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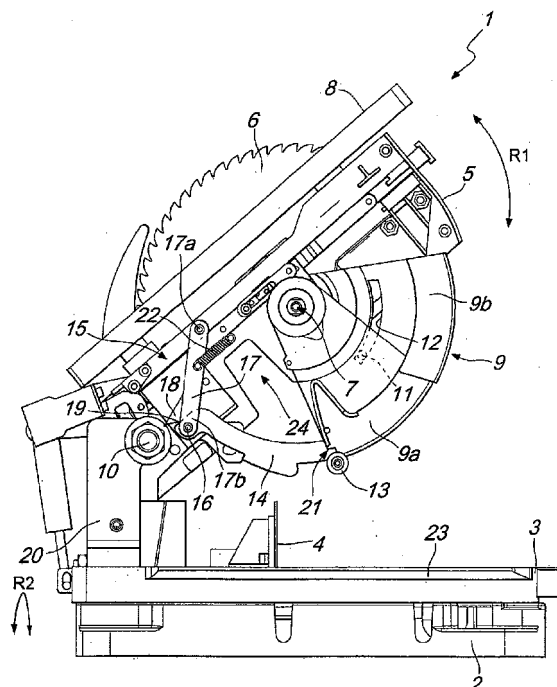
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Remarks:

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(54) **Chop sawing machine provided with improved guard means**

(57) The present invention relates to a chop sawing machine (1) comprising a base (2) defining at least one work table (3) for support of at least one workpiece, at least one work head (5) pivotally associated with the base, movable relative to the work table (6) at least between a configuration that is close to the work table and a configuration moved apart therefrom and provided with a rotary circular blade (6) at least partly emerging from the head and exposed for cutting the workpiece; guard means (9,14) for at least one exposed portion of the blade from the work head; the guard means being pivotally associated with the work head for progressive exposure of said blade during cutting of the workpiece; the guard means comprises at least one first guard element (9) for the lower portion of the blade distal from the hinging point (10) of the work head on the base and at least one second guard element (14) for protection of the lower portion of the blade proximal to the hinging point, the particularity of which consists in comprising means for displacement of the fulcrum of rotation of the second guard element.



Description

[0001] The present invention relates to a chop sawing machine for cutting a workpiece into section members, bars and the like.

[0002] Known on the market are chop sawing machines, and in particular compound chop sawing machines, i.e. machines having two different work tables, an upper and a lower work table respectively, for carrying out cutting of section members, bars, wood laths for skirting boards and other artefacts, which are provided with means for rotation-translation of the work head relative to the work table.

[0003] These types of machines are generally used *in situ*, e.g. in building yards for cutting off the above mentioned artefacts.

[0004] These machines comprise a work head that is movable relative to the lower work table and manually operable by means of handle members; the work head is provided with a cutting member, generally a powered rotary blade, for carrying out the chopping and/or squaring operations on the pieces resting on the lower work table.

[0005] The upper region of the work head is substantially planar to define the upper work table provided with a slot from which the upper portion of the cutting member emerges for cutting the pieces positioned on the upper work table and rigidly fastened thereto by means of abutment elements and screw threaded fastener means.

[0006] In particular, the work head is rotatably associated with the lower work table relative to at least one rotation axis substantially parallel to the plane defined by the lower work table.

[0007] In addition, the work head can be slidably associated with the base for translation of same relative to the work table and therefore for carrying out the front cut of the pieces resting on the work table.

[0008] In particular, chop sawing machines are known which have straight guide means interposed between the work head and the base for performing the translational motion of the head along a direction substantially parallel to the lower work table.

[0009] In addition, the chop sawing machines of known type comprise guard means for protection of at least one blade portion exposed from the work head, which means is pivotally associated with the work head for progressive exposure of said blade during cutting of the workpiece.

[0010] The guard means comprises at least one first guard element for protection of the lower blade portion which is the farthest from the hinging point of the work head on the base and at least one second guard element for protection of the lower blade portion which is the closest to said hinging point, in the form of a plate disposed alongside the blade, for example.

[0011] The above described chop sawing machines of known type in any case are not devoid of drawbacks, among which it is to be mentioned the fact that the second guard element of the blade portion concerned therewith,

being hinged on the work head, greatly restricts the cutting capability of the blade, in particular as regards the so-called end trimming operations of the workpieces and therefore the sizes of the pieces that can be machined in this direction.

[0012] In particular, the region concerned with said second guard element is the so-called end trimming region in which by a cut from the top with the lower portion of the blade that is the closest to the hinging point of the work head on the base, exactly said end trimming operations of special pieces such as laths for skirting boards and the like are carried out.

[0013] Generally these pieces have a great height and therefore an important space in the upper region above the work table is necessary for them and consequently a high rotation stroke is required for the guard element disposed in this region for progressive exposure of the cutting blade portion.

[0014] However, the rotation stroke of the second guard element is limited by the construction sizes of the machine because since the guard element must have a longitudinal length sufficient for protecting the exposed portion of the blade in a rest configuration, during its rotation for exposing the blade it encounters an upper end of stroke defined by the work head with which it is pivotally associated.

[0015] Accordingly, it is a main task of the present invention to eliminate the above mentioned drawbacks of the known art by devising a chop sawing machine enabling cutting operations and in particular end trimming operations to be carried out without restrictions in the sizes of the workpieces.

[0016] Within the scope of this task, the invention aims at ensuring a good cut efficiency, above all in the so-called end trimming region of the workpieces, enabling wide sectors in the active portion of the cutting member to come into contact with the workpieces, irrespective of the angle of inclination of the cutting member to the lower work table and of the shape of the workpiece.

[0017] Another aim of the present invention is to provide a simple structure of relatively easy practical accomplishment, safe use and efficient operation, and also of relatively reduced cost, exhibiting a reduced bulkiness similar to that of a traditional radial chop sawing machine.

[0018] The technical task mentioned and the aims specified are all achieved by the present chop sawing machine which comprises a base defining at least one work table for support of at least one workpiece, at least one work head pivotally associated with said base, which is movable relative to said work table at least between a configuration close to said work table and a configuration away therefrom and provided with a rotary circular blade at least partly emerging from said work head and exposed for cutting of said piece; guard means for protection of at least one portion of said blade exposed from said work head, said guard means being pivotally associated with said work head for progressive exposure of said blade during cutting of said workpiece; said guard means com-

prising at least one first guard element for protection of the lower portion of said blade distal from the hinging point of the work head on said base and at least one second guard element for protection of the lower portion of said blade proximal to said hinging point, characterized in that it comprises displacement means for the rotation fulcrum of said second guard element.

[0019] Further features and advantages of the present invention will become more apparent from the detailed description of a preferred but not exclusive embodiment of a chop sawing machine, illustrated by way of non-limiting example in the accompanying drawing in which the only figure represents a diagrammatic, partly sectional side view of the chop sawing machine in accordance with the invention.

[0020] Referring particularly to this figure, generally identified by 1 is a chop sawing machine, of the compound type for example, comprising a base 2 defining at least one work table 3 for support of at least one workpiece.

[0021] The work table 3, for instance, can be of the type rotating about a substantially vertical axis and having means for temporarily clamping the workpiece, of the vice type or the like for example, not shown in detail as it is of known type, as well as abutment means 4 for positioning the workpiece in a working region defined in the work table.

[0022] The machine 1 further comprises at least one work head 5, associated with base 2, which is movable relative to the work table 3; for example, the work head is pivotally associated with base 2 for rotation relative to at least one axis substantially parallel to the work table 3 according to a rotation R1, shown in the figure.

[0023] In particular, the work head 5 is provided with a circular blade 6 having a region at least partly exposed from the work head and rotating, through motor means 7 of a type known to a person skilled in the art, for carrying out cutting of the workpiece.

[0024] The work head 5 is for example pivotally associated with base 2 relative to two distinct rotation axes, i.e. a first axis orthogonal to the lying plane of the blade 6 for moving the work head close to/away from the work table 3 following the rotation R1 and a second axis parallel to said lying plane for inclination of the work head 5 and consequently the blade, to the work table 3, which rotation is identified by reference R2.

[0025] The work head 5, in the preferred embodiment shown in the figure, has an auxiliary work table 8 associated in an adjustable manner with the upper portion of the work head itself; the auxiliary work table is provided with a through slot from which the upper portion of blade 6 emerges for cutting a further piece.

[0026] In particular, the auxiliary work table 8 is adjustable as known to a person skilled in the art, being adjustable the distance between the auxiliary work table 8 and the hinging axis of blade 6 on the work head 5, so that it is possible to adjust the cut depth imparted to the further piece by the upper portion of blade 6 emerging from the

auxiliary work table.

[0027] The work head 5 comprises guard means for at least an exposed portion of blade 6 from the work head 5.

5 **[0028]** In particular, by "exposed portion" it is intended the lower and/or upper arc of blade 6 emerging from the work head 5 comprising the lower and/or upper active portion for cutting the workpiece.

10 **[0029]** The guard means is pivotally associated with the work head 5 for progressive exposure of blade 6 during cutting of the workpiece.

[0030] Advantageously, the guard means comprises at least one first guard element 9 for protection of the lower portion of blade 6 distal from the hinging point 10 of the work head 5 on base 2.

15 **[0031]** The first guard element 9 is for instance alternately movable between a retracted configuration in the work head 5, for releasing the lower active portion of blade 6 for engagement on the workpiece, and an extended configuration for covering at least said lower exposed portion. The first guard element 9, in the particular embodiment shown in the figure, comprises at least one first and one second circular sector, 9a and 9b respectively, which are pivotally associated with the work head 5 around respective rotation axes substantially parallel to the rotation axis of blade 6.

20 **[0032]** The first and second circular sectors 9a and 9b comprise at least one first and one second plate respectively which have a lune-shaped conformation and are substantially disposed in coplanar relationship with blade 6 in the vicinity of the blade itself. In turn, each plate has a peripheral edge which is turned up in a U-shaped configuration for holding the corresponding portion of blade 6.

25 **[0033]** The first and second circular sectors, 9a and 9b respectively, are interconnected with each other by mutual-drive means, at least partly overlapped, of known type.

30 **[0034]** The drive means, as known, comprises at least one stud 11 protruding in a transverse direction from at least one of the first and second plates, and that, through progressive opening of said plate, is progressively slidably guided within a guide 12 associated with the other of the first and second plates.

35 **[0035]** In particular, the first circular sector 9a is pivotally associated with the work head 5 in coaxial relationship with blade 6 and comprises means 13 resting on the workpiece profile.

40 **[0036]** However different embodiments of the first guard element 9 are also possible, in which the second circular sector 9b is pivotally associated with the work head 5 coaxially with the blade itself, for example.

45 **[0037]** In addition, the guard means comprises at least one second guard element 14, pivotally associated with the work head 5, for protection of the lower portion of blade 6 proximal to the hinging point 10.

[0038] In particular, to the aims of present invention, the machine 1 comprises displacement means 15 for the

rotation fulcrum 16 of the second guard element 14.

[0039] The second guard element 14 is pivotally associated with the work head 5 with a rotation axis substantially parallel to the rotation axis of blade 6 and distinct therefrom.

[0040] The displacement means 15 comprises at least one interconnecting lever 17 interposed between the second guard element 14 and the work head 5.

[0041] The interconnecting lever 17 comprises at least one first end 17a pivotally associated with the work head 5 relative to an axis substantially parallel to the rotation axis of blade 6 and a second end 17b associated with the second guard element 14.

[0042] In an embodiment not shown in the figure, the interconnecting lever 17 can be pivotally associated with the work head 5 in coaxial relationship with blade 6, the first guard element 9 and the interconnecting lever 17 being counter-rotating for exposure of at least the active portion of the blade itself.

[0043] More specifically, the second end 17b is pivotally associated with the second guard element 14.

[0044] The machine 1 further comprises removable locking means restraining rotation of at least one of the second guard element 14 and the interconnecting lever 17 and associated with at least one of the second guard element, the interconnecting lever and the work head 5.

[0045] The locking means in particular is of the automatic activation type upon positioning of the second guard element 14 in a configuration for protection of the lower portion of blade 6 proximal to the hinging point 10 and/or upon positioning of the work head 5 in a configuration moved close to and/or apart from the work table 3.

[0046] In the particular embodiment shown in the figure, the removable locking means comprises at least one catch 18 associated with the interconnecting lever 17 and adapted to be housed in at least one housing seat 19 formed at least at one of the work head 5 and the base 2.

[0047] In particular, the housing seat 19 is made at a support body 20 in the vicinity of the hinging point 10; the support body 20 is pivotally associated with the work head 5 and the base 2 respectively, as known to a person skilled in the art, for rotation of the work head itself relative to the work table 3 according to two distinct rotation axes.

[0048] The first guard element 9 and second guard element 14 are adapted to move independently of each other.

[0049] At all events, provision is made for locking means, with friction fit means 21 interposed between the first and second guard elements, 9 and 14 respectively, and advantageously between the second guard element 14 and the first circular sector 9a, for removably locking the guard elements themselves in the moved-apart configuration of the work head 5 from the work table 3.

[0050] The locking means, in the particular embodiment shown, are of such a nature that it is activated for locking of the interconnecting lever 17 of the first and second guard elements, 9 and 14 respectively, upon positioning of the work head 5 in the moved-apart configuration;

therefore, the machine 1 when in this configuration is in a fully safe condition for the operator, with the lower cutting edge of the blade 6 completely enclosed by the first and second guard elements 9 and 14, when the work head 5 is in the configuration moved apart from the work table 3.

[0051] The second guard element 14 is for example in the form of a plate disposed parallel to the lower blade portion and proximal to the hinging point 10 of the work head on base 2.

[0052] The machine 1 comprises feeler means following the profile of the workpiece, which is associated with the end of the second guard element 14 opposite to the fulcrum of rotation 16, in particular with the plate end facing the workpiece itself.

[0053] The feeler means, known by a person skilled in the art, rests on the workpiece for pushing the second guard element 14 from the protection configuration to the configuration of exposing the lower portion of said blade proximal to the hinging point 10, against the action of spring means.

[0054] In particular the spring means is in the form of a helical spring 22 for example and is directly interposed between the interconnecting lever 17 and the work head 5 for return of the interconnecting lever and therefore the second guard element 14, from the exposed to the protected configurations of the blade portion concerned with the second guard element.

[0055] In particular, the machine 1 comprises a pair of second guard elements 14 and a respective pair of said interconnecting levers 17 disposed on the opposite side relative to blade 6 for full protection of both the blade sides.

[0056] The work head 5 can further contemplate the presence of a third guard element for protection of the upper blade portion emerging from the slot formed in the auxiliary work table 8, the third guard element being not shown in the figure as known by itself.

[0057] The third guard element for example, consists of a casing which is rotatably or removably associated with the auxiliary work table 8 and is adapted to be fitted on the upper portion of blade 6 under non-use conditions of the latter, as known to those skilled in the art.

[0058] The work table further comprises a groove 23 for housing blade 6 which is formed in the work table and is disposed with its longitudinal axis substantially parallel to the lying plane of the blade itself.

[0059] The machine 1 can further comprise straight guide means for the work head 5, of known type or of the type being the object of a copending patent application of the same Applicant, which is associated with at least one of the work head 5 and the base 2 for translation of the work head relative to the work table 3, along a translation direction.

[0060] Advantageously, the translation direction is defined so as to be substantially parallel to the longitudinal axis of groove 23 and, therefore, to the lying plane of blade 6.

[0061] The work head 5 further comprises a slot 24 disposed in the vicinity of a lower blade portion close to the hinging point 10, this slot 24 being adapted to expose such a blade portion which in particular acts for carrying out working operations of the end trimming type, known to those skilled in the art.

[0062] Operation of the present invention is as follows.

[0063] Therefore the machine 1 employed for execution of end trimming operations on workpieces through cutting from above by means of the blade 6 portion which is the closest to the hinging point 10, contemplates that the second guard element 14 will expose such a blade portion, through rotation relative to the work head around the fulcrum of rotation 16, gradually with the progress of the cutting operation.

[0064] When the workpiece has a high longitudinal height and in particular substantially greater than the rotation stroke that the second guard element 14 is allowed to cover, the interconnecting lever 17 hinged on the work head 5 and the second guard element respectively, progressively rotates as cutting advances, against the action of the helical spring 22.

[0065] Rotation of the interconnecting lever 17, in particular, allows displacement of the fulcrum of rotation 16 and consequently enables a further rotation of the second guard element 14 adapted to uncover a larger portion of blade 6 concerned with the workpiece end trimming operation.

[0066] In particular, a further rotation of the second guard element 14 progressively releases the region interested by slot 24 and therefore causes the active portion of blade 6 contained therein to intervene.

[0067] When cutting has been completed and the end trimmed piece removed, the interconnecting lever 17 and the second guard element 14 are moved back by the action of the helical spring, for protection of the blade itself.

[0068] Practically, it has been ascertained that the disclosed invention achieves the intended purposes and it is in particular pointed out that the chop sawing machine of the invention has a reduced bulkiness while at the same time enabling cutting operations, in particular end trimming operations, without the sizes of the workpieces being limited.

[0069] In addition, the above described chop sawing machine ensures a good cut efficiency, above all in the so-called workpiece end trimming region, allowing wide sectors of active portion of the cutting member to come into contact with the workpieces, irrespective of the angle of inclination of the cutting member to the lower work table and of the shape of the workpiece.

[0070] Moreover, the invention as conceived allows a chop sawing machine to be obtained which has a simple structure, of relatively easy practical accomplishment, safe use and efficient operation, which in addition has a relatively reduced cost.

[0071] The invention as conceived is susceptible of many modifications and variations, all falling within the

scope of the inventive idea.

[0072] In addition, all of the details can be replaced by technically equivalent elements.

[0073] Practically the material used, the shapes and sizes can be of any nature and magnitude in accordance with requirements without departing from the protection scope of the following claims.

10 Claims

1. A chop sawing machine comprising a base defining at least one work table for support of at least one workpiece, at least one work head pivotally associated with said base, movable relative to said work table at least between a configuration that is close to said work table and a configuration moved apart therefrom and provided with a rotary circular blade at least partly emerging from said head and exposed for cutting of said workpiece; guard means for protection of at least one exposed portion of said blade from said work head, said guard means being pivotally associated with said work head for progressive exposure of said blade during the workpiece cutting; said guard means comprising at least one first guard element for the lower portion of said blade distal from the hinging point of said work head on said base and at least one second guard element for protection of the lower portion of said blade proximal to said hinging point, wherein the chop sawing machine comprises means for displacement of the fulcrum of rotation of said second guard element;
characterized in that said displacement means comprises at least one interconnecting lever interposed between said second guard element and work head.
2. A machine as claimed in claim 1, **characterized in that** it comprises at least one auxiliary work table for support of another workpiece, associated with said work head in an adjustable manner and disposed superiorly of the latter, said auxiliary work table being provided with at least one slot from which at least the upper portion of said blade emerges for cutting said further workpiece.
3. A machine as claimed in one or more of the preceding claims, **characterized in that** said second guard element is pivotally associated with said work head, its rotation axis being substantially parallel to the rotation axis of said blade and distinct therefrom.
4. A machine as claimed in claim 1 and in one or more of the preceding claims, **characterized in that** said interconnecting lever comprises at least one first end pivotally associated with said work head relative to an axis substantially parallel to the rotation axis of said blade and a second end associated with said

second guard element.

work head is in the configuration moved apart from the work table.

5. A machine as claimed in one or more of the preceding claims, **characterized in that** said interconnecting lever is pivotally associated with said work head in coaxial relationship with said blade, said first guard element and interconnecting lever being counter-rotating relative to each other for exposure of at least the active portion of said blade.

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6. A machine as claimed in claim 4 and in one or more of the preceding claims, **characterized in that** said second end is pivotally associated with said second guard element.

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7. A machine as claimed in one or more of the preceding claims, **characterized in that** it comprises removable locking means for restraining the rotation of at least one of said second guard element and interconnecting lever, said locking means being associated with at least one of said second guard element, interconnecting lever and work head.

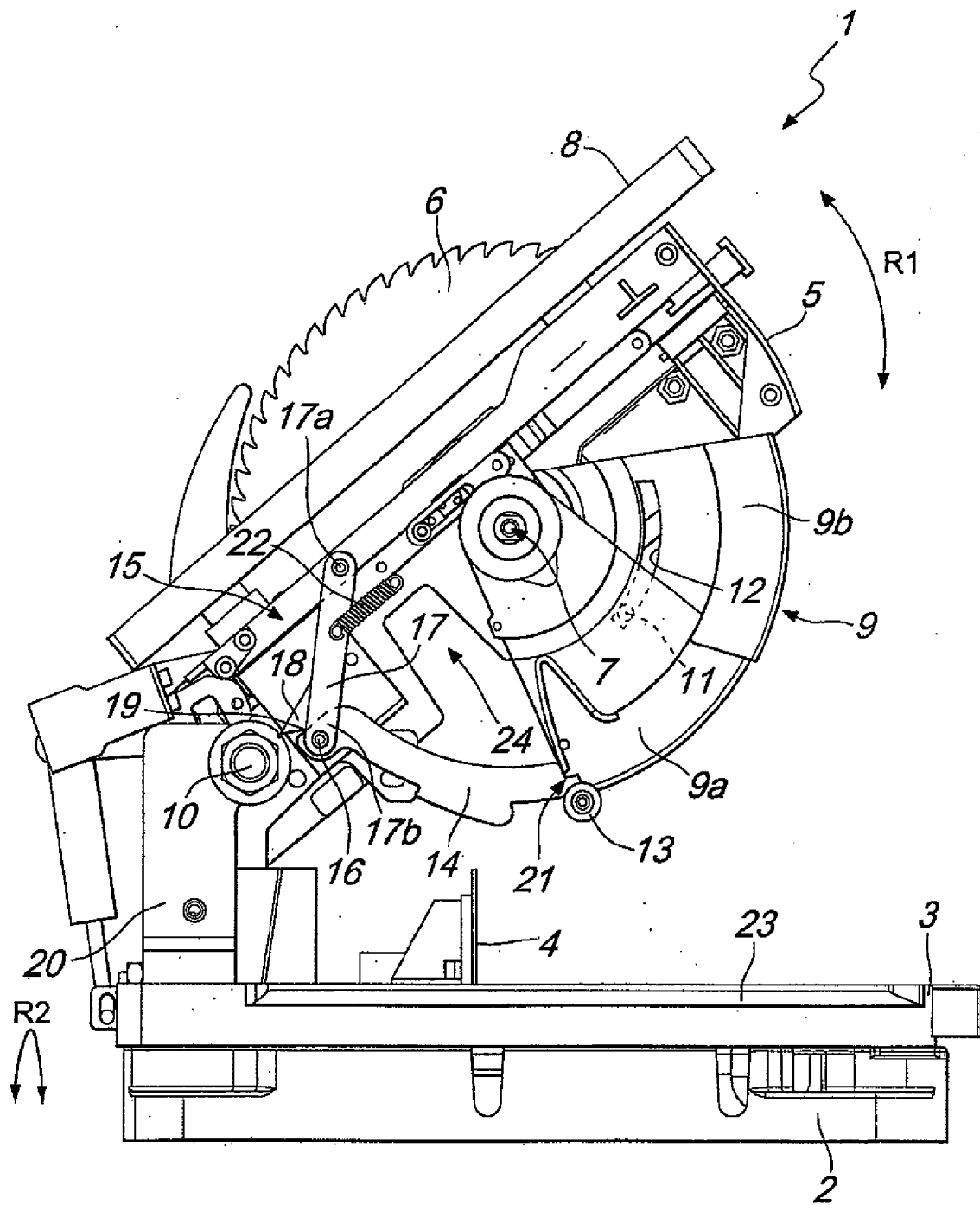
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8. A machine as claimed in one or more of the preceding claims, **characterized in that** said locking means is of the automatic activation type upon positioning of said second guard element in a configuration for protection of the lower portion of said blade proximal to said hinging point and/or upon positioning of said work head in said approached and/or moved apart configuration relative to said work table.

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9. A machine as claimed in one or more of the preceding claims, **characterized in that** said second guard element comprises feeler means following the profile of said workpiece, associated with the end of said second guard element opposite to said fulcrum of rotation facing said workpiece, for pushing said second guard element from the protection configuration to the configuration of exposing said lower portion of said blade proximal to said hinging point, against the action of spring means.

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10. A machine as claimed in claim 1, **characterized in that** said work head comprises at least one slot disposed in the vicinity of the lower portion of said blade close to said hinging point for exposure of said active lower portion of said blade close to said hinging point.

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11. A machine as claimed in one or more of the preceding claims, **characterized in that** it comprises a pair of said second guard elements and a pair of said interconnecting levers disposed on the opposite side relative to said blade.

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12. A machine as claimed in claim 1, **characterized in that** said first and second guard elements fully enclose the lower edge of the cutting blade when the





EUROPEAN SEARCH REPORT

Application Number
EP 11 15 5320

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 297 07 664 U1 (HUANG PETER [TW]) 10 July 1997 (1997-07-10) * page 4, line 18 - page 5, line 4; figures 1,2 *	1-12	INV. B23D45/04 B27G19/04
A	US 5 950 514 A (BENEDICT CHARLES E [US] ET AL) 14 September 1999 (1999-09-14) * column 3, line 26 - column 4, line 50; figures 1-3 *	1-12	
			TECHNICAL FIELDS SEARCHED (IPC)
			B23D B27G
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 May 2011	Examiner Frisch, Ulrich
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 15 5320

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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24-05-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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