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(54) Device for shortening translucent multilateral plate material

Vorrichtung zum Verkürzen von durchsichtigen multilateralen Plattenelementen

Dispositif pour raccourcir des éléments translucides en forme de plaques multilatérales

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Description

[0001] The invention relates to a device according to the preamble of claim 1 for shortening translucent plate material of at least two basically parallel synthetic plates which have been connected by means of a number of parallel dividing walls, including at the same time a number of elongated channels.


[0003] When this type of multilateral plate material is shortened, especially in a direction transverse to the dividing walls, it is important to avoid too much pressure on the material where it is cut, because otherwise the occurring mechanical pressure could cause the walls to deform or even collapse. In case of a known device of the type as referred to in the opening lines, the plate material is sawn to the desired size to realise this. Although the mechanical stress on the plate material is extremely small in this case, a device of this type has the disadvantage that the plate material will become electrostatic as a consequence of the swiftly rotating saw plate, which will attract dirt and dust from the environment. Furthermore, some of the chips produced by the sawing, will inevitably end up in the channels of the plate material. The pollution, thus gathered in the channels, will concentrate itself in those spots which have the highest electrostatic charge. Because of this, this pollution, which can be seen from outside in the translucent plate material, is to be removed at a later stage, for example by blowing through each individual channel. Not only is additional handling required, but new pollutants outside air is almost inevitably admitted in the channels, which can become a germ for algal or fungal growth or spots of another kind.

[0004] For that matter, it should be noted that here the term translucent is to cover all types of plate material which are to a certain extent light transparent and susceptible to the above-mentioned growth of spots. This does not apply to purely transparent material only, but also to opal, milk white or otherwise coloured or treated plate material.

[0005] The invention aims at providing an installation as referred to in the opening lines which avoids both an intolerable stress on the plate material and the above-mentioned disadvantages of the known device.

[0006] According to the invention this is achieved by the features of claim 1.

[0007] Because the installation uses, in accordance with the invention, knives to cut the plate material, formation of chips is accordance with the invention, knives to cut the plate material, formation of chips is avoided, or limited to a minimum. Furthermore, the plate material will, because of the very limited amount of friction with the plate material, when compared with sawing, become considerably less electrostatic and will thus attract less dirt and dust. In accordance with the invention, the sound level and thus the annoyance of the invention will be much lower in practice than when a sawing installation is used. Because the rotating knives have been provided with propellants enabling the knives to rotate, when in use, with a speed of rotation different from the throughput speed used for the plate material, it is possible to modify the relative speed of the knives with regard to the throughput speed used for the plate material, to the extent desired, to limit their friction, and as a consequence of this, the electrostatic charging of the plate material. All this leads to reduced attraction of dirt and dust particles by the plate material which could eventually negatively influence the translucency of the plate material.

[0008] To avoid deformation or even collapsing of the plate material and especially of the dividing walls as a consequence of the pressure caused by the rotating knives, the rotating knives have been placed slantwise behind each other on both sides which ensures that the normal forces which the knives, when in use, apply on the plate material do not work against each other on the same line.

[0009] Furthermore, the knives promote, while working bilaterally together, a desired bevelled edge on both outer plates of the plate material, without a sharp ridge which could tear up a finishing of the edge, if any, which is usually strip stock.

[0010] Because of this, a special version of the device according to the invention is characterised in that the combined penetration of the rotating knives slightly exceeds the thickness of the plate material, and that the knives are slightly separated at their outlines. Because the combined penetration of the knives is, without the risk of damage, set to exceed slightly the thickness of the plate material, a complete cut through the plate material is ensured. To be able to shorten very thick plate material, a special version of the device according to the invention, is characterised in that at least one of both rotating knives can be adjusted in height in a direction transverse to the plane of entry. Thus a deep cut can be realised by repeated cuttings, which become deeper with every repetition, without intolerable friction with or pressure on the plate material.

[0011] In a practical embodiment of the device according to the invention it is characterised in that the rotating knives have been installed on a frame, under which a wagon has been placed on a linear guiding system to be able to move them, while, more specifically, the frame has been provided with means of attachment to fix the plate material on it.

[0012] The invention will now be discussed in more detail using an example of an embodiment and an accompanying drawing in which:

figure 1 shows a perspective front view of an embodiment of the device according to the invention;
figure 2 shows a cross section of the cutting part of the device of figure 1; and
figure 3 shows a cross section in a direction trans-
The drawings are purely schematic and have not been drawn to scale. Especially for reasons of clarity, some dimensions are represented extremely large or small. The corresponding parts in the figures are to the best possible extent indicated with one and the same reference number.

An embodiment of a device according to the present invention is represented in figures 1-3, showing the front view and two detailed cross sections, respectively. In this example the device includes a frame 1, on which means of fixation, in the form of table 2, are attached for the plate material to be processed. Table 2 includes a stop 3 underneath against which the plate material can be positioned, when in use. For shortening the plate material, the installation has been provided with two rotating knives 4, 5 placed opposite each other, which have been placed in a closed screening cap 6 for reasons of safety, which is the reason why they cannot be seen in figure 1. However, the interior of screening cap 6 has been drawn in more detail in the cross sections of figure 2 and 3.

Both knives 4, 5 have been installed on wagons 7, 8 respectively which both run on a linear guiding system 9, 10 attached to frame 1. This makes it possible to make dead straight cuts. Both wagons 9, 10 use screw windings which can be energized with an engine 11 for their propulsion. For that matter, within the framework of the invention, it is possible to use other propelling agents for the wagons, for example pneumatic or hydraulic systems. When the wagons 7, 8 are moved over guiding 9, 10 they both run along a gear rack 12, 13 which is in mesh with a toothed wheel 14, 15 hereafter to be referred to as intermediate gear, which drives a toothed wheel 16, 17 placed on a shaft 18, 19 of one of the rotating knives 4, 5. This results in a transmission ratio of approximately 2:1 between gear racks 12, 13 and knives 4, 5; because of which the speed of rotation of the rotating knives is always 50% of the throughput speed over plate material 20. However, this ratio can be modified in practice, if desired, and be adapted to specific plate materials to realise an optimum effect. Thus, the friction between the plate material and the knives and therefore the electrostatic charging of the plate material can be limited.

Furthermore, the rotation of the knives safeguards, when in use, a straight clean cut and a minimal wear of the knives which guarantees a long standing time.

The device has especially been developed for shortening multilateral plate material of at least two mostly parallel exterior plates 21, 22 which have been separated by means of a number of parallel dividing walls 23. Typically, plate material of this type has been manufactured with polycarbonate or other translucent synthetic material. The dividing walls 23 cover almost the entire length or width of the plate material, thus forming a number of elongated cavity channels 24 in the plate material which are responsible for its warmth insulating qualities. Compared with solid plate material, much more attention is to be paid to the pressure put on exterior plates 21, 22 when this type of plate material is used for shortening this material. Too much pressure will cause the dividing walls to deform or even collapse.

For shortening, plate material 20 is placed on table 2 and pushed against stop 3. To realise this material is positioned in such a way that the desired cut level with the rotating knives 4, 5. The table includes a number of parallel joists 25, 26 which extend from the right and from the left of rotating knives 4, 5 respectively, leaving together with stop 3 some space which gives free passage to knives 4, 5 see figure 2. When the plate material is cut, the plate material is firmly pressed on table 2 using pressure devices shaped like two-jointed pressure beam 28. The pressure beam too is discontinued in the plane of intersection to give knives 4, 5 free passage. Because the table joists on the left 25 and on the right 26 as well as the parts of the pressure beam form a slight angle, the vertex of which lies in the plane of intersection, the plate material is slightly bent backwards causing a slight deviation near the plane of intersection. Thus, an intolerable friction with the plate material of especially upper knife 4, which almost completely penetrates the thickness of the plate material, is avoided.

Thus, possible levering of knife 4 in the plate material is adequately prevented. A slight angle is enough, in this respect, to realise satisfactory results, when thicker plate material is used, whereas too large a wedge in table top 2, for example of more than 10 degrees, would put an intolerable pressure on the plate material causing deformations. Possible levering of knives 4, 5 in plate material 20 is furthermore limited by shafts 18, 19 which are supported on bearings installed on the relevant wagon 7, 8 which realises complete absence of play.

Because penetration depth d4 of the upper knife almost equals the thickness of the plate material and penetration depth d5 of the lower knife not or hardly exceeds the thickness of lower exterior plate 22 and therefore only cuts through the "soul" of the plate material, the friction of this knife 5 with plate material 20 is limited. However, the cutting through with this knife 5 does provide the desired bevelled edge of the lower exterior plate 22 which avoids the possible tearing or breaking of an edge finishing.

Because both knives 4, 5 are, in accordance with the invention, placed slantwise behind each other, a situation is prevented in which the knives work into a similar line of normal force on the plate material limiting the total amount of pressure on dividing wall 23 and especially avoiding too much stress on the dividing walls. Furthermore, positioning knives 4, 5 in such a way offers the possibility of a combined penetration depth of both knives; this means that penetration depth d4 of the up-
per knife 4 is added to penetration depth d5 of the lower knife 5, which is only slightly deeper than the thickness of the plate material. This ensures a complete cut through plate material 20. At their outlines both knives 4, 5 are separated by a small margin d45 ensuring that the knives 4, 5 will never touch each other, which would cause premature wear of the knives.

Unlike in a situation in which the familiar installation for shortening plate material of this type is used, in which case the plate material is usually sawn mechanically, the knives 4, 5 will produce a small quantity of chips or none at all.

Because the friction and therefore the electrostatic charging of the plate material is, compared with the familiar installation, considerably limited, hardly any dirt or dust penetrates the cavity channels 24. Because of this, an additional step in the process which is to blow chips, dirt and dust out of the translucent cavity channels 24, as is necessary for the familiar installation, can, in accordance with the invention, be avoided for the installation.

In practice, the device described here has shown to be able to cut multilateral plate material varying in thickness and stacking satisfactorily to size using high throughput speed.

Although in the above paragraphs the invention has been explained on the basis of a few embodiment examples only, it is obvious that the invention is not at all restricted to these examples. On the contrary, within the scope of the claims there are many possible varieties and forms for an average craftsman. Thus, the upper knife can be installed adjustable in height in order to realise a cutting through of the plate material by repeated cuttings, which become deeper with every repetition. Impermissible friction of the knife with the plate material and impermissible stress on the material can thus be avoided to an even larger extent.

Furthermore, the invention can be supplemented with small stationary sliding knives, preferably placed on either side very close alongside both rotating knives. Protective tinfoil, if any, attached on the exterior plates, can be cut off where the plate material begins, making it possible to remove a small strip afterwards. The remaining tinfoil, however, is kept in place to keep on protecting the plate material until it has been installed with the end user. Thus, a small strip of plate material is uncovered just before the ease is typically finished with some tape. The attached tape sticks to lanes, typically 15 mms wide, which have been freely laid out on either side of the plate material, and thus in the same process track.

The pair of knives can be installed in a stationary version too so that the plate material can be put through in between them. In this case, an adequate stop of the plate material can promote a linear guidance causing dead straight cuts.

In general, the invention offers an installation of the type as referred to in the opening lines which avoids too much pressure because of a pair of knives with a specific position with respect to each other which makes it especially suitable for multilateral plate material, which plates are separated by relatively vulnerable dividing walls. However, the area of application of the installation is, in accordance with the invention, not restricted to the above-mentioned multilateral plate material. The installation can also be used for shortening solid plate material, within a certain thickness, and can especially be used, if, in accordance with the model version described above, installed with a wedge-shaped table top, for shortening foamed plate materials which can be cut excellently because of the wedge-shaped table top.

Claims

1. Device for shortening translucent plate material (20) of at least two basically parallel synthetic plates mutually connected by means of a number of parallel dividing walls, which separate a number of elongated channels, the device having means for shortening the plate material with a mostly rectilinear cut, comprising two substantially coplanar knives (4,5) rotatably mounted around a first and second shaft (18,19) respectively slantwise behind each other, which knives are to act on the plate material from opposite sides in a common cutting plane with a combined penetration of at least the thickness of the plate material and are provided with propellants enabling the knives to rotate, during use, with a speed of rotation different from the through process speed of the plate material, and the device further comprising support means for supporting the plate material in a plane which is substantially transverse to the plane of said knives, the support means comprise two parts (25,26) disposed on opposite sides of the plane of the knives, each of said two parts providing a support surface for said plate material, characterized in that said support surfaces form a small angle with each other whose vertex is substantially in said plane of said knives and in that the penetration depth of the knife (5) passing though the support means is only slightly deeper than the thickness of the synthetic plate thereby penetrated.

2. Device according to claim 1, characterised in that pressure means are present to press the plate material on the table on either side of the plane of intersection, at least during use.

3. Device according to claim 1 or 2 characterised in that said angle does not exceed 10 degrees.

4. Device according to any of the preceding claims, characterised in that the combined penetration of
the rotating knives is slightly deeper than the thickness of the plate material, and that the knives are slightly separated at their outlines.

5. Device according to any of the preceding claims characterised in that the knife (4) located above the support means (25,26) is mounted so as to act on the plate material prior to the other knife.

6. Device according to claim 4 or 5 characterised in that at least one of the knives can be adjusted in height in a direction transverse to the plate material.

7. Device according to one of the preceding claims, characterised in that the knife are mounted on a frame (1) and are movable on a linear guiding system by means of a wagon (7,8).

8. Device according to claim 7 characterised in that the guiding system comprises a gear rack (12,13) in that the knives comprise a toothing (14,15,16,17) which engages said gear rack (12,13).

Patentansprüche

1. Vorrichtung zum Ablängen von lichtdurchlässigem Plattenmaterial (20) aus zumindest zwei grundsätzlich parallelen synthetischen Platten, die mit Hilfe einer Anzahl von parallelen Trennwänden miteinander verbunden sind, welche eine Anzahl von langen Kanälen trennen, wobei die Vorrichtung Mittel zum Ablängen des Plattenmaterials mit einem überwiegend geradlinigen Schnitt besitzt, mit zwei im Wesentlichen koplanaren Messern (4, 5), die jeweils schräg hintereinander auf einer ersten und einer zweiten Welle (18, 19) drehbar angeordnet sind, wobei die Messer so ausgebildet sind, dass sie auf das Plattenmaterial in einer gemeinsamen Schnittebene von einander entgegengesetzten Seiten einwirken, und zwar mit einer gemeinsamen Eindringung von zumindest der Dicke des Plattenmaterials, und wobei die Messer mit Antrieben versehen sind, die es den Messern im Betrieb ermöglichen, mit einer Rotationssgeschwindigkeit zu drehen, die sich von der Durchschnittsgeschwindigkeit des Plattenmaterials unterscheidet, und wobei die Vorrichtung ferner Haltemittel aufweist zum Halten des Plattenmaterials in einer Ebene, die im Wesentlichen quer zu der Ebene der Messer liegt, und dass die Eindringtiefe des durch die Haltemittel hindurchtretenden Messers (5) nur geringfügig tiefer ist als die Dicke der dabei durchdrungenen synthetischen Platte.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass Druckmittel vorhanden sind, um das Plattenmaterial zumindest im Betrieb auf jeder Seite der Schnittebene auf den Tisch zu drücken.

3. Vorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass der Winkel 10 Grad nicht übersteigt.

4. Vorrichtung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass die gemeinsame Eindringung der rotierenden Messer geringfügig tiefer ist als die Dicke des Plattenmaterials und dass die Messer an ihren Umrisslinien geringfügig getrennt sind.

5. Vorrichtung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass das oberhalb der Haltemittel (25, 26) angeordnete Messer (4) so angeordnet ist, dass es auf das Plattenmaterial früher als das andere Messer einwirkt.

6. Vorrichtung nach Anspruch 4 oder 5, dadurch gekennzeichnet, dass zumindest eines der Messer in einer Richtung quer zu dem Plattenmaterial in der Höhe eingestellt werden kann.

7. Vorrichtung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass die Messer auf einem Rahmen (1) angeordnet sind und dass sie mit Hilfe eines Wagens (7, 8) auf einem linearen Führungssystem beweglich sind.

8. Vorrichtung nach Anspruch 7, dadurch gekennzeichnet, dass das Führungssystem eine Zahnstange (12, 13) aufweist und dass die Messer eine Verzahnung (14, 15, 16, 17) aufweisen, die in die Zahnstange (12, 13) eingreift.

Revendications

1. Dispositif pour raccourcir un matériau en plaques translucides (20) composé d’au moins deux plaques synthétiques essentiellement parallèles mutuellement connectées au moyen d’un certain nombre de parois de séparation parallèles, qui séparent un certain nombre de canaux allongés, le dispositif comportant un moyen pour raccourcir le matériau en plaques avec une coupe principalement rectiligne, comprenant deux lames sensiblement coplanaires (4, 5) montées à rotation autour d’un premier et d’un deuxième axe (18, 19) respectivement de
biais l'un derrière l'autre, lesquelles lames doivent agir sur le matériau en plaques depuis des côtés opposés dans un plan de coupe commun avec une pénétration combinée valant au moins l'épaisseur du matériau en plaques et sont pourvues de propulseurs permettant aux lames de tourner, en utilisant, avec une vitesse de rotation différente de la vitesse de débit du matériau en plaques, et le dispositif comprenant en outre un moyen de support pour supporter le matériau en plaques dans un plan qui est sensiblement transversal par rapport au plan desdites lames, le moyen de support comprend deux parties (25, 26) disposées sur les côtés opposés du plan des lames, chacune de ces deux parties constituant une surface de support pour le matériau en plaques, caractérisé en ce que lesdites surfaces de support forment un petit angle entre elles dont le sommet est sensiblement dans le plan desdites lames et en ce que la profondeur de pénétration de la lame (5) traversant le moyen de support est seulement légèrement plus grande que l'épaisseur de la plaque synthétique ainsi pénétrée.

2. Dispositif selon la revendication 1, caractérisé en ce que des moyens de pression sont présents pour presser le matériau en plaques sur la table de chaque côté du plan d'intersection, au moins pendant l'utilisation.

3. Dispositif selon la revendication 1 ou 2, caractérisé en ce que ledit angle ne dépasse pas 10 degrés.

4. Dispositif selon l'une quelconque des revendications précédentes, caractérisé en ce que la pénétration combinée des lames en rotation est légèrement plus grande que l'épaisseur du matériau en plaques, et en ce que les lames sont légèrement séparées au niveau de leurs contours.

5. Dispositif selon l'une quelconque des revendications précédentes, caractérisé en ce que la lame (4) située au-dessus du moyen de support (25, 26) est montée de façon à agir sur le matériau en plaques avant l'autre lame.

6. Dispositif selon la revendication 4 ou 5, caractérisé en ce qu'au moins l'une des lames peut être réglée en hauteur dans une direction transversale au matériau en plaques.

7. Dispositif selon l'une quelconque des revendications précédentes, caractérisé en ce que les lames sont montées sur un châssis (1) et sont mobiles sur un système de guidage linéaire au moyen d'un chariot (7, 8).

8. Dispositif selon la revendication 7, caractérisé en ce que le système de guidage comprend une crémaillère (12, 13) et en ce que les lames comprennent une denture (14, 15, 16, 17) qui coopère avec ladite crémaillère (12, 13).