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(54) **METHOD FOR PRODUCING CUTLERY AND A CUTLERY BLANKING TOOL**

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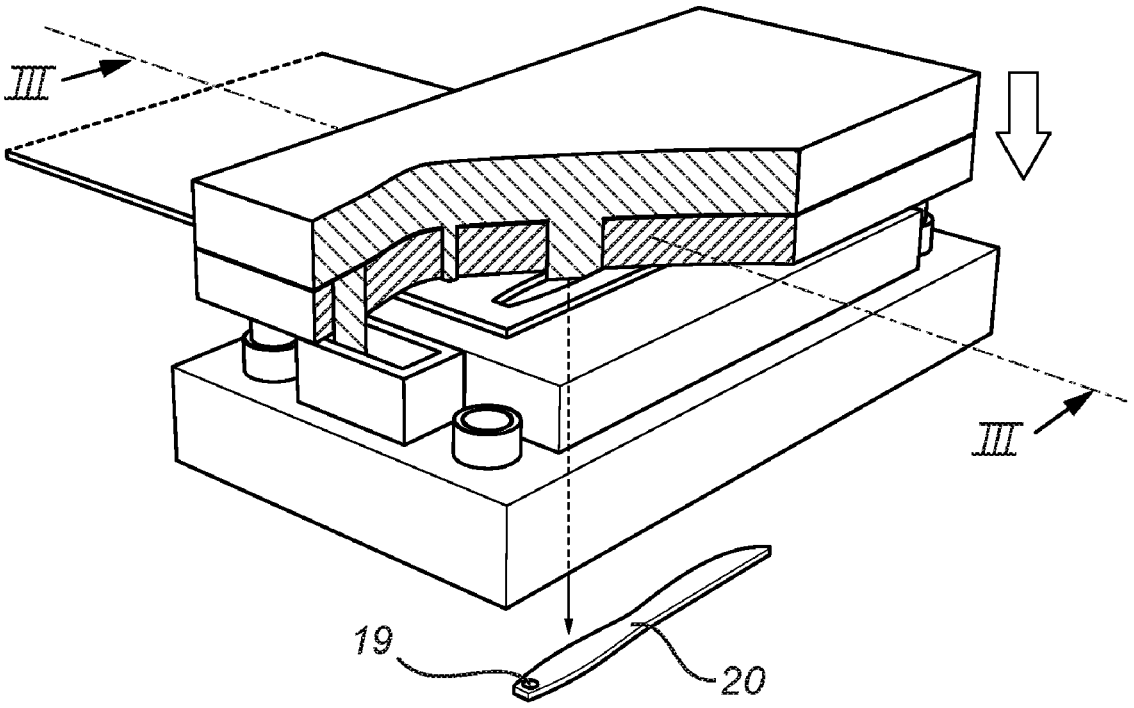
(57) **ABSTRACT**

The present invention is directed to a method of producing cutlery and a blanking tool to be used in said method of producing cutlery. In the method a sheet metal is placed on a die. The sheet metal is held fixed on the die by means of a holder. In a blanking stroke a punch cooperates with the die to form at least a part of a circumference of a cutlery blank in the sheet metal while the holder holds the sheet metal fixed on the die. Thereafter the sheet metal is released from the die. The blanking tool comprises an upper part in the form of a punch, an intermediate part in the form of a holder and a lower part in the form of a die. The blanking tool further comprises means to move the punch and the holder together as one unit towards the die during a first part of a blanking stroke for the punch. The punching tool comprises means to move the punch in relation to the holder during a second part of the blanking stroke for the punch. The holder abuts the sheet metal placed on the die during said second part of the blanking stroke for the punch.



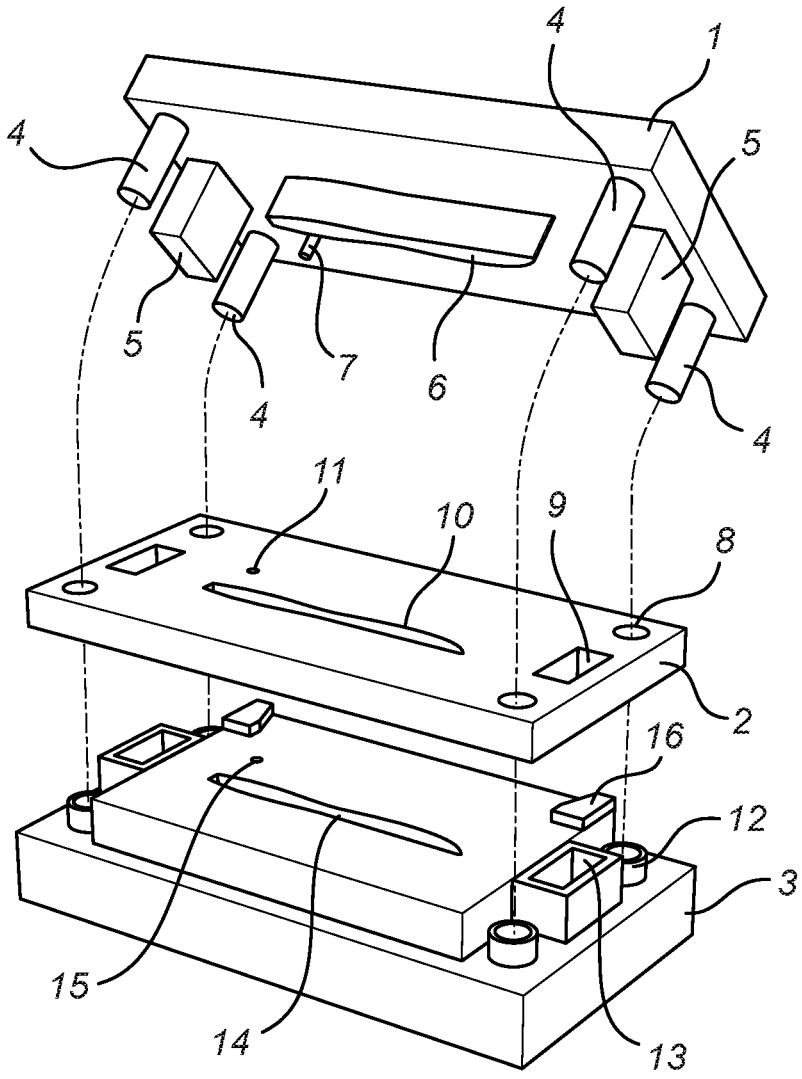


Fig. 1

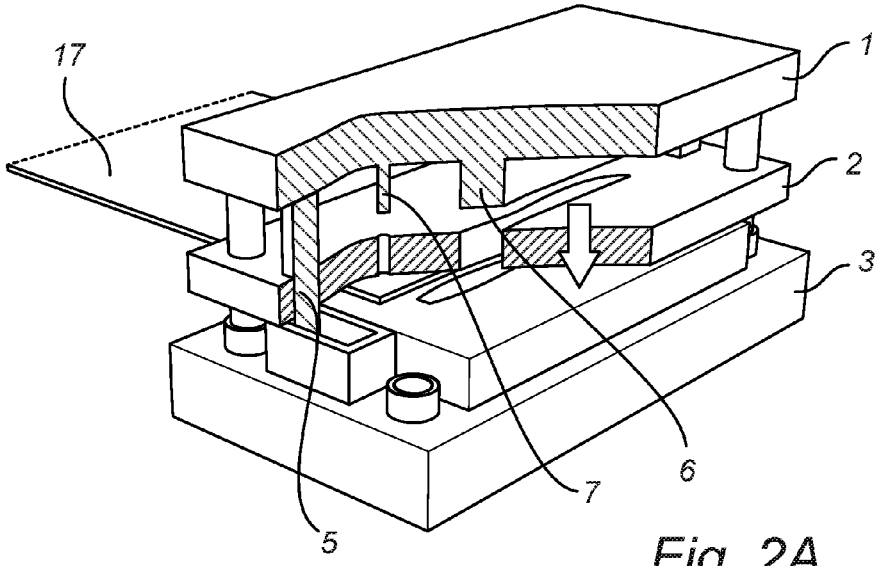


Fig. 2A

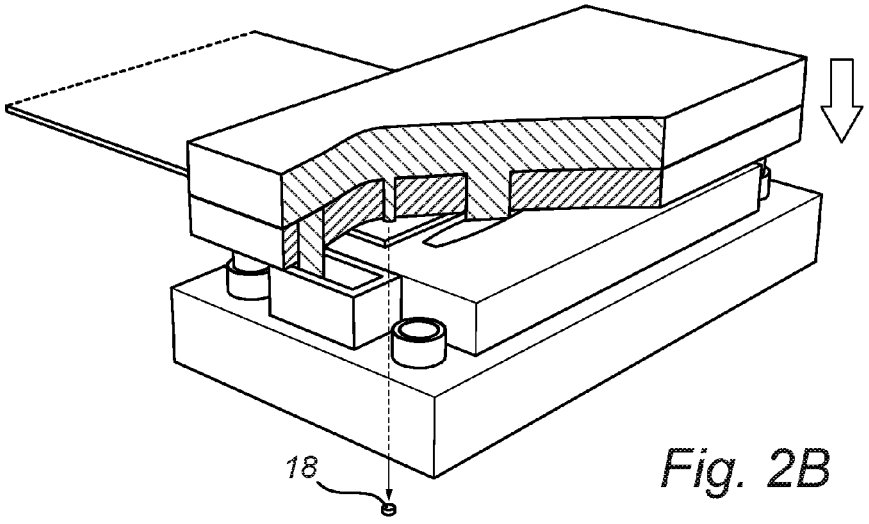


Fig. 2B

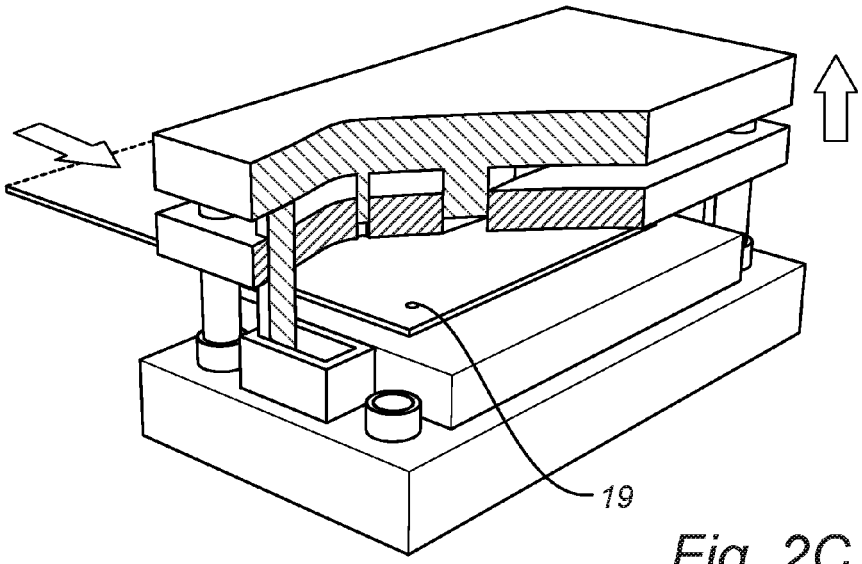


Fig. 2C

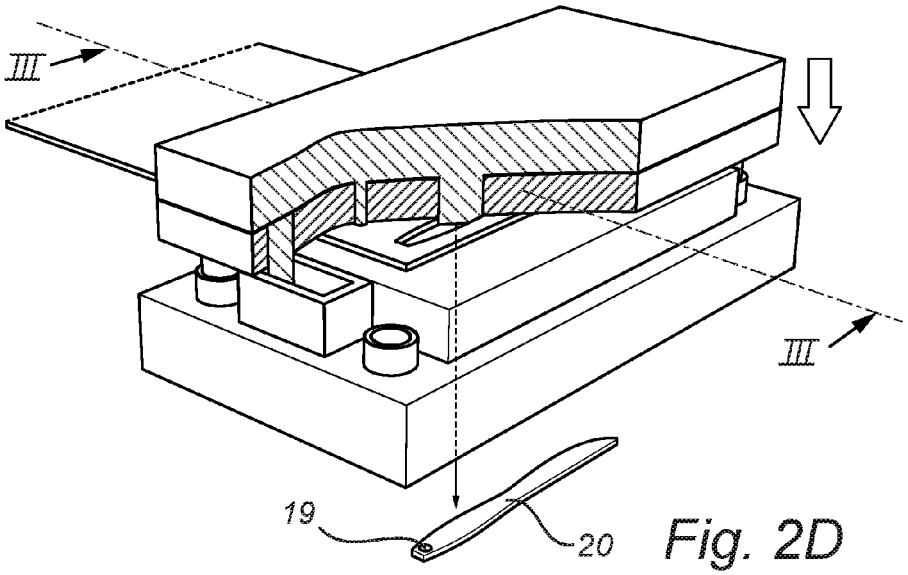


Fig. 2D

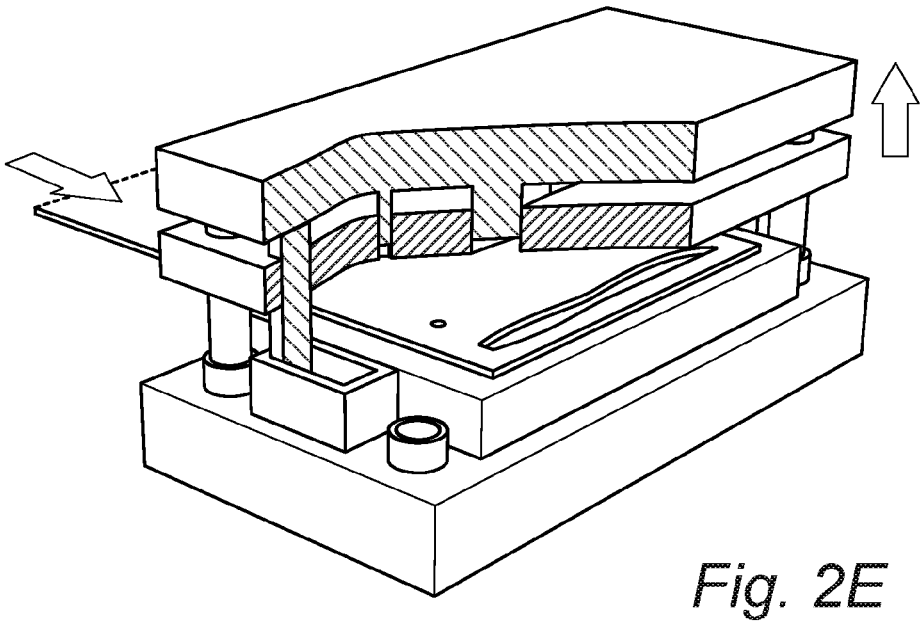


Fig. 2E

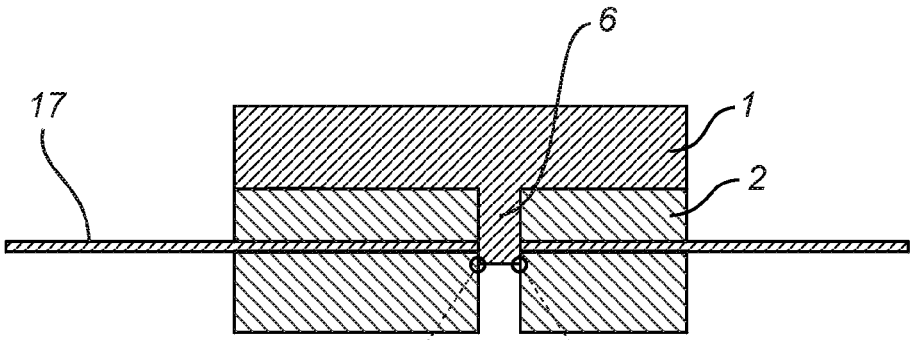


Fig. 3A

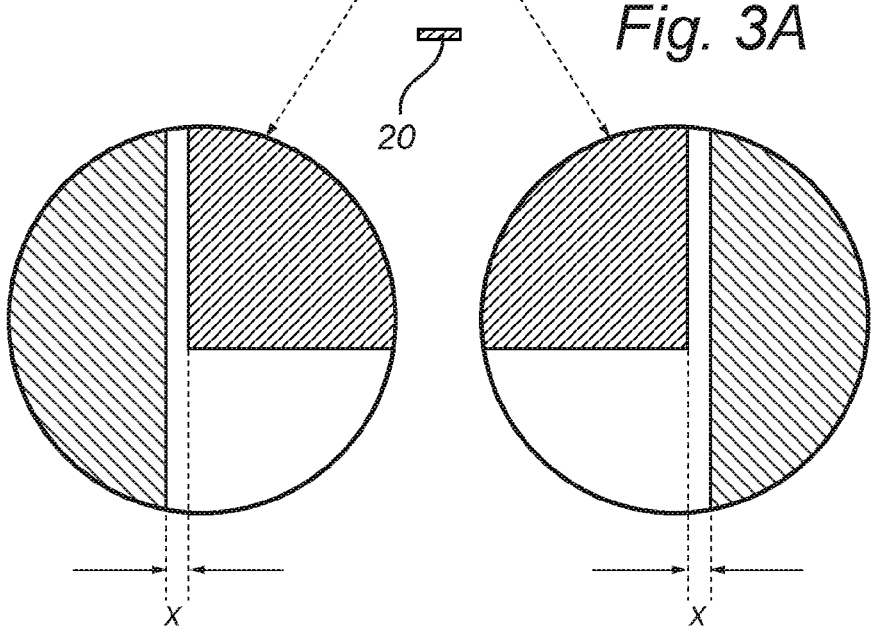


Fig. 3B

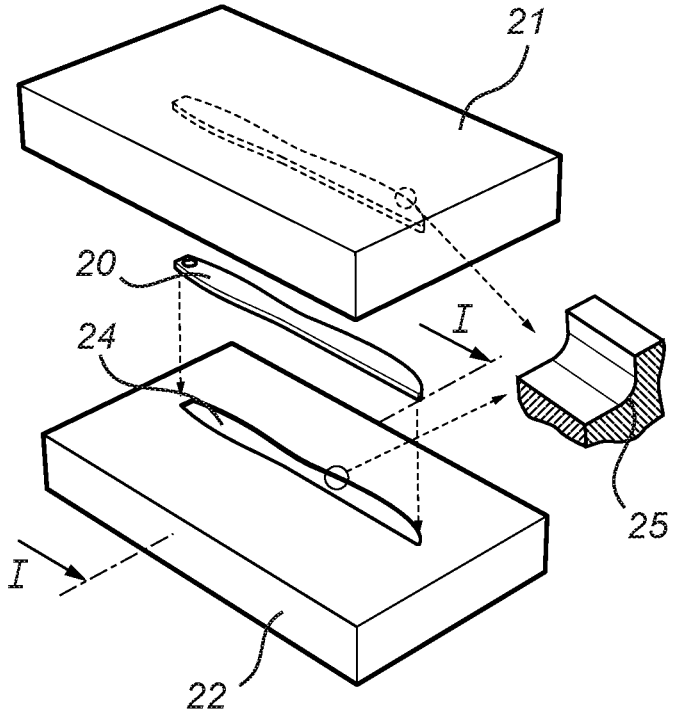


Fig. 4A

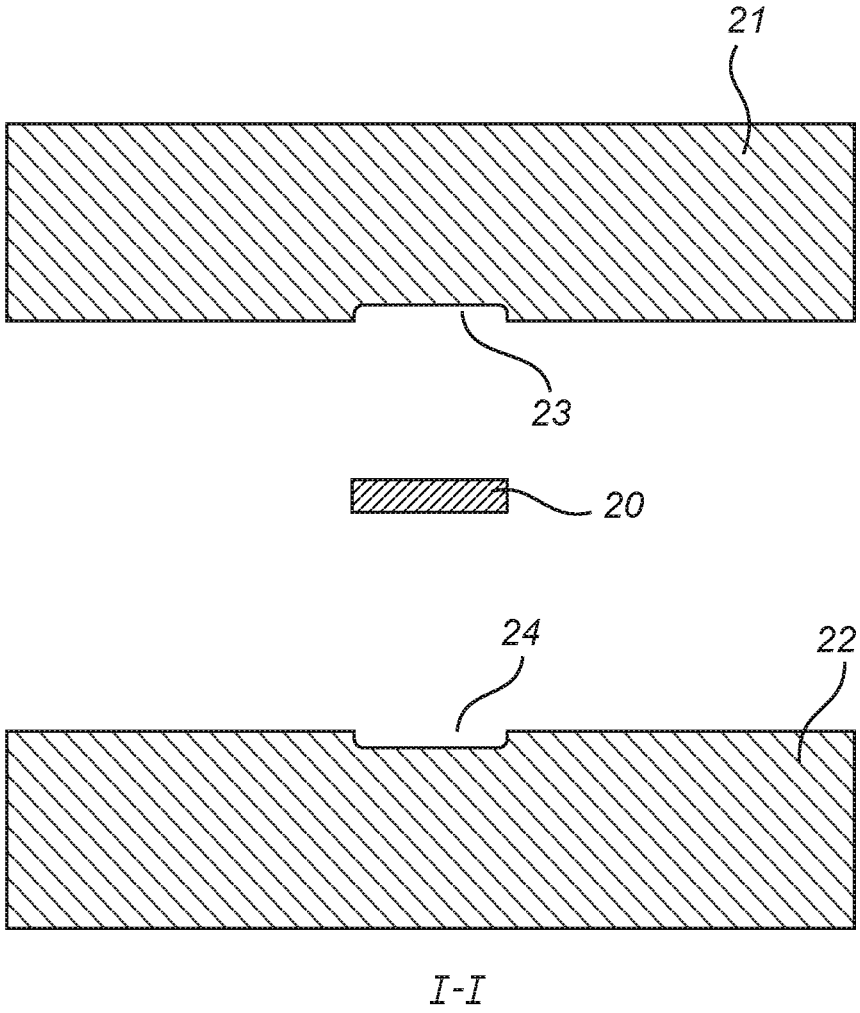


Fig. 4B

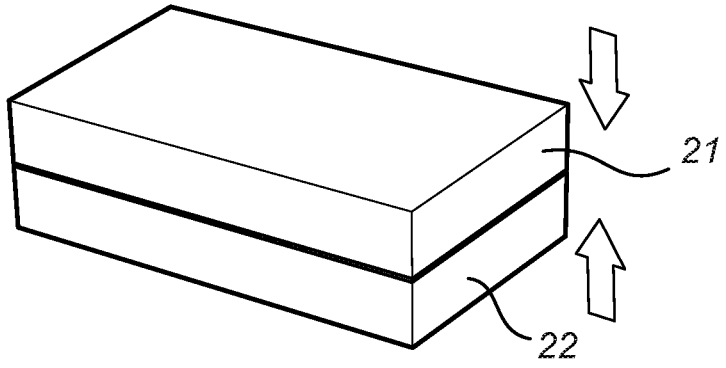


Fig. 4C

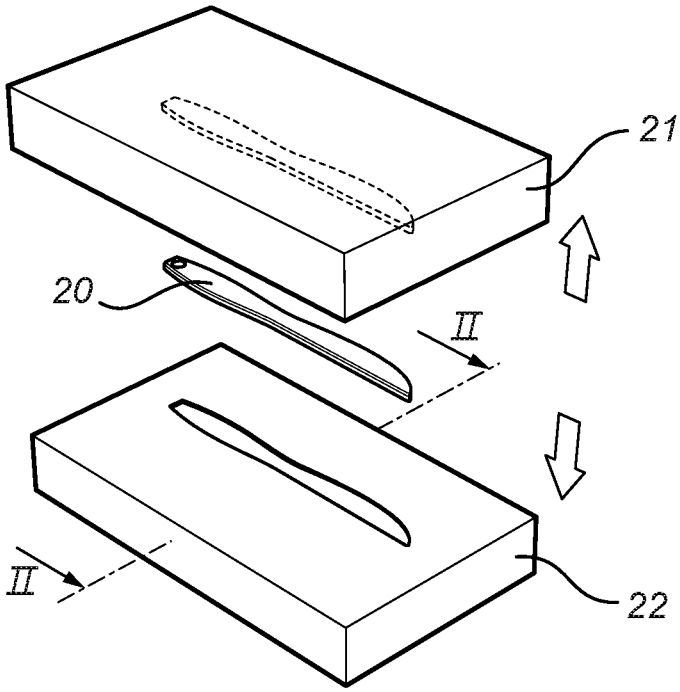


Fig. 4D

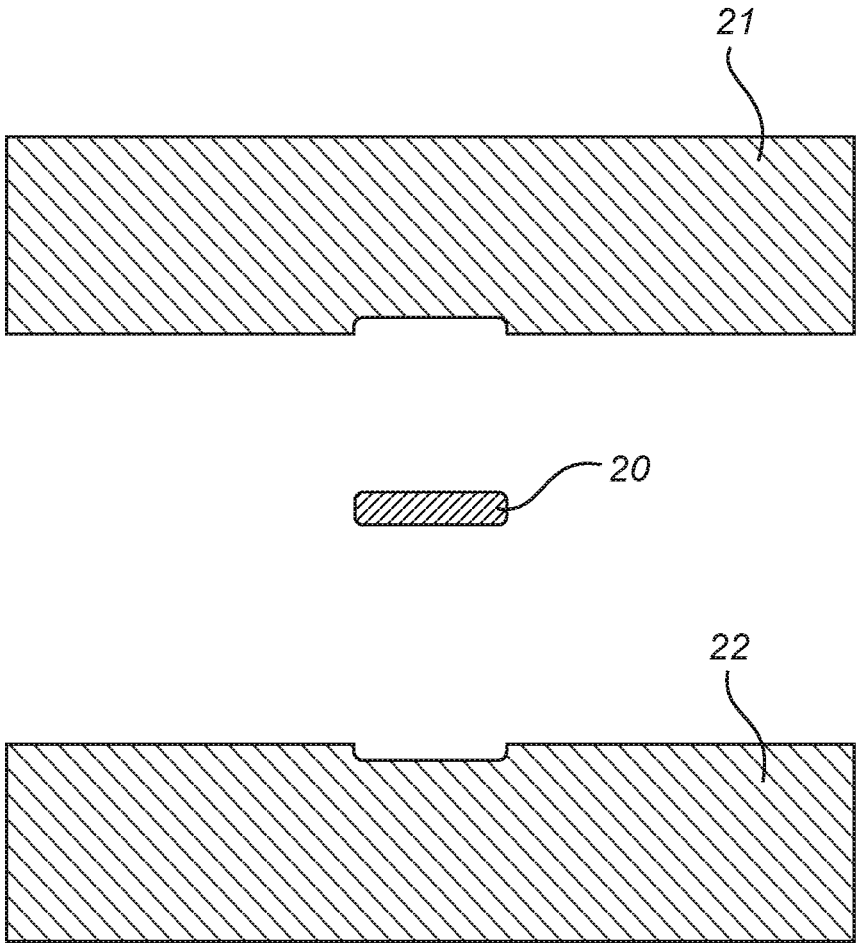


Fig. 4E

METHOD FOR PRODUCING CUTLERY AND A CUTLERY BLANKING TOOL

TECHNICAL FIELD

[0001] The present invention is directed to the production of cutlery. It is directed both to a method of producing cutlery and a blanking tool to be used in producing cutlery.

BACKGROUND

[0002] Today cutlery is normally made in a number of steps, which steps comprise blanking, trimming and grinding. The trimming and grinding steps are often performed a number of times, between other steps. Each piece of cutlery is often made by blanking of a sheet metal of stainless steel.

[0003] In the blanking step the first part of the cut of the cutlery blank will be relatively sharp while the next part will be relatively rough. This is a well-known phenomenon and is due to the fact that in the shearing process the first part will in practice be a cutting process while the second part will be a tearing process. The rough surface formed by the tearing process will have to be grinded rather extensively.

[0004] Normally there is a clearance of between 10 to 15% between the blanking tool and the final dimension of the piece of cutlery. Thus, trimming is necessary to arrive with the final cutlery. For cutlery stainless steel is normally used. During each trimming and grinding step the material is heated. Such heating may influence the material, in that chromium is released from the stainless steel. This will diminish the protection of the finished cutlery against rust.

SUMMARY

[0005] In view of the above there is a need for a production method for cutlery, which reduces the risk of rust formation on the cutlery at normal use. Furthermore, it is a need for a production method for cutlery, which is more accurate than the one used today and which is suitable for industrial production of cutlery at a high speed, thereby being suitable for high volume production of cutlery.

[0006] In the method of the present invention the same presses as used today for blanking of cutlery may still be used. The blanking is done in what can be called a hybrid fineblanking tool. In the blanking tool block guiding is used to stabilize movement in the tool. Thereby, the clearance between the blanking tool and the final dimension of the piece of cutlery may be reduced to between 0.1-2.0%, preferably to 0.2-1.5% and more preferably to about 0.5%. The method of the present invention may be used without any anvil. In the method of the present invention there is less material usage than in known fineblanking methods, since in known fineblanking methods the holding means will need more material to hold on to. By holding the sheet metal of which the cutlery is formed during the actual blanking, the shearing will be completely a cutting process with no or little tearing. Thus, the problem with part of the shearing being a tearing process is avoided. It is essential to hold the sheet metal fixed on the die during the blanking. A person skilled in the art realises that different means can be used to hold the sheet metal. In the embodiment shown in the enclosed drawings the sheet metal is held at the die by means of a spring loaded holder.

[0007] In a first step of the present invention a piece of cutlery, or cutlery blank, may be blanked from a pre-polished material. The circumference of the cutlery blank is blanked by one blanking stroke in some embodiments. In other embodiments the circumference of the cutlery blank is blanked by two or more blanking strokes. In each such blanking stroke a part of the circumference of the cutlery blank is blanked. In an optional second step a radius is formed on the edges to prevent sharp edges and burrs. Thereby, grinding and/or polishing steps are minimized. In the second step the piece of cutlery is pressed into a tool having rounded surfaces to form the radii of the edges of the piece of cutlery. In an optional third step the piece of cutlery is given its three dimensional shape. The steps following the third step may include final polishing, cleaning, quality control and packing.

[0008] With the method of the present invention the piece of cutlery is produced using fewer steps than in the traditional method of making cutlery. Fewer steps means less time to produce each piece of cutlery and less time will reduce the costs. Fewer steps also means better quality since no grinding and less polishing may be used thereby less chromium is released from the stainless steel. Compared to traditional production of cutlery the number of steps in the method of the present application is about half the number of steps of traditional production of cutlery. The method according the present invention may be a grinding free method of producing cutlery.

[0009] In one embodiment, through openings and/or notches are punched in the cutlery prior to punching the circumference of the cutlery. The advantage with this embodiment is that through openings and/or notches may be arranged in a cutlery as an integrated part of the punching process. Through openings may for instance be used to enable storing the cutlery by hanging. Through openings may also be used for other purposes such as a punching step for improving the final cutlery. The notches may for example be for producing the tines of a fork.

[0010] Further objects and advantages of the present will become apparent to a person skilled in the art when reading the detailed description below of embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The invention will be described further below by way of example and with reference to the enclosed drawings. In the drawings:

[0012] FIG. **1** is a perspective and exploded view of cutlery blanking tool, which may be used with the method of the present invention,

[0013] FIGS. **2**A to **2**E are perspective views, partly cut out, of the cutlery blanking tool of FIG. **1** and illustrating different production steps,

[0014] FIG. **3**A is a sectional view taken along the line III-III of FIG. **2**D, FIG. **3**B is a detailed view of parts of FIG. **3**A, and

[0015] FIGS. **4**A to **4**E are perspective views and sectional views, respectively of a deburring die and illustrating different production steps.

DETAILED DESCRIPTION

[0016] In specific of the enclosed Figs. blanking or producing of one type of cutlery is shown. A person skilled in the art realises that the principles of blanking and producing the cutlery are the same irrespectively of the type of cutlery to be produced.

[0017] As used in this description the expression "cutlery" refers to table cutlery or tableware and comprises knives, spoons and forks.

[0018] As used in this description the expressions "upper", "lower" and similar expressions are in view of the normal orientation of the cutlery blanking and forming tools.

[0019] The shown embodiment of one example of a cutlery blanking tool comprises three basic parts. Said parts are an upper part in the form of a punch **1**, an intermediate part in the form of a holder **2**, and a lower part in the form of a die **3**.

[0020] The cutlery blanking tool is to be used in an ordinary press for blanking of cutlery. As the present invention is not directed to the press as such and as the function of such a press is well known to a person skilled in the art, the press will not be described further here.

[0021] The punch **1** comprises four guiding pins **4** placed adjacent the corners of the punch **1**. The punch **1** further comprises two guiding blocks **5**. Said guiding pins **4** and guiding blocks **5** are used to distinctly guide the punch **1** in respect of the other parts of the cutlery blanking tool. Furthermore, the punch **1** comprises a first blanking part **6**, which in the shown embodiment is adapted for forming a knife. When producing forks or spoons the blanking part will have a shape corresponding with that particular fork or spoon. The first blanking part **6** projects from the punch **1** on the side facing the holder **2** and the die **3**. The punch **1** comprises a further, or second, blanking part **7**, which second blanking part **7** is used when blanking a recess. The number of blanking parts **6**, **7** of the punch **1** may vary depending on the design of the piece of cutlery to be produced. Thus, the punch **1** may have one or more blanking parts **6**, **7**. In other embodiments only one blanking part is provided, which blanking part has a basic part in the general shape of the actual piece of cutlery to be produced and also one or more further blanking parts protruding from said basic part. Said further blanking parts are to form openings and/or recesses of the piece of cutlery.

[0022] The holder **2** has openings **8**, for the guiding pins **4** of the punch **1**, and guide openings **9**, for the guiding blocks **5** of the punch **1**. It also has openings **10**, **11** for the blanking parts **6**, **7** of the punch **1**. All openings **8**, **9**, **10**, **11** of the holder **2** are through openings.

[0023] The die **3** comprises openings **12**, for the guiding pins **4** of the punch **1**, and guide openings **13**, for the guiding blocks **5** of the punch **1**. Furthermore, the die **3** comprises openings **14**, **15** for the blanking parts **6**, **7** of the punch **1**. The die **3** also comprises guides **16** for the material from which the cutlery is to be blanked.

[0024] A person skilled in the art will realize that the cutlery blanking tool will differ somewhat depending on the type of cutlery to be produced.

[0025] In use a sheet metal **17** is placed on the die **3**, as shown in FIG. **2**A, whereby the blanking parts **6**, **7** of the punch **1** goes down into the openings **14**, **15** of the die **3**, cutting out parts **18** of the sheet metal **17** corresponding to the form of the blanking parts **6**, **7**. In the blanking movement the punch **1** is meticulously guided by means of the guiding blocks **5** received in the guide openings **9**, **13** of the holder **2** and the die **3**, respectively. In the first part of the movement, the punch **1** and the holder **2** moves together as one unit towards the die **3**, until the holder **2** hits the sheet metal **17** placed on the die **3**. The punch **1** will then continue its downward movement, and will move relative both the holder **2** and the die **3**. The punch **1** will move downwards until it has cut through the sheet metal **17**, held between the die **3** and the holder **2**. The cut out parts **18**, **20** will fall down from the openings **14**, **15** of the die **3**.

[0026] During the first part of the blanking movement the distance between the punch **1** and the holder **2** is held fixed by means of springs (not showed) or the like, placed between the punch **1** and the holder **2**. The springs are compressed in the last part of the blanking movement, in which last part of the blanking movement the holder **2** will abut the sheet metal **17**. Thus, the force of the punch **1** will exceed the force of the means holding the distance between the punch **1** and the holder **2**. As stated in the summary above, the sheet metal **17** can be held at the die **3** by other means than the holder described above. The important thing is that the sheet metal **17** is held fixed at the die **3** during the actual blanking.

[0027] The distance for the movement of the punch **1** during the last part of the blanking movement exceeds the thickness of the sheet metal **17**. As indicated above there is no movement between the holder **2** and the die **3** during said last part of the blanking movement. The movement of the punch **1** is stopped in that the punch **1** hits the holder **2**. The height by which respective blanking part **6**, **7** protrudes from the punch **1**, exceeds the sum of the thickness of the sheet metal **17** and the height of the openings **10**, **11** of the holder **2** to receive said blanking parts **6**, **7**. In one embodiment the stroke length for the punch **1** in the blanking step is about 10 mm.

[0028] The steps of using the shown embodiment of a cutlery blanking tool will now be described with reference to FIGS. **2**A to **2**E.

[0029] In FIG. **2**A the set up of the cutlery blanking tool is illustrated. As indicated by the arrow, protruding parts of the punch **1** will be pushed into the holder **2**.

[0030] In FIG. **2**B a first step is shown, in which the sheet metal **17** has been pushed into a position for blanking of a first cut out part **18**. Thus, in this position the sheet metal **17** is only placed covering one of the openings **14**, **15** of the die **2** to receive the blanking parts **6**, **7** of the punch **1**. As indicated above one main blanking part can be provided with one or more further blanking parts protruding from said main blanking part. In the blanking step the holder **2** is first stopped by hitting the sheet metal **17**, while the punch **1** continues to move in relation to the holder **2**. The punch **1** will continue to move downwards until it hits the holder **2**, in which position one of the blanking parts **7** will go through the sheet metal **17**, forming a through opening **19** in the sheet metal **17**. In the production of forks the tines of the fork are also formed of further blanking parts, which further blanking parts may be separated from or being part of a main blanking part.

[0031] In the next step, as indicated in FIG. **2**C, the holder **2** and the punch **1** are moved upwards. In the movement upwards, the holder **2** will be lifted from the sheet metal **17** and the punch **1** and the holder **2** will be separated, by means of the springs or the like, with a distance exceeding the thickness of the sheet metal **17**. When the sheet metal **17** is free from the holder **2** it will be pushed further into the cutlery blanking tool. The sheet metal **17** will be moved such a distance that the previously formed through opening **19** will be placed above the opening for the blanking part **6** having the shape of a knife.

[0032] In the following step, as indicated in FIG. **2**D, the punch **1** and the holder **2** once again goes downward until the holder **2** hits the sheet metal **17**. The punch **1** will then continue to move downwards, whereby the blanking parts **6**, **7** of the punch **1** will go through the sheet metal **17**. In the shown embodiment a knife blank **20** is punched from the sheet metal **17**, which knife blank **20** comprises the previously formed through opening **19**.

[0033] The holder **2** and the punch **1** is then again lifted from the sheet metal **17**, after which the sheet metal **17** is pushed further into the cutlery blanking tool. The above indicated steps of producing cutlery are then repeated. As indicated above, the general production steps described in connection with FIGS. **2**A to **2**E in connection to producing knifes may also be applied for producing forks and/or spoons according to similar principles.

[0034] In FIGS. **3**A and **3**B the end of a blanking stroke is shown. At said end of the blanking stroke, the blanking part **6** of the punch **1** has gone through the sheet metal **17**, producing a knife blank **20**. As indicated in FIG. **3**B there is a clearance x between the blanking part **6** and the die **3**.

[0035] In one embodiment the thickness of the sheet metal **17** used is between **2** and 6.0 mm. Often the sheet metal **17** used for knives is thicker than the sheet metal **17** used for forks and spoons. In that the sheet metal **17** is held fixed during the actual blanking and that the movement of the punch **1** is meticulously guided, the clearance x, as shown in FIG. **3**B, between the blanking parts **6**, **7** of the punch **1** and the openings **12**, **13** of the die **3** co-operating with said blanking parts **6**, **7** can be small. In one embodiment the clearance x between each opening **14**, **15** of the die **3** for receiving the blanking parts **6**, **7** of the punch **1** and the corresponding blanking part **6**, **7** is 0.01 mm. In other embodiments the clearance x between each opening **14**, **15** of the die **3** for receiving the blanking parts **6**, **7** of the punch **1** and the corresponding blanking part **6**, **7** may be between 0.008 mm and 0.05 mm, and preferably between 0.01 mm and 0.03 mm.

[0036] After the blanking the cut blanks of the cutlery is deburred, in that the knife blank **20** is placed in a deburring die. The deburring die comprises an upper part **21** and a lower part **22**. The upper part **21** has a die space **23** and the lower part **22** has a corresponding die space **24**. There is a radius **25** between a bottom or top and respective side of each die space **23**, **24**. In use a knife blank **20** is placed in one of the die spaces **23**, **24**, as indicated in FIG. **4**A. In this stage the knife blank **20** has straight edges, as indicated in FIG. **4**B. Then the upper and lower parts **21**, **22** of the deburring die are pressed together, as indicated in FIG. **4**C, whereby the edges of the knife blank **20** will be given a radius, corresponding with the radius **25** of respective die space **23**, **24**, as indicated in FIG. **4**E. Then the upper and lower parts **21**, **21** are separated from each other and the knife blank **20** is removed, as indicated in FIG. **4**D. Also spoons and forks are deburred in a corresponding way as described above for knifes.

[0037] The next step is the final three dimensional forming of the pieces of cutlery. Three dimensional forming of pieces of cutlery is a well known technique. It is normally made using a forming tool comprising a punch and a die. It is also known to use a hot forging process to give the three dimensional form.

[0038] After the final forming the cutlery is polished, cleaned, quality controlled and packed.

1. A method of producing cutlery, comprising

placing sheet metal on a die;

holding the sheet metal fixed on the die by means of a holder;

making at least one blanking stroke by means of a punch cooperating with the die to form at least a part of a circumference of a cutlery blank in the sheet metal while the holder still holds the sheet metal fixed on the die; and

releasing the sheet metal from the die.

2. The method of claim **1**, wherein in a first part of the blanking stroke the holder and the punch move together towards the die, wherein in a second part of the blanking stroke the holder contacts the sheet metal and presses the sheet metal against the die while the punch is moved towards the holder and the die to finalize the blanking stroke and wherein the second part of the blanking stroke begins in that the holder contacts the sheet metal.

3. The method of claim **1**, wherein the circumference of the cutlery blank is formed in at least two separate blanking strokes, wherein a first part of the circumference is formed by means of a first blanking part in a first blanking stroke, and a second part of the circumference is formed by means of a second blanking part in a second blanking stroke.

4. The method of claim **1**, wherein one or more parts are blanked from the area of the sheet metal inside the circumference of the cutlery blank by means of one or more blanking strokes.

5. The method of claim **1**, wherein a cutlery blank formed by the at least one blanking stroke and separated from the sheet metal is placed in a deburring die having a die space with rounded inner edges, wherein the cutlery blank is pressed in the die space of the deburring die to obtain rounded edges in at least a portion of that periphery of the cutlery blank which was separated from the sheet metal.

6. The method of claim **5**, wherein said step of pressing the cutlery blank in the deburring die is separate from a subsequent step of giving the piece of cutlery its three dimensional form by exposing the cutlery blank to a forming tool and/or to hot forging.

7. The method of claim **1**, wherein the punch is provided with at least one blanking part that co-operates with a corresponding opening in the die, wherein a clearance between the at least one blanking part and the opening is in the range of 0.008 to 0.5 mm, and preferably between 0.01 mm and 0.4 mm, and most preferably between 0.01 mm and 0.02 mm.

8. The method of claim **1**, wherein the piece of cutlery is a fork, a knife or a spoon.

9. A cutlery blanking tool adapted for being placed in a press producing cutlery, wherein the blanking tool comprises an upper part in the form of a punch, an intermediate part in the form of a holder and a lower part in the form of a die, wherein the blanking tool comprises means to move the punch and the holder together as one unit towards the die during a first part of a blanking stroke for the punch, and that the blanking tool comprises means to move the punch in relation to the holder during a second part of the blanking stroke for the punch, wherein the holder is adapted for abutting a sheet metal placed on the die during said second part of the blanking stroke for the punch and to hold the sheet metal against the die.

10. The blanking tool of claim **9**, wherein the punch has at least one blanking part that protrudes in a direction towards the holder and the die.

11. The blanking tool of claim **10**, wherein a first blanking part has the general shape of the piece of cutlery to be produced.

12. The blanking tool of claim **11**, wherein at least a second blanking part has the shape of a through opening and/or a notch to be formed in the final piece of cutlery.

13. The blanking tool of claim **9**, wherein the punch comprises guiding means received in openings of the holder and the die, which guiding means protrude from the punch in a direction towards the holder and the die.

14. The blanking tool of claim **13**, wherein the guiding means of the punch comprises two guiding blocks having a generally rectangular cross section.

15. The blanking tool of claim **13**, wherein the guiding means of the punch comprises four guiding pins, each placed adjacent one corner of the punch and protruding in a direction towards the holder and the die.

16. The blanking tool of claim **15**, wherein each guiding pin is received in a through opening of the holder and in an opening of the die.

17. The blanking tool of claim **8**, wherein springs are placed between the punch and the holder.

18. The blanking tool of claim **10**, wherein the holder has one or more openings for receiving the at least one blanking part of the punch during the second part of the stroke of the punch.

19. The blanking tool of claim **10**, wherein the die has one or more openings for receiving the at least one blanking of the punch during the second part of the stroke of the punch.

20. The blanking tool of claim **19**, wherein the clearance (x) between the one or more openings of the die and the corresponding at least one blanking parts of the punch is below 0.05 mm, and preferably below 0.02 mm.

* * * * *