 is here formed by V-shaped arranged portions 25, 26 of chains 27, 28. The chain denoted 27 is in the example running around three chain wheels, namely the ones denoted 29, 30 and 31 (see figs 2 and 4). The chain part denoted 25 and included in the V-shaped seat 13 is thereby formed between the chain wheels 29 and 30 while the chain wheel 31 is drivably connected to the motor 9, which is secured in relation to the carcass sheet 24. The other chain part 26 is formed by the chain 28 extending between chain wheels 32 and 33. The chain wheels 30 and 33 are substantially concentric and connected to a common shaft so that the rotation conveyed to the chain wheel 33 by the chain 27 and the motor 9 will be conveyed to the chain wheel 33 and the wheel 32 via the chain 28. It is pointed out that the chain parts 25 and 26 are intended to be supported by suitable support bands or similar.

[0029] The support member denoted 10 is illustrated in fig 5. This support member also comprises a carcass sheet 34. The V-shaped seat is also here formed by parts 35, 36 of chains 37, 38. The chain 37 is running around two chain wheels 39, 40, while the chain 38 is running around two chain wheels 41, 42. The chain parts 35, 36 forming the V-shaped configuration are also here intended to be supported by support bands or similar.

[0030] The chain wheels 40, 42 are concentric and connected to each other so as to be prevented from relative rotation. The chain wheel 42 is besides connected to chain wheel 30 of the support element 11 so as to be prevented from rotation relative thereto by means of an intermediate drive shaft 43. Hence, the motor 9 will drive the chains of said both support elements 10, 11.

[0031] The above-used general expression rotation means referring to the reference numeral 4 is intended to comprise the chains and the chain wheels capable of affecting turning of the log, in this embodiment. The rotation means 4 may in an alternative embodiment be formed by pairs of driven wheels located so that they form V-shaped seats for the log. It should however be pointed out that the rotation means 4 do not need to comprise any drive motor 9 arranged on the movable unit 5, even if it is preferred in the illustrated example. Thus, the drive motor 9 could within the scope of the invention also be arranged on the framework 1 and a transmission between this drive motor and the driven rotation means on the unit 5 could instead be arranged. The solution according to the invention is however based on the movable unit 5 comprising the support device 2 and the rotation means 4 being capable of turning the log around at least during some movement of the unit 5.

[0032] The carcass sheets 21, 24 and 34 included in

the different support elements 10, 11, 12 form the complete unit 5 by means of being rigidly connected to each other, e.g. with the aid of beams indicated at 44. Thus, all support elements 10, 11, 12 are to be transferred uniformly with the aid of the power exerting arrangement 6. It is in the example formed by a piston-cylinder mechanism acting between a point 45 on the framework 1 and a point 46 on the unit 5, in the example a point on the carcass sheet 24 of the support member 11.

[0033] The pivotable axis 8 is in the example formed by two separate pivot pins 47 completed with casings, as is illustrated in figs 1 and 2.

[0034] The following actions take place during operation of the machine according to the invention: The unit 5 is adjusted to the position according to fig 6 when a log is going to be introduced into the machine, i.e. in a position somewhat pivoted upwards so that the root swellings of a log will at least during normal conditions be located on a level above the cutter indicated with dotting when a log is rolled down into the unit 5. The pressure members 17 are of course elevated during the introduction of the log into the unit 5. The pressure members 17 are thereafter lowered so that the log 7 is pressed against the support elements 10, 11, 12 and the unit 5 is at the same time lowered so that the log is moved into contact with the cutter 3. A control device for the machine may be arranged to cause the log 7 to rotate before or in connection with the unit 5 being started to be lowered, but the device could also be such that the log 7 is caused to rotate first after the unit 5 having been lowered to the lowest position of the log, which is illustrated in fig 7. A mantle line in the longitudinal direction of the log is here tangentiating the periphery of the cutter 3 so that the log is thus intended to be cut along a straight line substantially tangentiating the contact points between the log and the different supports 10, 11, 12.

[0035] The unit 5 is in fig 6 somewhat inclined to the left and in fig 7 somewhat inclined to the right as appears by comparing fig 6 and 7.

[0036] The log 7 should be removed from the machine when it has been reduced. The arrangement 6 is for this purpose arranged to pivot the unit 5 to the position according to fig 8, which is the removing position. The log will leave the unit 5 by rolling downwards to the left in fig 8 under the influence of gravity.

[0037] Hence, it is from the description clear that the movable arrangement of the unit 5 comprising the support device 2 and the rotation means 4 means that the unit 5 itself may effect all necessary support functions during the processing operation and besides also may be brought into suitable positions for introduction and removal respectively of logs (figs 6 and 8).

[0038] It is obvious that the invention is not limited to the above-described, preferred embodiment, and that a plurality of modifications are possible within the scope of the invention as defined by the following claims. Certain modification possibilities have already been described above. Others may also be realized. It may e.g. be pointed out that mobility of the unit 5 does not necessarily need to have the character of only a pivoting motion. It would thus be possible to effect the movement of the unit 5 as a combination of a pivoting movement and a translationary movement or as a combination of different super-positioned pivoting movements. The movement of the unit 5 could also be arranged so that it is substantially translationary in a lower movement region while a pivoting component should be added in an upper movement region in order to obtain the inclined position in said upper movement region of the unit, which is desirable at least when removing logs (fig 8), but perhaps also when introducing logs (fig 6).

Claims

1. A machine for root reduction of logs comprising a framework (1), a support device (2) arranged on the framework, logs being placeable on the support device in a position with a root end portion of the log (7) in question protruding freely from the support device, and a cutter (3) for processing the root end portion of the log protruding from the support device, the support device (2) comprising means (4) for causing the log to rotate while the root end portion is being processed, wherein the support device (2) and the rotation means (4) form a unit (5), which is movably connected to the framework, this unit being operable, by means of a power exerting arrangement (6), between different positions wherein a log supported on the support device (2) is located on different levels in the machine, the support device (2) comprising at least two support elements (10, 11, 12) separated along the longitudinal direction of the framework and at least one (10, 11) of said elements being co-ordinated with rotation means (4), and that an individual support element (10, 11, 12) forms a substantially V-shaped seat (13) for the log,
   characterized in that the unit (5) comprising the support device (2) and the rotation means (4) is pivotally connected to the framework (1) around an axis (8) extending substantially parallel to the longitudinal direction of the framework (1) of the support device (2).

2. A machine according to claim 1, **characterized in that** the unit (5) is adjustable to a position suitable for receiving logs by means of the power exerting arrangement (6), said unit (5) being movable downwards from said position to a log processing position.

3. A machine according to any of claims 1 or 2, **characterized in that** the unit (5) is adjustable to an upper position by means of the power exerting ar-

rangement, in which upper position a log received by the unit (5) is intended to be removed from the unit.

4. A machine according to claim 2, **characterized in that** the unit (5) is arranged to move the log into contact with the rotating cutter (3) during the movement downwards to the log processing position.

5. A machine according to claim 4, **characterized in that** the cutter (3) is substantially stationarily arranged except for its rotatability.

6. A machine according to any preceding claim, **characterized in that** at least one motor (9) for driving the rotation means (4) is included in the unit (5) being movable in relation to the framework.

7. A machine according to any preceding claim, **characterized in that** the cutter (3) is arranged to process the root end of the log so that the natural conicity of the log is substantially maintained.

Patentansprüche

1. Vorrichtung zur Reduktion der Wurzeln von Baumstämmen, umfassend einen Tragrahmen (1), eine Halteeinrichtung (2), welche auf dem Tragrahmen angeordnet ist, wobei Baumstämme auf der Halteeinrichtung in einer Position platzierbar sind, in welcher ein Wurzelendabschnitt des betreffenden Baumstammes (7) von der Halteeinrichtung frei absteht, und eine Schneidvorrichtung (3) zum Bearbeiten des von der Halteeinrichtung abstehenden Wurzelendabschnittes des Baumstammes, wobei die Halteeinrichtung (2) Mittel (4) aufweist zum Veranlassen des Rotierens des Baumstammes, während der Wurzelendabschnitt bearbeitet wird, wobei die Halteeinrichtung (2) und das Rotationsmittel (4) eine Einheit (5) bilden, welche mit dem Tragrahmen bewegbar verbunden ist, wobei diese Einheit mittels einer Kraftausübevorrichtung (6) zwischen unterschiedlichen Positionen betreibbar ist, wobei ein Baumstamm, welcher auf der Halteelementeinrichtung (2) gehalten ist, auf unterschiedlichen Höhen in der Maschine angeordnet ist, wobei die Halteeinrichtung (2) mindestens zwei Halteelemente (10, 11, 12) aufweist, welche entlang der Längsrichtung des Tragrahmens voneinander getrennt sind, und mindestens eines der Teile (10, 11) mit dem Rotationsmittel (4) koordiniert ist, und wobei ein einzelnes Halteelement (10, 11, 12) eine im Wesentlichen V-förmige Auflage (13) für den Baumstamm bildet, **dadurch gekennzeichnet, dass** die Einheit (5), welche die Halteeinrichtung (2) und das Rotationsmittel (4) aufweist, um eine Achse (8) schwenkbar mit dem Tragrahmen (1) verbunden ist, wobei sich die Achse (8) im Wesentlichen parallel zur Längsrichtung des Tragrahmens (1) der Halteeinrichtung (2) erstreckt.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Einheit (5) mittels der Kraftausübevorrichtung (6) in eine Position verstellbar ist, welche geeignet ist, Baumstämme aufzunehmen, wobei die Einheit (5) von dieser Position abwärts bewegbar ist zu einer Baumverarbeitungsposition.

3. Vorrichtung nach einem der Ansprüche 1 oder 2, **dadurch gekennzeichnet, dass** die Einheit (5) mittels der Kraftausübevorrichtung (6) in eine obere Position verstellbar ist, in der beabsichtigt ist, einen von der Einheit (5) aufgenommenen Baumstamm von der Einheit zu entfernen.

4. Vorrichtung nach Anspruch 2, **dadurch gekennzeichnet, dass** die Einheit (5) so angeordnet ist, dass sie während der Abwärtsbewegung zur Baumstamm-Bearbeitungsposition den Baumstamm mit der rotierenden Schneidvorrichtung (3) in Kontakt bringt.

5. Vorrichtung nach Anspruch 4, **dadurch gekennzeichnet, dass** die Schneidvorrichtung (3) im Wesentlichen stationär angeordnet ist, abgesehen von ihrer Rotierbarkeit.

6. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet; dass** mindestens ein Motor (9) zum Antreiben des Rotationsmittels (4) in der Einheit (5) vorgesehen ist, welche im Verhältnis zum Tragrahmen bewegbar ist.

7. Vorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Schneidvorrichtung (3) zur Bearbeitung des Wurzelendes des Baumstammes so angeordnet ist, dass die natürliche Konizität des Baumstammes im Wesentlichen beibehalten wird.

Revendications

1. Machine pour réduire la souche de billes de bois, comportant un bâti (1), un dispositif de support (2) agencé sur le bâti, les billes pouvant être placées sur le dispositif de support dans une position telle que la partie de souche d'extrémité de ladite bille (7) fait saillie librement hors dudit dispositif de support, et un dispositif de coupe (3) pour traiter ladite partie de souche d'extrémité de la bille faisant saillie hors du dispositif de support, le dispositif de support (2) comprenant des moyens (4) pour faire tourner la bille pendant le traitement de la partie de souche d'extrémité, dans laquelle le dispositif de support (2)

et les moyens de rotation (4) forment une unité (5), qui est reliée de façon mobile au bâti, cette unité pouvant fonctionner, au moyen d'un agencement de puissance (6), entre différentes positions dans lesquelles une bille supportée par ledit dispositif de support (2) est disposée à des niveaux différents de la machine, le dispositif de support (2) comprenant au moins deux éléments de support (10, 11, 12) séparés le long de la direction longitudinale du bâti et au moins un (10, 11) desdits éléments étant coordonné avec les moyens de rotation (4), un élément de support individuel (10, 11, 12) formant, pour la bille, un siège au moins approximativement en forme de V,
caractérisée en ce que l'unité (5) comprenant le dispositif de support (2) et les moyens de rotation (4) est reliée de façon pivotante au bâti (1) autour d'un axe (8) sensiblement parallèle à la direction longitudinale du bâti (1) du dispositif de support (2).

2. Machine selon la revendication 1,
caractérisée en ce que l'unité (5) peut être ajustée à une position appropriée pour recevoir les billes au moyen de l'agencement de puissance (6), ladite unité étant mobile vers le bas de cette position à une position de traitement de la bille.

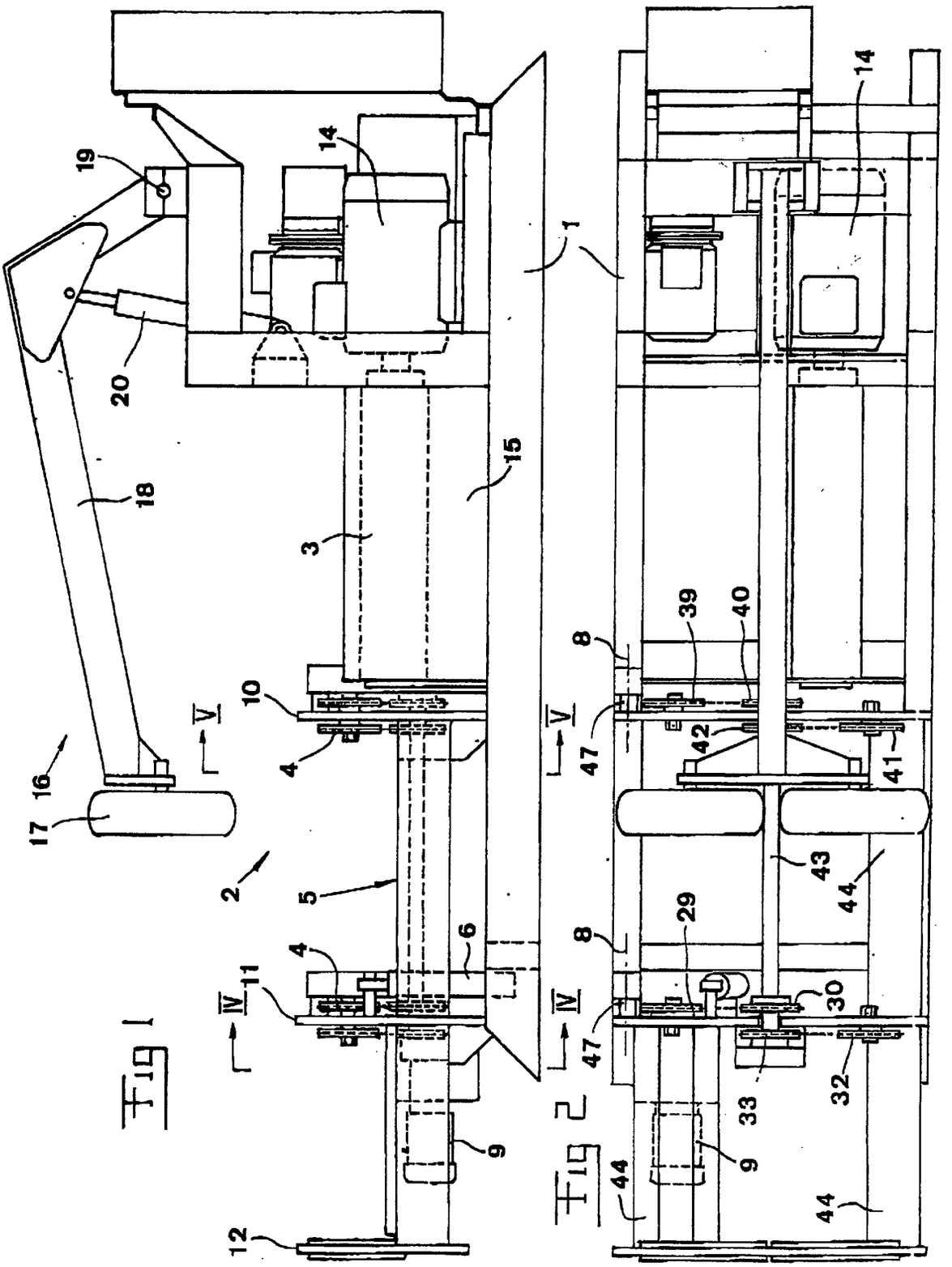
3. Machine selon l'une des revendications 1 ou 2,
caractérisée en ce que l'unité (5) peut être ajustée à une position supérieure au moyen de l'agencement de puissance, position supérieure dans laquelle une bille reçue par l'unité (5) peut être sortie de l'unité.

4. Machine selon la revendication 2,
caractérisée en ce que l'unité (5) est agencée pour amener la bille au contact du dispositif de coupe (3) pendant le mouvement vers le bas en direction de la position de traitement de la bille.

5. Machine selon la revendication 4,
caractérisée en ce que le dispositif de coupe (3) est sensiblement stationnaire, sauf en ce qui concerne sa capacité à tourner.

6. Machine selon l'une des revendications précédentes,
caractérisée en ce qu'au moins un moteur (9) pour l'entraînement des moyens de rotation (4) est prévu dans l'unité (5), en étant mobile par rapport au bâti.

7. Machine selon une des revendications précédentes,
caractérisée en ce que le dispositif de coupe (3) est agencé pour traiter l'extrémité de souche de la bille de façon que la conicité naturelle de la bille est sensiblement maintenue.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IV
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Fig 1

Fig 2

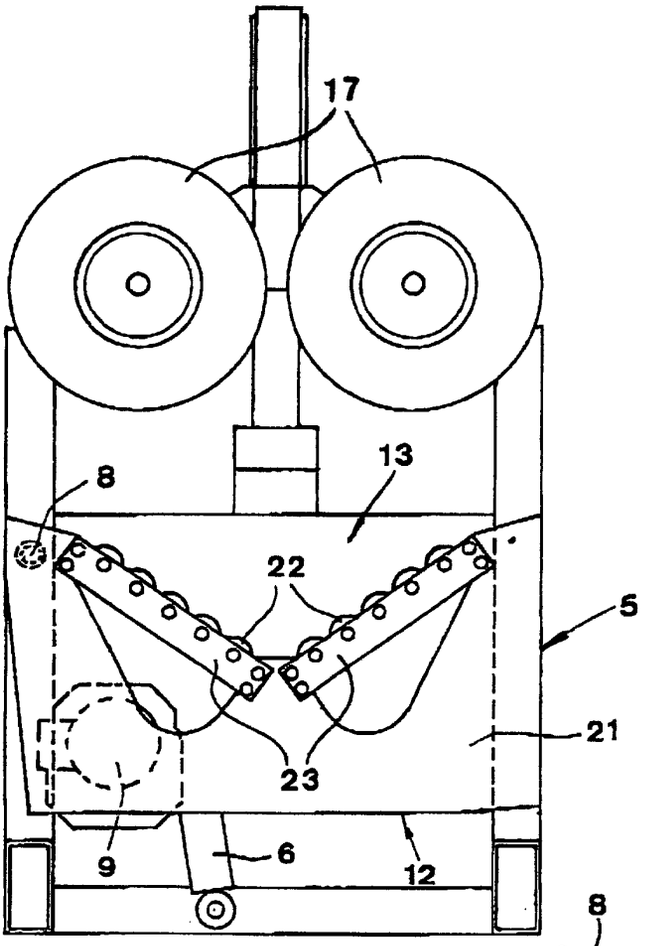


Fig 3

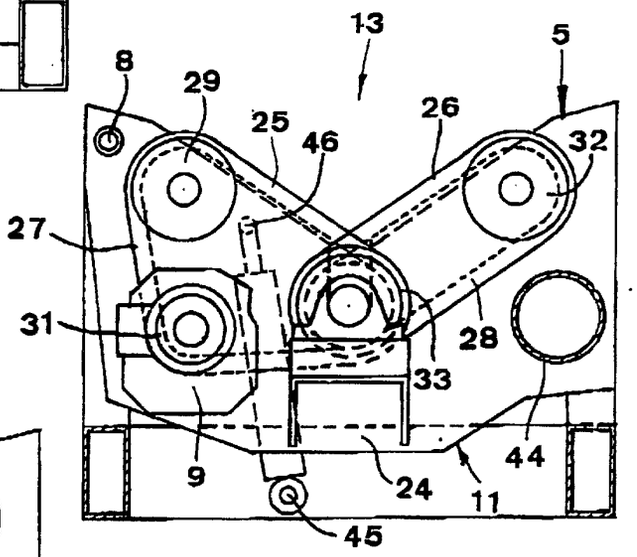


Fig 4

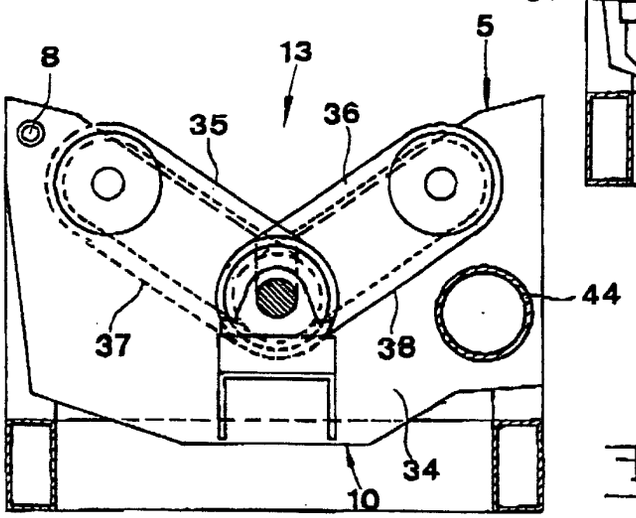
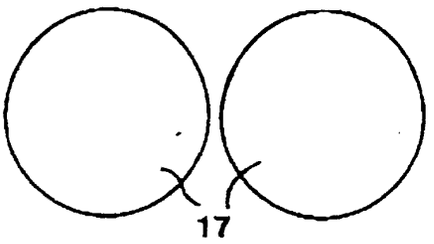


Fig 5



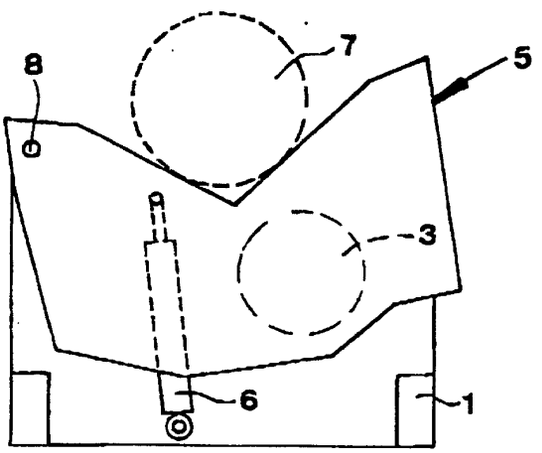


Fig 6

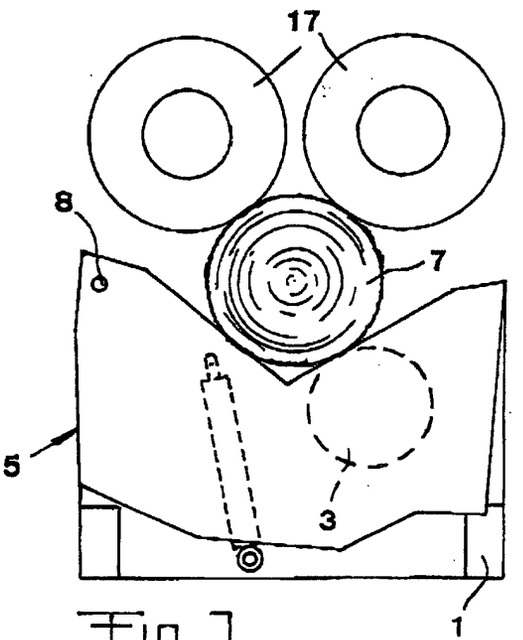


Fig 7

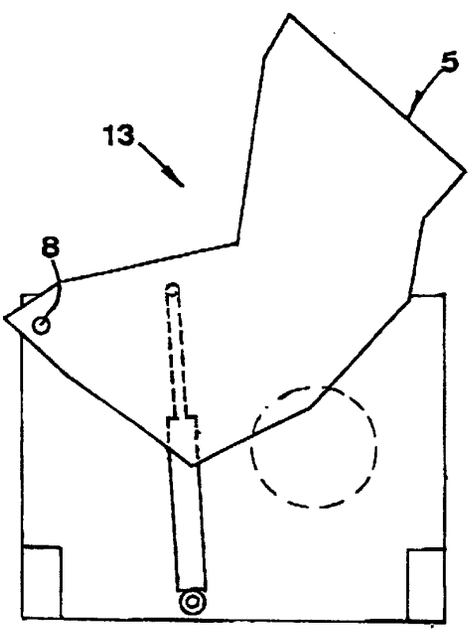


Fig 8