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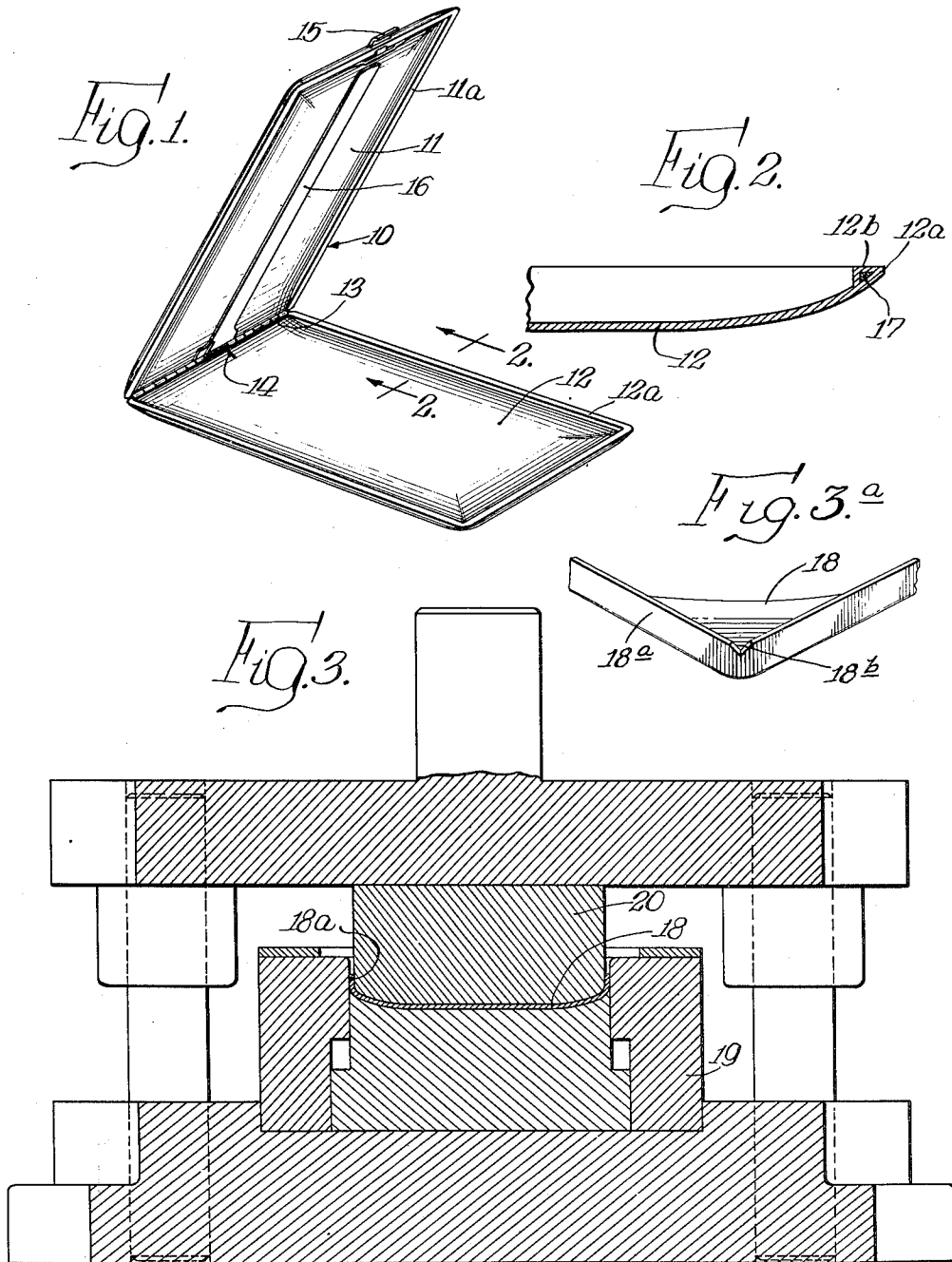
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2,601,029

METHOD OF MAKING A THICKENED REINFORCED PORTION
IN A RELATIVELY THIN METAL PLATE

Filed March 6, 1951

2 SHEETS—SHEET 1



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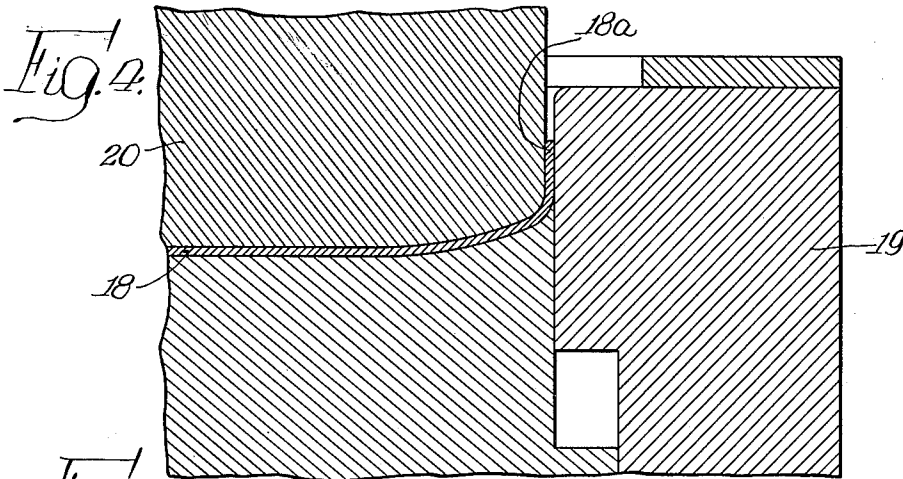
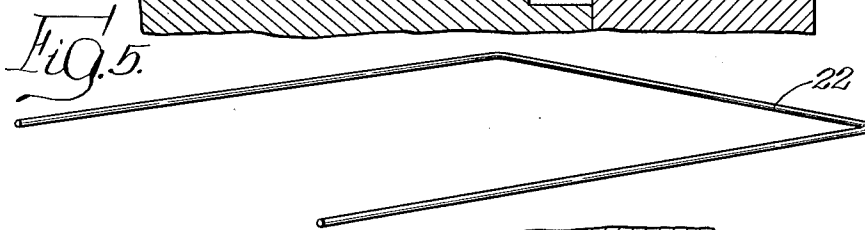
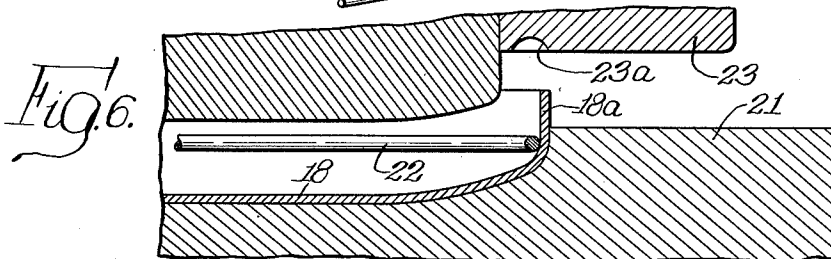
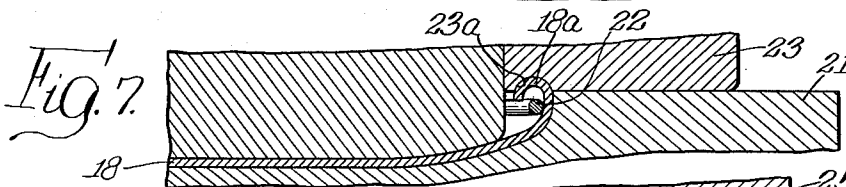
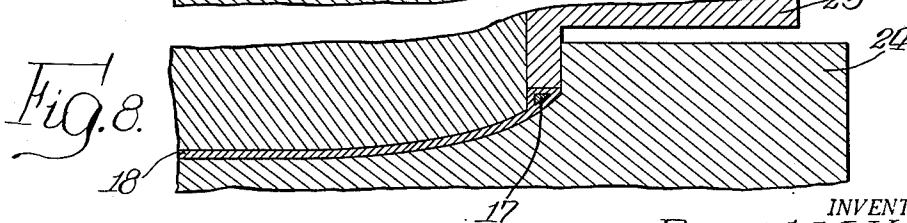
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2 SHEETS—SHEET 2



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UNITED STATES PATENT OFFICE

2,601,029

METHOD OF MAKING A THICKENED REINFORCED PORTION IN A RELATIVELY THIN METAL PLATE

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2 Claims. (Cl. 29-148)

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This invention relates to a method of making a thickened reinforced portion in a relatively thin metal sheet. The invention relates particularly to a thickened reinforced edge portion on a casing section or the like with said edge portion having a flat surface adapted to cooperate with a similar surface on another casing section to form a tight seal, as for example in a cigarette case.

This application is a continuation-in-part of my copending application Serial No. 36,876, filed July 3, 1948, and now abandoned.

One of the features of this invention is the provision of an improved method of making a reinforced portion in a relatively thin metal sheet wherein said thickened reinforced portion is formed of a portion of said sheet and contains a core member therein; another feature of this invention is the provision of such a metal sheet wherein the core member and surrounding metal is an integral structure; still another feature of this invention is the provision of an improved method of making a thickened edge portion on a casing section or the like having a flat surface adapted to cooperate with a similar surface on another casing section and formed at least in part of the metal of the casing section; a further feature of this invention is the provision of a casing section having a thickened edge portion formed of metal from the casing section and containing a metal core member within the thickened edge portion with the whole forming a substantially integral structure. Other features and advantages of the invention will become apparent from the following description when considered with the accompanying drawings. Of the drawings:

Fig. 1 is a perspective view of a partially open cigarette case having edge portions thereon formed by the method of this invention;

Fig. 2 is a section taken substantially along line 2-2 of Fig. 1;

Fig. 3 is a sectional elevation of a die illustrating one step in the method of this invention;

Fig. 3a is a fragmentary perspective view of one corner of the case showing the shape resulting from the step of Fig. 3 and showing one additional step in the method.

Fig. 4 is a fragmentary enlarged vertical section of a portion of the die of Fig. 3;

Fig. 5 is a perspective view of a wire core member used in making the thickened edge portion of a casing section;

Fig. 6 is a fragmentary enlarged vertical section through a die illustrating a second step of the method of this invention;

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Fig. 7 is a view similar to Fig. 6 and showing the dies closed; and

Fig. 8 is an enlarged fragmentary vertical section through the dies used in the cold forging operation.

Cigarette cases, powder cases and the like are ordinarily made of rather thin sheet metal. In order that the edges will be properly reinforced and in order that these edges will be mated properly so as to prevent the leakage of tobacco, powder and the like therebetween, it has been common practice to provide a thickened edge portion on each casing section with these portions having surfaces adapted to mate closely with each other when the casing is closed. In the past these edge portions have been formed separately and then soldered or welded to the body of the casing section. After this welding or soldering, it was necessary to remove excess metal and polish the joined portions in order to get a smooth structure. This procedure, of course, required considerable labor and time and increased the cost of the cases materially. In the present invention the thickened edge portion, which is known in the trade as a bezel, is formed from the metal of the casing section. Here the edge portion of the casing section is formed into a pocket having an upstanding outer edge wall. A wire metal core is arranged in this pocket and the outer edge wall is bent inwardly until it extends at least partially around the core. Inasmuch as the bending of the edges of the case serves to harden the metal therein, it is necessary to reanneal the metal in the edge portion prior to the final forging operation in order to facilitate forging and also to prevent fracturing of the edge portions during the final operation. Preferably, the reannealing is done prior to the insertion of the wire core inasmuch as it is preferred to degrease the case after the annealing operation, and the degreasing may be carried out with less difficulty if the entire edge portion is exposed and thus prior to rolling the edge portion over the core. The annealing is performed to bring the metal to a "soft anneal," which is understood in the art to mean annealing between temperatures of 1370° and 1430° F.

The assembly, including the core, is then cold forged to provide the thickened reinforced portion. The pressures employed are such that a substantially integral structure results in which the core member is completely surrounded by metal from the casing section. The bending and cold forging is preferably done in dies and the die used in the last step is preferably shaped so that a flat surface is provided with this surface

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being adapted to cooperate with a similar surface on another casing section. During the final forging operation in which a flat upper edge is formed on the case, a center die is provided to hold the balance of the case against deformation, which die presents a surface located at right angles to the flat surface of the forging die. Thus as the edge portion is pressed into a flattened edge the center die holds the inner portion of the edge in a position at right angles to the flattened upper surface. This accomplishes the formation of a neat right angle corner on the inner portion of the edge with the outer extremities of the edge portion abutting the inner surface of the case. This method results in a very strong edge structure and one that will not be deformed with ordinary use so that the casing section forms a tight seal that prevents the loss of fine grains of tobacco and the like from the cigarettes or other articles within the case. It is believed readily apparent that the new method of forming reinforced edge portions reduces the amount of time required and materially lowers the cost of the case. Although the method is particularly adapted for forming edge portions on casing sections, it is apparent that it can also be employed for forming any thickened reinforced portion in a metal sheet or the like.

The method of this invention is particularly useful for forming flattened edge portions on polygonal sheets, that is on sheets having corners, as contrasted to a circular sheet which is to be formed into a round case. The structure resulting from the method is extremely strong and resists warping or bending even when incorporated in an elongated rectangular cigarette case such as illustrated in Fig. 1.

In the drawings there is shown a cigarette case 10 having an upper casing section 11 and a lower casing section 12 connected along one edge of a hinge 13. There is provided a coil spring 14 around the hinge pin with this coil spring serving to maintain the case in normal opened position. The upper casing section 11 is provided with a latch mechanism 15 and a bar member 16 adapted to hold the cigarettes in place in the upper casing section. Each of the casing sections 11 and 12 have their two longitudinal edges and their outer end edges formed in a continuous thickened edge portion. The thickened edge portion 12a of the lower casing section 12 is shown in cross section in Fig. 2. The thickened edge portion 11a of the upper casing section 11 is similar to this.

As shown in Fig. 2, the thickened edge portion 12a is provided with a core member 17 preferably of the same metal from which the casing section 12 is formed. This core member is completely surrounded by metal from the casing section. The edge portion 12a is provided with a flat relatively wide surface 12b adapted to cooperate with a similar surface on the portion 11a to form a tight seal when the case of Fig. 1 is closed. Extending at right angles downwardly from the surface 12b is the surface 12c which abuts the inner surface of the casing member 12 to provide a neat closure for the interior of the casing. Although in Fig. 2 the core member 17 is shown as a separate member for purposes of illustration, the core member and surrounding metal is actually formed in a unitary structure so that when a section is cut from the edge of the casing the core member can only be identified with difficulty.

While, as previously stated, the metal of the core is the same as that of the case the core may

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be made of dissimilar metal as long as its hardness does not exceed the hardness of the case. In other words, both the case and the core should have a hardness resulting from a "soft anneal."

It is possible to have the wire somewhat softer than the case although when this condition prevails the wire has a tendency to "flow" under the edges of the portion 12c and thus does not present as neat appearing edge as where the wire hardness is substantially the same as that of the sheet of metal forming the case.

One embodiment of the method of forming thickened edge portions or bezels is shown in Figs. 3, 3a, 4, 6, 7 and 8. In forming the new casing sections, the metal blanks are cut from a malleable metal in the required shape by any method desired. Where the final case is to be polygonal or rectangular in shape a V-shaped notch is then cut in each corner in order that the final forging operation will produce a neatly mitered corner and in order to avoid the wrinkling which would otherwise occur if excess metal were not removed.

As shown in Fig. 3, a metal blank 18 is then placed on a lower die 19 having a cavity therein of the desired shape. The blank 18 is then pressed into the cavity by an upper die or punch 20. The dies 19 and 20 are so shaped that the blank 18 is given the required curvature, and upstanding outer edge walls 18a are formed therein. This produces a blank as illustrated in Fig. 3a and, where a polygonal casing is to be formed, the notches, which have been previously referred to, are shown at 18b. The height of the side walls 18a formed in the forming operation just described is determined by the ultimate width which the edge construction is to have. In determining the height of the side walls the diameter of the core later to be inserted and amalgamated therein must also be considered. Preferably, the side wall has a height of approximately four times the diameter of the wire although the side walls may vary from 3 to 7 times the diameter of the wire.

After the side walls 18a are formed, the case is then reannealed to remove any hardness which may have been imparted to the edge portion by the bending operation. The annealing is carried out to reduce the hardness of the edge portion to a "soft anneal" which may be accomplished by subjecting the metal to temperatures of between 1370° and 1430° F. in the usual manner. The blank is then degreased by immersing the same in a suitable degreasing bath.

The blank 18 is then placed in a second lower die 21 from which the edge walls 18a extend. A malleable metal wire 22 is then placed within the pocket formed by the edge walls 18a and the rim of the blank shown in Fig. 6, the wire conforming to the shape of the case except along the edge where hinges are to be installed and thus in the embodiment illustrated the wire is substantially U-shaped. A second upper die 23 is then employed to bend the side walls 18a over the wire 22 as shown in Fig. 7. This bending operation is caused by providing a groove 23a in the upper die 23 with this groove being adapted to contact the edge walls and bending them over the wire.

In the final operation, a third lower die 24 is provided having a cavity therein of the required configuration for giving the final desired shape to the casing section. There is provided a third upper die 25 adapted to cooperate with the lower die 24 so as to exert a relatively large amount

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of pressure on the edge walls 18a and wire 22 so that these will be cold forged to produce the desired unitary structure. As will be seen by comparing Figs. 7 and 8, the cold forging operation exerts sufficient pressure on the wire 22 that it becomes deformed and assumes the approximate shape of the edge portion of the casing section. The wire 22 which was originally circular in cross section is now substantially triangular.

Before the pressure is applied by the die 25, a centering die 26 is placed in position over the blank 18 as shown. The centering die is provided with an edge 27 which extends upwardly substantially at right angles to the lower edge 28 of the die 25. The die 25 may be in the form of a sleeve sliding over the centering die 26 and the final pressure applied by a drop hammer operation. When the final pressure is applied, the flat upper edge 12b is formed by the die 25, the die 26 serving to hold the outer extremity of the portion 18a against movement in any direction but downwardly against the inner surface of the blank 18. Thus the inner wall 12c is formed with the outer extremities of the edge portion 18a abutting the inner surface of the blank.

The metal sheet and the wire core that are used in this invention are each made of a malleable metal that is capable of being shaped by pressure. Typical metals are bronze alloys, sterling silver, and the like. In practicing the invention it is necessary that the metal be of sufficient thickness that it not tear when bent around the core and cold forged. In actual practice the minimum thickness has been found to be about 0.015 inch, while the metal sheet may have any desired maximum thickness. As previously indicated, the core member has a diameter preferably $\frac{1}{4}$ the height of the side walls 18a although its diameter may be varied somewhat from this dimension between the limits of $\frac{1}{3}$ and $\frac{1}{2}$ the height of the side walls. In one embodiment of the invention the sheet metal was about 0.024 inch thick and the wire core member had a diameter of about 0.045 inch. The wire should have a diameter not less than the thickness of the sheet in order to avoid tearing of the metal sheet, and it is preferred that the wire have a diameter that is approximately twice the thickness of the sheet metal.

Having described my invention as related to the embodiments shown in the accompanying drawings, it is my intention that the invention be not limited by any of the details of description unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

I claim:

1. The method of making a thickened reinforced edge portion in a relatively thin polygonal metal sheet which comprises: forming an outwardly expanding V-shaped notch in the cor-

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ners of said sheet; forming the edge portions of said sheet into a pocket having upstanding outer edge walls; annealing said portions to reduce their hardness to a soft anneal; degreasing said edge portions; arranging in said pocket a metal wire core member having a diameter approximately equal to $\frac{1}{3}$ to $\frac{1}{2}$ the height of the side wall having a shape corresponding to the shape of said pocket, said wire core member being no harder than the sheet; bending said edge walls inwardly and at least partially around said core member; and cold forging the metal including said edge portions and core member to produce a substantially integral edge structure of thickened cross section having a flat surface formed thereon.

2. The method of making a thickened reinforced edge portion in a relatively thin elongated rectangular metal sheet which comprises: forming an outwardly expanding V-shaped notch in the two corners adjacent one of the short edge portions of said sheet; forming said short edge portion and the two long edge portions of the sheet into a pocket having upstanding outer edge walls; annealing said portions to reduce their hardness to a soft anneal; degreasing said edge portions; arranging in said pocket a U-shaped wire core member of the same metal as the sheet and having a diameter approximately $\frac{1}{3}$ to $\frac{1}{2}$ the height of the edge walls; bending said edge walls inwardly and at least partially around said core member; and cold forging the metal including said edge portions and core member by flattening the upper surface of said edge portion while pressing said portion to form an inner edge at right angles to the flattened upper surface with the edge of the edge wall pressed against the inner surface of the sheet and enclosing the core to produce a substantially integral edge structure of thickened cross section.

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