EUROPEAN PATENT SPECIFICATION

(54) Method for adjusting cutting dies and die cutting machine equipped with such a compensating sheet

Verfahren zum Zurichten von Stanzwerkzeugen, sowie mit einem solchen Zurichtbogen ausgerüstete Stanzmaschine

Procédé pour l’ajustage d’outils d’estampage, ainsi que machine d’estampage équipée d’une telle feuille

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(64) References cited:
EP-A- 0 125 667
US-A- 5 172 622

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Description

[0001] The present invention concerns a method for adjusting cutting dies, in a die cutting machine equipped with several simultaneously operated cutting dies, as well as a die cutting machine equipped with a compensating sheet.

[0002] In the first place, the invention is designed to be applied for the die cutting of paper and/or boxboard, for example to form cartons, such as folding cartons and such, out of a sheet or roll of cardboard or corrugated board, or for the die-cutting of any other material which can be processed on bending/die cutting machines and similar cutting machines.

[0003] It is known that for the die cutting of cardboard, use is made of a cutting forme in which several cutting dies and/or bending, scoring or embossing forms are provided, as well as a metal cutting plate provided against the backsides of the cutting dies and the cutting forme and which can be moved by means of a press-on system. During the die cutting, the cutting dies go through the cardboard, after which they make contact with a typically hard, usually metal base. It is hereby of primary importance that all the cutting edges of the cutting dies make contact with the base at the end of the die-cutting movement. Otherwise, a number of cuts will be incomplete.

[0004] Due to inaccuracies and/or wear and tear of the cutting dies and due to tolerances, deviations and/or wear of the parts of the die cutting machine concerned, the above-mentioned demand will in fact be hardly or never met right away, at least when no compensation is provided for.

[0005] According to a known method, of which a number of embodiments are described in the documents US 4.955.855, EP 0 125 667 which is regarded as the closest prior art, EP 0 297 324, EP 0 655 303 and WO 91/03358, the differences in height of the cutting dies are offset by means of a compensating sheet made of a compressible material working in conjunction with the backsides of the cutting dies, which preferably work in conjunction with a base during the die cutting, whereby the differences in height of the cutting dies are offset by means of a compensating sheet made of a compressible material working in conjunction with the backsides of the cutting dies, characterized in that a sheet made of polycarbonate or a material on the basis of polycarbonate is used as a compensating sheet.

[0006] According to the known method, use is made of compensating sheets or compensating foils made of polyurethane, metal, tetrafluoroethylene, paper or a combination thereof.

[0007] It has been revealed in practice that the use of compensating sheets made of these materials do not meet the required demands in many cases, especially when die cutting boxboard. In many cases, the use of the existing compensating sheets either results in an insufficient compensation or in a too heavy load on the cutting edges of the cutting dies. In both cases, this leads to an incomplete cut, in the first case because certain cutting dies do not go entirely through the material to be cut, and in the second case because a number of the cutting edges become blunt.

[0008] The invention aims among others to remedy this problem.

[0009] To this end, the invention concerns a method for adjusting cutting dies in a die cutting machine equipped with several simultaneously operated cutting dies, which preferably work in conjunction with a base during the die cutting, whereby the differences in height of the cutting dies are offset by means of a compensating sheet made of a compressible material working in conjunction with the backsides of the cutting dies, characterized in that a sheet made of polycarbonate or a material on the basis of polycarbonate is used as a compensating sheet.

[0010] By applying a compensating sheet made of polycarbonate according to the invention, particularly good adjusting qualities are obtained. In particular, a perfect compensation is obtained without any damage to the cutting dies.

[0011] Moreover, the invention also concerns a die cutting machine according to claim 12 and whose characteristics will become clear from the following description.

[0012] In order to better explain the characteristics of the invention, the following preferred embodiment of the invention is described as an example only without being limitative in any way, with reference to the accompanying drawings, in which:

figures 1, 2 and 3 schematically represent three steps of the method.

[0013] As represented in figure 1, it is known that when die cutting a material 1, in particular paper and cardboard, as well as corrugated board, use can be made of a cutting forme 2 in which several cutting dies 3A-3B are provided, as well as a metal cutting plate 4 working in conjunction therewith, provided against the backsides 5 of the cutting dies 3A-3B and the backside of the cutting forme 2, for example by means of fixing means such as bolts 6, and which can be moved by means of press-on means 7, with for example what is called a top platen 8 and a makeready 9.

[0014] The material 1 to be die cut is provided under the cutting dies 3A-3B on a usually very hard base 10 which is supported either directly or indirectly by the machine frame or the lower platen 11. A supporting plate, for example made of steel or plastic, can be either or not provided between the base 10 and the lower platen 11.

[0015] As described in the introduction, the cutting edges 12 of the cutting dies 3A-3B are initially not all situated at the same distance from the base 9. As represented in figure 1, for example the cutting edges 12 of a number of cutting dies 3B may be situated at a larger distance from the base 10 than the cutting edges 12 of the other cutting dies 3A, due to tolerance differences in the cutting dies or due to wear and tear. Similar differences may occur due to deviations in the machine parts, such as for example the base 10 or other machine parts not being flat. In fact, we are speaking of differenc-
es of some one hundredths to tenths of a millimetre.

[0016] In order to compensate for these differences, it is known to provide a compensating sheet 13 between the cutting forme 2 and the cutting plate 4.

[0017] In order to offer an optimal compensation, use is made of a compensating sheet 13 which consists of polycarbonate or a material on the basis of polycarbonate.

[0018] Other components may be added to the polycarbonate, such as colorants, additives which promote the processability and the shaping of the sheets, or even other base components. Preferably, however, the material of the compensating sheet 13 predominantly consists of polycarbonate in this case as well.

[0019] Better still, pure or almost pure polycarbonate will be used.

[0020] The thickness D of the compensating sheet, which is exaggerated in the figures for clarity's sake, preferably amounts to 0.1 to 1 mm, and better still to 0.4 to 0.6 mm, and according to the most preferred embodiment to 0.5 mm.

[0021] This relatively reduced thickness offers the advantage, apart from optimal compensating qualities, that such a compensating sheet 13 can be used in any existing die cutting machine, since the parts of such die cutting machines are usually made such that this thickness is acceptable, even when said die cutting machine was originally not designed to be equipped with a compensating sheet.

[0022] The compensating sheet 13 is preferably put directly into contact with the backsides 5 of the cutting dies 3A-3B, i.e. without any other compensating layers being included, as differences in height can be set off immediately there.

[0023] Preferably, cutting dies 3A-3B with blunt, flat backsides 5 are used, as this offers optimal compensating qualities in combination with the typical toughness and hardness of polycarbonate.

[0024] If required for the fixing of the cutting formes 2 by means of bolts in the manner shown, pre-formed openings 14 can be provided for the bolts 6 or for any other penetrating elements.

[0025] During the die cutting movement, the situations as represented in figures 1 to 3 successively occur.

[0026] After a compensating sheet 13 has been applied, and as the movement begins, the situation as represented in figure 1 occurs.

[0027] As represented in figure 2, the cutting dies 3A which stick out the most will go first through the material 1.

[0028] By applying a suitable die cutting pressure, also all the other cutting dies 3B will be subsequently pressed entirely through the material 1, as is represented in figure 5, which is possible because the backsides 5 of the cutting dies which previously stuck out further, in this case 3A, are pressed in the compensating sheet 13.

[0029] By making use of a compensating sheet made of polycarbonate according to the invention, it is obtained that the differences in height of the cutting dies, plane parallelism deviations, machine distortions and/or inaccuracies are perfectly compensated for, so that very precise cuts are finally obtained.

[0030] According to the invention, the die cutting pressure is preferably systematically increased at the transition from the situation in figure 2 to that in figure 3 until all the cutting dies 3A-3B go through the material 1. Thanks to such a temporary, systematic increase of pressure, a pressure can be applied which is just sufficient, which may possibly be maintained for the following cycles, and it can be excluded that a pressure which is bigger than necessary is applied for the cutting and that the cutting edges are loaded more heavily than necessary. Thus is also avoided that cutting dies are pressed into pieces.

[0031] The use of polycarbonate is advantageous in that, in particular when die cutting boxboard products, the cutting dies 3A-3B can go through the material 1 to be die cut without any or hardly any compression of said material. Such a polycarbonate sheet offers just enough resistance to let the cutting dies 3A-3B cut through the boxboard material, but it is still sufficiently soft so as not to damage the cutting edges 12 on the base 10 when the pressure is increased.

[0032] To sum up, it may be said that polycarbonate provides the best results, especially when die cutting paper or boxboard, both solid cardboard and corrugated board.

[0033] It is clear that the invention concerns the above-described method and the compensating sheet 13 used thereby, as well as die cutting machines equipped with such a compensating sheet 13 and which are possibly equipped to this end with special features for the application of such a compensating sheet 13.

[0034] Although the invention was described above on the basis of what is called a flat-bed die cutting machine, it is not excluded to apply it in rotary die cutting machines.

[0035] The cutting dies 3A-3B must not necessarily have a sharp cutting edge 12. They can also be impress knives, for example to realize folding lines or embossing forms.

[0036] The term "compensating sheet" is to be interpreted in a broad sense according to the invention. The compensating sheet may also consist of a polycarbonate coating provided on a base sheet or of a layer in the form of a foil.

[0037] The present invention is by no means restricted to the embodiments described as an example and represented in the accompanying drawings.

Claims

1. Method for adjusting cutting dies in a die cutting machine equipped with several simultaneously operat-
ed cutting dies (3A-3B), whereby the differences in height of the cutting dies are offset by means of a compensating sheet (13) made of a compressible material working in conjunction with the cutting dies (3A-3B), characterized in that a sheet made of polycarbonate or a material on the basis of polycarbonate is used as a compensating sheet (13).

2. Method according to claim 1, characterized in that a compensating sheet (13) is used which is 0.1 to 1 mm thick.

3. Method according to claim 1, characterized in that a compensating sheet (13) is used which is 0.4 to 0.6 mm thick.

4. Method according to claim 1, characterized in that a compensating sheet (13) is used which is 0.5 mm thick.

5. Method according to any of the preceding claims, characterized in that a compensating sheet (13) is mainly formed of polycarbonate.

6. Method according to any of the preceding claims, characterized in that a compensating sheet (13) is formed of pure polycarbonate.

7. Method according to any of the preceding claims, characterized in that the compensating sheet (13) is put directly into contact with the backsides (5) of the cutting dies (3A-3B).

8. Method according to claim 7, characterized in that the compensating sheet (13) is fixed between a cutting forme (2) and a cutting plate (4).

9. Method according to any of the preceding claims, characterized in that the adjustment is carried out by systematically increasing the die cutting pressure until all the cutting dies (3A-3B) are situated with their cutting edges (12) at the required height.

10. Method according to any of the preceding claims, characterized in that it is used for die cutting boxboard or other comparable material which can be die cut.

11. Method according to any of the preceding claims, characterized in that cutting dies (3A-3B) with blunt, in particular flat backsides (5) are used.

12. Die cutting machine, equipped with several simultaneously operated cutting dies (3A-3B) and a compensation sheet (13) made in compressible material, characterized in that the sheet (13) mainly consists of polycarbonate.

Patentansprüche

1. Verfahren zum Zurichten von Stanzwerkzeugen, in einer Stanzmaschine, die mit mehreren gleichzeitig bedienten Stanzwerkzeugen (3A-3B) ausgerüstet ist, wobei die Höhenunterschiede der Stanzwerkzeuge mittels eines aus komprimierbarem Material gefertigten Zurichtbogens (13), der mit den Stanzwerkzeugen (3A-3B) zusammenwirkt, ausgeglichen werden, dadurch gekennzeichnet, dass eine aus Polycarbonat oder einem Material auf Basis von Polycarbonat gefertigte Platte als Zurichtbogen (13) verwendet wird.

2. Verfahren gemäß Anspruch 1, dadurch gekennzeichnet, dass ein Zurichtbogen (13) verwendet wird, der 0.1 bis 1 mm dick ist.

3. Verfahren gemäß Anspruch 1, dadurch gekennzeichnet, dass ein Zurichtbogen (13) verwendet wird, der 0.4 bis 0.6 mm dick ist.

4. Verfahren gemäß Anspruch 1, dadurch gekennzeichnet, dass ein Zurichtbogen (13) verwendet wird, der 0.5 mm dick ist.

5. Verfahren gemäß einem der vorgenannten Ansprüche, dadurch gekennzeichnet, dass ein Zurichtbogen (13) verwendet wird, der hauptsächlich aus Polycarbonat geformt ist.

6. Verfahren gemäß einem der vorgenannten Ansprüche, dadurch gekennzeichnet, dass ein Zurichtbogen (13) verwendet wird, der aus reinem Polycarbonat geformt ist.

7. Verfahren gemäß einem der vorgenannten Ansprüche, dadurch gekennzeichnet, dass der Zurichtbogen (13) direkt mit den Rücken (5) der Stanzwerkzeuge (3A-3B) in Kontakt gebracht wird.

8. Verfahren gemäß Anspruch 7, dadurch gekennzeichnet, dass der Zurichtbogen (13) zwischen einer Stanzform (2) und einer Stanzplatte (4) befestigt ist.


10. Verfahren gemäß einem der vorgenannten Ansprüche, dadurch gekennzeichnet, dass es zum Stanzen von Kartonagelpappe oder anderem vergleichbarem Material, das gestanzt werden kann, verwendet wird.
11. Verfahren gemäß einem der vorgenannten Ansprüche, **dadurch gekennzeichnet, dass** Stanzwerkzeuge (3A-3B) mit stumpfen, spezieller flachen Rücken (5) verwendet werden.

12. Stanzmaschine, ausgerüstet mit mehreren, gleichzeitig bedienten Stanzwerkzeugen (3A-3B) und einem aus komprimierbarem Material gefertigten Zaubertüchern (13), **dadurch gekennzeichnet, dass** der Bogen (13) hauptsächlich aus Polykarbonat besteht.

**Revendications**

1. Procédé pour régler des outils de coupe dans une machine de découpe équipée de plusieurs outils de coupe (3A - 3B) actionnés de manière simultanée, par lesquels les différences de hauteur des outils de coupe sont rattrapées à l'aide d'une feuille de compensation (13) constituée d'une matière compressible qui travaille de manière conjointe avec les outils de coupe (3A - 3B), **caractérisé en ce qu'**on utilise une feuille constituée de carbonate ou d'une matière à basé de carbonate à titre de feuille de compensation (13).

2. Procédé selon la revendication 1, **caractérisé en ce qu'**on utilise une feuille de compensation (13) dont l'épaisseur s'élève de 0,1 à 1 mm.

3. Procédé selon la revendication 1, **caractérisé en ce qu'**on utilise une feuille de compensation (13) dont l'épaisseur s'élève de 0,4 à 0,6 mm.

4. Procédé selon la revendication 1, **caractérisé en ce qu'**on utilise une feuille de compensation (13) dont l'épaisseur s'élève à 0,5 mm.

5. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**on utilise une feuille de compensation (13) qui est formée principalement de polycarbonate.

6. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**on utilise une feuille de compensation (13) qui est formée de polycarbonate pur.

7. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la feuille de compensation (13) est mise directement en contact avec les côtés dorsaux (5) des outils de coupe (3A - 3B).

8. Procédé selon la revendication 7, **caractérisé en ce que** la feuille de compensation (13) est fixée entre une forme de coupe (2) et une plaque de coupe (4).

9. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**on effectue le réglage en augmentant de manière systématique la pression s'exerçant sur les outils de coupe jusqu'à ce que tous les outils de coupe (3A - 3B) soient situés avec leurs bords de coupe (12) à la hauteur requise.

10. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**on utilise pour la découpe du carton ou d'une autre matière comparable qui peut être découpée.

11. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**on utilise des outils de coupe (3A - 3B) qui possèdent des côtés dorsaux émoussés, en particulier des côtés dorsaux plats (5).

12. Machine de découpe équipée de plusieurs outils de coupe (3A - 3B) et d'une feuille de compensation (13) réalisée en une matière compressible, **caractérisé en ce que** la feuille (13) est constituée principalement de polycarbonate.