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Description

The invention relates to a processing unit for a machine for deburring a flat workpiece. The processing unit thereby sweeps across a flat side of the workpiece to be deburred.

- 5 When making holes and recesses in steel plate, which can be up to a few centimetres thick, nuisance burrs form on the top side and/or on the bottom side. These can for example be ground off using an abrasive drum. To do this, the workpiece is passed under the stationary, relatively quickly rotating abrasive drum.
- 10 Deburring machines also exist with horizontally revolving belts, which support a multiplicity of processing units arranged parallel to one another, which are formed in the style of brushes and have an abrasive element on their underside. In particular, packages of sand paper, emery cloth or abrasive fleece lying close to one another come into consideration as abrasive elements. The workpiece to be deburred is moved forward transverse to the movement direction of the processing
- 15 units. The exposed lower edges of the abrasive sheets sweep transverse to the feed direction of the workpiece over its surface and thereby remove the protruding burrs. The flexibility of the abrasive sheets allows these to penetrate the cut recesses. However, the mechanical abrasion means that the abrasive sheets wear relatively quickly.
- 20 In recent times, combined machines have also been developed, which comprise both a rotating abrasive drum and processing devices with horizontally revolving drive belts, which support brushes or similarly designed processing units. The processing units fitted with flexible abrasive sheets thus more easily remove the burrs and at the same time round off the sharp edges of the workpiece, whereas, due to its design, the abrasive drum cannot penetrate cut recesses in the
- 25 workpiece and/or round off its edges and therefore can only remove burrs protruding from the surface.

EP 2 792 450 A1 (see the generic term of Claim 1) discloses a machine for deburring sheet metal parts with continuously revolving drive belts on which a multiplicity of brushes are arranged

30 parallel to one another. The abrasive element of the brushes comprises a package of abrasive sheets, which are glued to the flat bottom side of a carrier plate using their upper edge. A backing fleece is respectively arranged between two adjacent abrasive sheets. Abrasive sheets and backing

fleeces protrude vertically from the bottom side of the carrier plate to which they are glued. This has the advantage that the exposed lower edges of the abrasive sheets impinge approximately parallel on the first edge of the workpiece or at least one piece can penetrate deep in holes or recesses of the workpiece, so as not only to deburr but also to round off these edges. Similar processing units with abrasive sheets lying close to one another and backing fleeces lying between are known from EP 1 910 024 B1.

DE 201 06 234 describes an abrasive device for smoothing a plate-shaped workpiece, preferably in wood, with a revolving abrasive band, which comprises a multiplicity of abrasive elements. The abrasive elements have strips of brushes consisting of bristles, on one side of which an abrasive cloth is applied. The abrasive elements are inclined opposite the transport direction of the workpiece, whereby the side of the abrasive element turned towards the workpiece is covered with the abrasive cloth.

DE 20 2005 011 640 U1 shows and describes a device for processing a strip-shaped or plate-shaped metal workpiece. Processing elements are fastened to the outer side of a revolving V belt. The processing elements are provided with metal bristles and can be inclined in the direction of rotation of the V belt, so as to be able to penetrate better into recesses of the workpiece. Alternatively, the processing elements can also be designed as abrasive sheets, whereby backing elements, preferably backing fleeces or backing felts are arranged between the individual abrasive sheets. The abrasive sheets are fastened vertically on a carrier element towards the movement direction of the processing unit. Processing units with abrasive sheets arranged vertically to the surface of the workpiece to be deburred, in particular sand papers or emery cloths, impinge hard on the edges of the workpiece. The result is that the lower edges of the abrasive sheets wear and fray relatively quickly.

The aim of the invention is to create an improved processing unit for a deburring machine, in which the processing unit is moved over the surface of the workpiece to be deburred, in particular to create a processing unit specially to remove slight and moderately difficult burrs.

The solution of the problem posed is based on a processing unit according to the generic term of Protection Claim 1. The aim is resolved by fastening the abrasive sheets on the carrier plate

inclined obliquely to the movement direction so that they fan out in the area of their lower edges.

In the processing unit according to the invention, the abrasive sheets are not therefore, as customary until now, standing vertically to the surface of the workpiece to be deburred, but have a setting inclined to the movement direction. The abrasive sheets therefore form an obtuse angle with the carrier plate. Due to this, two adjacent abrasive sheets no longer lie congruent with each other, but are arranged offset to each other. The result is that the lower edges of the abrasive sheets do not form a closed surface, but a stepped outline.

10 If the abrasive sheets arranged inclined obliquely to the movement direction now impinge on the edges of the workpiece, the edge slides more easily and with less friction resistance on the inclined abrasive sheet than would be the case with an abrasive sheet standing vertically or even inclined obliquely in the movement direction. The flexibility of the abrasive sheets means that even after a short operating time they bend against the movement direction, which causes further fanning in the area of the lower edges and therefore the exposure of larger areas of the abrasive sheet. Depending on the flexibility of the abrasive sheets used, an approximately flat abrasive surface actually forms after a certain service life parallel to the upper side of the workpiece to be deburred, formed from the lower bent areas of the individual abrasive sheets. The abrasive action thereby corresponds approximately to that of an abrasive drum, with which the movement direction of the abrasive product in the contact area runs tangential or parallel to the surface of the workpiece.

A conventional machine for deburring and rounding with processing units whose abrasive sheets are arranged vertically, can, if required, relatively easily be converted to a machine specially for removing slight burrs, in particular by exchanging the processing units with processing units according to the invention with abrasive sheets arranged inclined obliquely, which is then distinguished by considerably longer service lives of the processing units.

The angle enclosed by the abrasive sheets and the flat bottom side of the carrier plate is preferably between 3 and 60 degrees, measured in the area of the upper edges of the abrasive sheets near the carrier plate. An incline setting angle between 20 and 40 degrees, in particular 30 degrees, is particularly preferred. It has been shown in particular that a particularly good relation is obtained between deburring performance on one hand and wear resistance on the other.

The abrasive sheets advantageously comprise sand paper or emery cloth coated on one side with an abrasive product, wherein the abrasive side faces in the direction of the workpiece. The smooth side facilitates reciprocal movement of adjacent abrasive sheets, which assists the desired fanning
5 in the area of the lower edges.

The sand papers or emery cloths are expediently glued to the carrier plate using their upper edge. For this purpose, the carrier plate can have a peripheral, laterally projecting edge, which covers the upper area of the sand papers or emery cloths by a bit. As a result, a kind of trough forms on the
10 bottom side of the carrier plate, which can advantageously be moulded with a plastic mass. The sand papers or emery cloths can be immersed in this liquid plastic mass using their upper edge. Once the plastic mass has hardened, the sand papers or emery cloths are embedded in the plastic mass by a bit. The high strength bond achieved in this way between the sand papers or emery cloths and the carrier plate of the processing unit is the prerequisite for obtaining the precise
15 oblique setting of the abrasive sheets not only in a new unused processing unit, but also remaining in place throughout the entire operating life.

The flexibility of the abrasive sheets allows them to bend backwards in the movement direction and form a kind of cushion, which stretches over the surface of the workpiece to be deburred. So
20 as to improve the flexibility and elasticity of the package of abrasive sheets lying on top of each other by areas, in a particularly preferred embodiment of the processing unit according to the invention, a thin plate made from a flexible, elastic material, such as for example a plastic fleece, is respectively arranged between the individual abrasive sheets. The elasticity improved in this way, particularly in the area of the bottom side of the processing unit causes irregularities of the
25 workpiece to be evened out and at the same time pressure peaks on the abrasive sheets can be absorbed.

An embodiment example of the invention is described below with reference to the figures. These show:

- 30 Figure 1: a machine for deburring a flat workpiece, diagrammatically;
Figure 2: a single processing unit of the machine of Figure 1, in perspective;
Figure 3: the processing unit according to Figure 2, in side view;

Figure 4: a processing unit, in used condition, diagrammatically.

In Figure 1, only the essential part of a deburring machine is seen, to the extent that this is important for understanding the invention. Two parallel drive belts 1a, 1b revolve continuously
5 between two motor-driven belt wheels 2a, 2b. Mounting brackets 3 embodied in an L-shaped cross section are screwed onto the drive belts 1a, 1b and support processing units 4 embodied like brushes. The processing units 4, which belong to the upper belt drive 1a, are located mirror-inverted opposite the processing units 4, which are seated on the lower drive belt 1b.

10 A workpiece 5 in steel sheet, which is to be deburred, is fed down between the upper and lower processing units 4, vertical to the drawing plane. At the same time, the processing units 4 are moved by the drive belts 1a, 1b transverse to the feed direction of the workpiece 5. The processing units 4 thereby at the same time sweep across the top surface and the bottom surface of the workpiece 5 so as to remove burrs on the edges and at the same time also to round off the edges.

15 Figure 2 indicates that the processing units 4 include an essentially flat carrier plate 6. Retainers 7a, 7b, in which a bent tab of the mounting bracket 3 is inserted, are embodied on the top side of the carrier plate 6. A locking lug 8 latches with a recess of the mounting bracket 3 and thereby guarantees a fixed play-free seating of the carrier plate 6 on the mounting bracket 3. The carrier
20 plate 6 is injection moulded in a single piece of plastic. A peripheral projecting edge 9 is embodied on the bottom side.

A package of abrasive sheets 10 is fastened to the flat bottom side of the carrier plate 6. The abrasive sheets 10 are rectangular and here comprise for example sand paper, coated on one side
25 with an abrasive product. A multiplicity of abrasive sheets 10 is arranged parallel to one another on the carrier plate 6 and extend transverse to the movement direction of the processing unit 4. The thickness of the abrasive sheets 10 is exaggerated in the drawing. In reality, the thickness of an abrasive sheet 10 is for example 1 mm. The individual abrasive sheets 10 are fixed on the carrier plate 6 inclined obliquely to the movement direction (see arrow) of the processing unit 4. Due to
30 this inclined setting, the abrasive sheets 10 fan out in the area of their lower edges. The abrasive side of the abrasive sheets 10 is thereby exposed by a bit.

As shown in particular in Figure 3, the area enclosed by the edge 9 on the bottom side of the carrier plate 6 is moulded with a plastic mass 11. The abrasive sheets 10 are embedded in the plastic mass 11 using their upper edge. In this way, the abrasive sheets 10 are bonded extraordinarily firmly with the carrier plate 6.

5

The angle α between the abrasive sheets 10 and the carrier plate 6 here is approximately 35 degrees for example, measured in the area of the upper edge of the abrasive sheets 10. The abrasive sheets 10 are arranged towards the movement direction of the processing unit 4, so that the side of the abrasive sheets coated with abrasive product faces in the direction of the workpiece 5. The abrasive side of the abrasive sheets 10 therefore impinges at an oblique angle on the respective front – right in Figure 3 – edges of the workpiece 5, so as to deburr same or lightly to round them off.

Due to the flexibility and elasticity of the abrasive sheets 10, these bend against the movement direction of the processing unit 4, which causes a significant reduction of the angle between the abrasive sheet and the carrier plate in the area of the lower edges. Figure 4 illustrates this process and shows the wear the abrasive sheets 10 are subject to. The wear of the sand paper takes place as a result of the abrasive grains being ground down until the backing material is exposed. This material is then quickly knocked off at the edges of the metal workpiece, so that the adjacent layer of sand paper is exposed piece by piece.

After a certain service life, the abrasive sheets 10 have bent so far backwards and at the same time upwards, therefore away from the workpiece 5, that the total height of the processing unit 4 has reduced significantly. At the same time, the abrasive sheets 10 have fanned out more in the area of their lower edges, so that a greater part of their abrasive side is no longer covered by the respective adjacent abrasive sheet 10, but is exposed. As a result, the package of abrasive sheets 10 forms an almost flat surface on its bottom side, the surface running approximately parallel to the top side of the workpiece 5. As a result, the abrasive product of the abrasive sheets 10 essentially only comes into contact with the top side of the workpiece 5 and only to a slight extent with its vertical edges. At the same time, the effective abrasive surface of the processing unit 4 has significantly increased in size compared with a fresh processing unit, in which the abrasive sheets 10 still run more or less straight (see Figure 3).

The degree of bending of the abrasive sheets 10 can be varied and optimised using the contact pressure of the processing unit 4 on the workpiece 5. If required, the bending of the abrasive sheets 10 can be increased or reduced as the case may be by inserting thin plates 12 (see Figure 4) made from a flexible elastic material, for example fleece or felt, between the individual abrasive sheets 10.

Reference signs

	1a, 1b	Drive belts
10	2a, 2b	Belt wheel
	3	Mounting bracket
	4	Processing unit
	5	Workpiece
	6	Carrier plate (of 4)
15	7a, 7b	Retainer
	8	Locking lug
	9	Edge
	10	Abrasive sheets
	11	Plastic mass
20	12	Plates

Patentkrav

1. Bearbejdningssenhed til en maskine til afgratning af et fladt emne, hvor bearbejdningssenheden stryger hen over overfladen af emnet til afgratning, med
en i alt væsentligt plan bæreplade (6),
5 en pakke af rektangulære, fleksible slibeblade (10), der er anbragt parallelt med hinanden på bærepladen (6) og strækker sig på tværs af bearbejdningssenhedens (4) bevægelsesretning,
kendetegnet ved, at
de enkelte slibeblade (10) er fastgjort på bærepladen (6) skråt hældende på
bearbejdningssenhedens (4) bevægelsesretning, hvorved slibebladene udbredes i vifteform i
10 området af deres underkanter.
2. Bearbejdningssenhed ifølge krav 1, **kendetegnet ved, at** vinklen mellem slibebladene (10) og bærepladen i området af slibebladenes (10) overkant er mellem 3 og 60 grader, fortrinsvis mellem 20 og 40 grader.
15
3. Bearbejdningssenhed ifølge et hvilket som helst foregående krav, **kendetegnet ved, at** slibebladene (10) består af slibemiddelbelagt slibepapir eller smergellærred, hvor slibesiden vender i emnets (5) retning.
- 20 4. Bearbejdningssenhed ifølge et hvilket som helst foregående krav, **kendetegnet ved, at** slibebladene (10) er klæbet til bærepladen (6) med deres overkant.
5. Bearbejdningssenhed ifølge krav 4, **kendetegnet ved, at** bærepladen (6) har en periferisk, lateralt fremstående kant (9), der dækker det øvre område af slibebladene (10) et stykke.
25
6. Bearbejdningssenhed ifølge krav 4 eller 5, **kendetegnet ved, at** et plastmateriale (11), hvori slibebladene (10) er indlejret med deres overkant, er hældt ud på bærepladens (6) underside.
- 30 7. Bearbejdningssenhed ifølge et hvilket som helst af kravene 1 til 6, **kendetegnet ved, at** en tynd plade (12) af et fleksibelt, elastisk materiale henholdsvis er anbragt mellem de enkelte slibeblade (10).

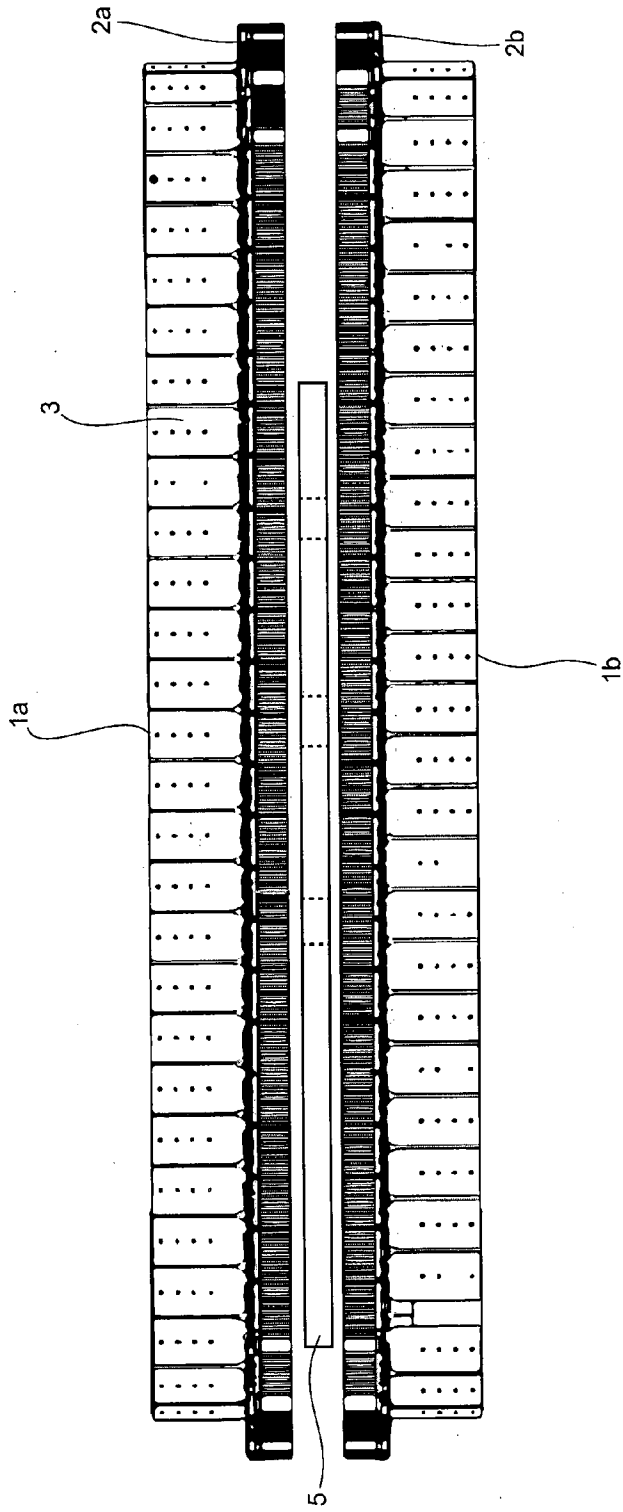


Fig. 1

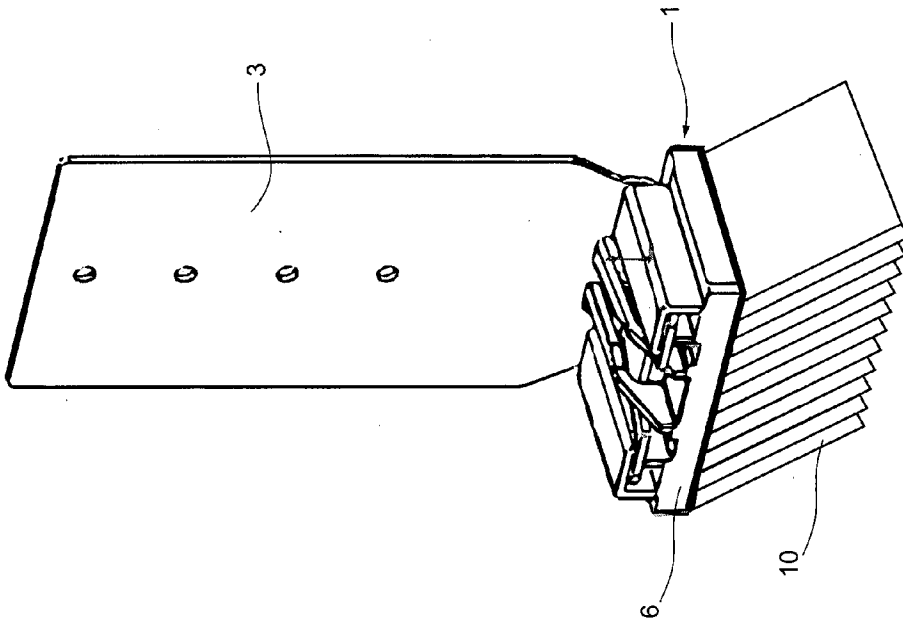


Fig. 2

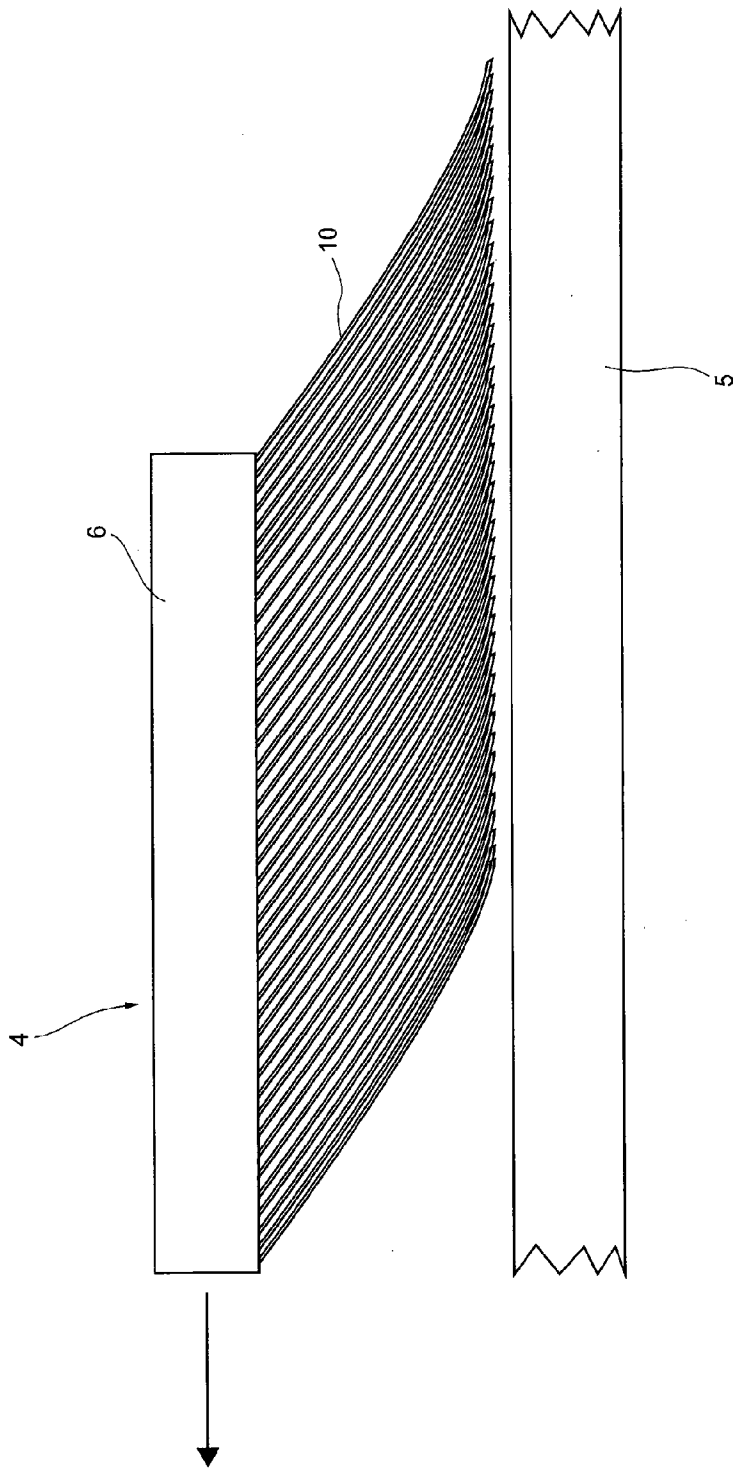


Fig. 4