

Sept. 11, 1923.

1,467,787

W. D. GEMMILL

FRAME AND METHOD OF MAKING IT

Filed May 25, 1921

2 Sheets-Sheet 1

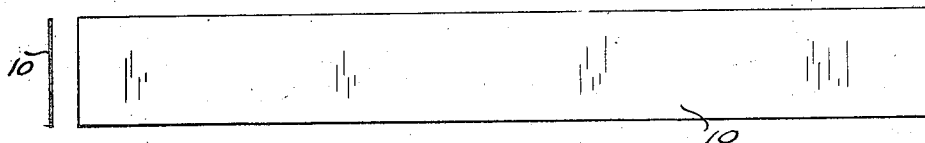


FIG. 1

FIG. 2

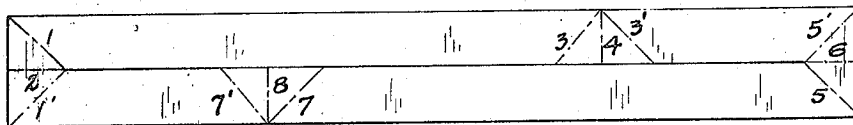


FIG. 3

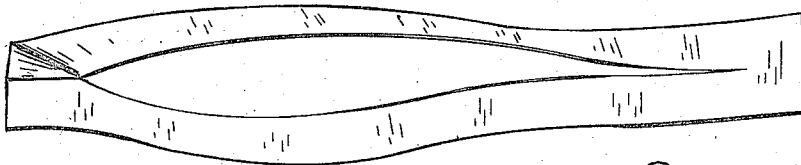
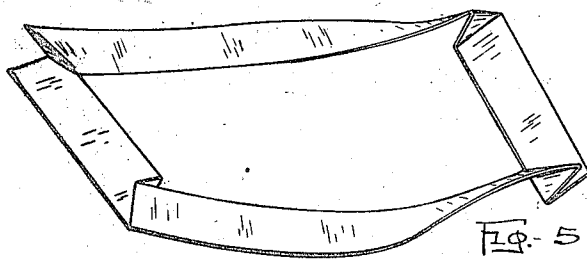


FIG. 5

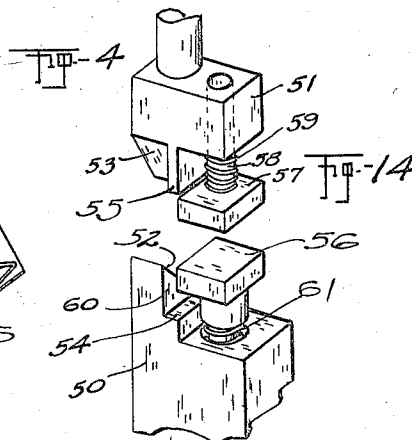


FIG. 14

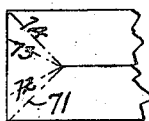


FIG. 15

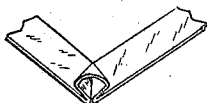


FIG. 16

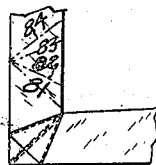


FIG. 17

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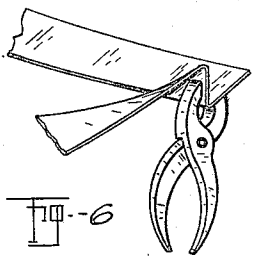
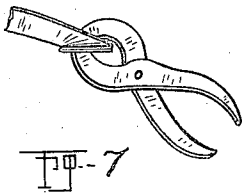
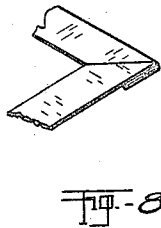
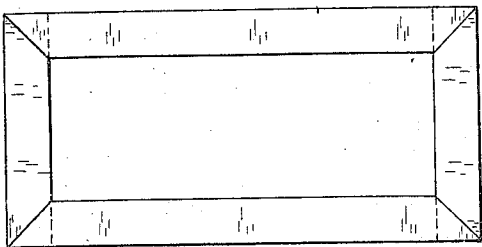
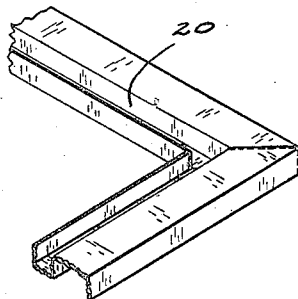
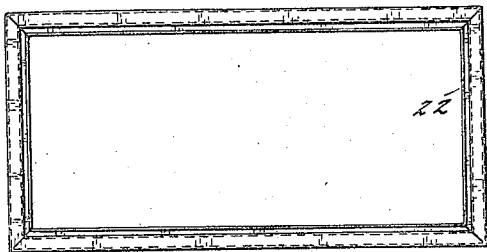
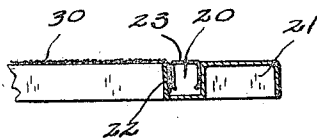
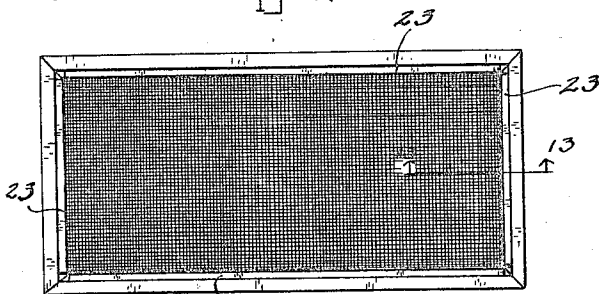
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FRAME AND METHOD OF MAKING IT

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

WORTHY D. GEMMILL, OF WILLOUGHBY, OHIO.

FRAME AND METHOD OF MAKING IT.

Application filed May 25, 1921. Serial No. 472,438.

To all whom it may concern:

Be it known that I, WORTHY D. GEMMILL, a citizen of the United States, residing at Willoughby, in the county of Lake and State of Ohio, have invented a certain new and useful Improvement in Frames and Methods of Making Them, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

My invention relates to a frame, particularly a metal frame, and a method for making the same.

An important feature of my method is that by it a rectangular frame may be made from a single piece of metal without waste. Another feature is that the method produces a rigid frame requiring but little material. Another feature is the simplicity of the operations performed whereby the cost of manufacture is reduced to a minimum.

Further advantages will be apparent in the course of the following description and the features of novelty will be set forth in the claims.

Referring to the drawings in which I have illustrated the steps performed in making a frame according to the principles of my invention, Fig. 1 is an end view of the original strip; Fig. 2 is a side view of the strip; Fig. 3 shows the strip after the slitting operation has been performed; Fig. 4 shows the strip after the first crimp has been made therein; Fig. 5 shows the strip crimped at the four points just ready to be folded down to rectangular form; Fig. 6 is a fragmentary view showing how the corners may be bent down from the position shown in Fig. 5; Fig. 7 is a view showing the corner further bent down just prior to the final forming of the rectangular corner; Fig. 8 is a fragmentary view showing the corner completely bent; Fig. 9 is a plan view showing the appearance of the frame after the corners have been formed as shown in Fig. 8; Fig. 10 is a fragmentary perspective on an enlarged scale showing the frame after the trough forming operation has been performed; Fig. 11 is a plan view of the completed frame; Fig. 12 is a view showing a netting material attached to the frame; Fig. 13 is a sectional view taken on the line 13—13 of Fig. 12 on a slightly enlarged scale; Fig. 14 shows a die adapted to crimp the folds in the strip; Figs. 15, 16 and 17, are fragmentary views illustrating the steps

of a slightly different method of forming a slit strip into a frame in accordance with the principles of my invention.

In the forming of a rectangular frame according to my method, I take a strip 10, as shown in Figs. 1 and 2. This strip is then slit along a central longitudinal line, the ends of the slit extending preferably a distance from each end of the strip equal to, or at least not greater than, half the width of the strip. The next operation is seen in Fig. 4 and comprises bending up the strip at right angles on a line 1, forming a continuance of the slit, and crimping down the strip along the line 2, extending from the end of the strip to one of the adjacent corners. The strip will then take approximately the form as shown in Fig. 4.

The strip is then crimped along the lines 2—3 and along 5—6 and along 7—8, to produce the form shown in Fig. 5, the order of forming these crimps being immaterial except that it is easier to crimp the strip along the lines 1—2 or 5—6 first, which tends to make the halves of the slit strip separate as shown in Fig. 4. It will be seen that these folds can all be made in a die of the form shown in Fig. 14, and would produce the crimp shown in Fig. 5, after which these crimped portions may be bent down as illustrated in Fig. 7, to form the rectangular corners, thereby producing a rectangular frame.

It will be noticed that in Fig. 9, that the corners have the diagonally extending lines at the corners indicating a visible fold on the metal, while the dotted lines indicate the fold visible from the other side, while the diagonal fold would be concealed on this side. In this arrangement therefore the metal is not symmetrically arranged with respect to the diagonals of the corners. It will be understood that lines 1 and 1' each extend at an angle of 45° to line 2 and the same is true of lines 3, 3' and line 4; lines 5, 5' and line 6; lines 7, 7' and line 8.

In Fig. 14, I have shown a die adapted to crimp the strip. This die comprises die members 50 and 51 having oppositely inclined bevel faces 52 and 53, the upper die having a transverse rectangular plate 55 adapted to coact with the side face 60 of the die 50 and with a shoulder 54 of the lower die. I have shown the dies as provided with gripping members for holding the work in position to be formed and herein

illustrated as comprising the block 56 on the die 50, spring pressed by means of the spring 61, which block is adapted to contact with the spring pressed block 57, as the dies are forced together, the block 57 having a suitable stem 58 projecting into a guide opening in the die 51 and surrounded by a spring 59 bearing on the die bed and on the block 57.

The spring 61 is somewhat stiffer than spring 56 so that block 57 is first forced upward, as the operation continues the block 56 will move down due to the action of the metal as it is forced down by plate 55. At the lowest position of die 51, the block 56 moves down so as to be flush with the shoulder 54. It will be seen therefore that the die is adapted to crimp a strip placed therein to the form shown in Fig. 5.

While I have shown the strip as crimped along the lines 1, 3, 5 and 7, it will be seen that the line 1' can be substituted for 1, the line 3' for 3, the line 5' for 5, the line 7' for 7, that is, at any one of the points the material may be crimped along either one of the diagonal lines. In other words, any combination of these diagonals may be used. If all of the folds are to be made by the die shown in Fig. 14, however, the diagonal lines employed would comprise either the lines 1, 3, 5 and 7, or the lines 1', 3', 5' and 7', if a frame were to be formed having its corners all appearing the same from one side of the frame.

I have shown the strip as crimped along the lines 1, 3, 5 and 7, and all of the corners therefore have the same appearance on one side of the strip. It should be noticed that if an additional die were employed having its beveled faces oppositely inclined from the die shown in Fig. 14, then any diagonal might be used and the appearance of any corner could be determined by the die employed in forming the crimp. However, by properly choosing the diagonal lines, each corner may be made to have either appearance on a given side, although all the corners are crimped by the single die.

In this connection, it will of course be apparent that if a strip is placed with one face toward die 50, then one diagonal line will be crimped while if the other face were presented to the die 50, then the other diagonal would be formed. For instance, in forming the crimps illustrated at the three similar corners in Fig. 5, the strip would be presented to the die with its under face directed toward die 50, while to form a corner utilizing one of the primed diagonals, the strip must be presented with its upper face toward die 50.

In the frame formed as shown in Fig. 9, the next step is the forming of the troughs in the frame. I prefer to stamp up the frame so as to cause it to have the double rectangular troughs 20 and 21 oppositely di-

rected. This operation, which really amounts to a corrugation of the frame, firmly locks the corners, and also strengthens the sides and ends of the frame and makes them rigid. Where the frame is to be used for making a screen, or for holding any material stretched thereon, the inner trough 20 forms a convenient means for attaching said material to the frame, as shown in Figs. 12 and 13, and where the screen 30 is placed over the frame and over-lapping the wall 22, four metal members 23 are inserted in the troughs 20 to hold the wire edges. I prefer to make these members 23 of metallic pieces bent into a trough shape and having sides tending to spring outwardly, whereby when the members are forced into position in the trough, they press the fabric toward the wall 22, and hold it firmly in position, as seen in Fig. 13. It will be seen that by my method, I provide a rigid but light frame made from a single strip of material and requiring very few steps in its manufacture, and that the steps performed in forming each of the separate corners are the same, so that they may be performed by the same means.

Referring now to Figs. 15, 16 and 17; Fig. 15 is a fragmentary view of a strip slit in the same manner as shown in Fig. 3. The lines along which the strip is bent at the ends of the strip are indicated by reference characters 71, 72, 73 and 74. The lines 71 and 74 correspond to 1 and 1' or 5 and 5', respectively, of Fig. 3. Fig. 16 shows the strip as bent along the lines 71 and 74 and these lines brought together. The strip is then crimped down as shown in Fig. 17 which produces a symmetrical corner. The same operation would, of course, take place at the other end of the strip, while in order to form the other two corners, the strip would similarly be bent along the lines 81, 82, 83 and 84, as shown in Fig. 17. In this case likewise, the lines 81 and 84 correspond to diagonal lines 7 and 7' or 3 and 3', seen in Fig. 3. It will be seen that lines 71 and 74 are at right angles to each other and line 72 makes an angle of $22\frac{1}{2}^\circ$ with line 71 and 73 makes an angle of $22\frac{1}{2}^\circ$ with line 74, so that lines 72 and 73 make an angle of 45° with each other. Lines 81, 82, 83 and 84, are arranged at the same angles to each other as lines 71, 72, 73, and 74, respectively, make with each other. By this method the frame will be formed, having an appearance which is exactly the same as shown in full lines in Fig. 9, when viewed from one side, while from the other sides the corners will present the appearance shown for the completed corner in Fig. 17. The frame so formed may then be corrugated, as shown in Figs. 10 and 11.

Referring now to my method in general, it will be seen that I obtain a strong integral frame, which is much stronger than one

formed by bending an unslit strip into rectangular form and thereafter joining the ends of the strip by welding or the like, which has been the process sometimes utilized in the past.

Not only is a frame formed in accordance with my invention superior to frames as commonly made heretofore on account of its increased rigidity, but the method is much simpler comprising only slitting of the strip and thereafter forming each corner by a simple operation which is the same for each corner. This reduces the cost of manufacture because it does away with the requirement for many different machines for performing different operations and also speeds up the production. Furthermore, the process is very simple, the mode of forming each corner involving only the folding of the metal back upon itself along a few lines. The corrugating of the frame locks the corners firmly in position and greatly increases the strength of these sides.

While I have described a specific embodiment of my invention, it is apparent that many changes might be made therein, falling within the principles of the invention, and the foregoing description is therefore to be taken as illustrative of a particular manner of carrying out my novel method rather than as restrictive of the character and scope of the invention.

Having thus described my invention, what I claim is:

1. The method of making a frame which comprises slitting a strip longitudinally nearly but not quite to its ends and folding the material at such ends to separate the slit portions and folding each slit portion toward the other portion at regions located along each portion.

2. The method of forming a polygonal frame which comprises intermediately slitting a strip longitudinally while leaving the ends intact, and thereafter bringing the strip to polygonal form by folding, said folding being accomplished in such manner that the sides of the frame lie in substantially the same plane as the original strip.

3. The method of forming a rectangular frame which comprises slitting a strip longitudinally between points distant from the ends equal to half the width of the strip and thereafter bringing the strip to rectangular form by folding.

4. The method of making a frame which comprises slitting a strip longitudinally nearly but not quite to its ends, and thereafter folding said strip in several regions along lines extending at an angle to each other and meeting in a point.

5. The method of making a frame which comprises slitting a strip longitudinally midway of its width and nearly but not quite to its ends, and thereafter folding said strip

at a plurality of points to make an open frame.

6. The method of making a rectangular frame which comprises slitting a strip longitudinally midway of its width and nearly to its ends, and thereafter folding said strip at four points along lines extending at an angle to each other and meeting in a point.

7. A method of making frames which comprises slitting a strip longitudinally to form substantially equal sections forming corners on said sections by bending the sections on lines extending at an angle to each other and folding the metal upon itself at these points.

8. A method of making frames which comprises slitting a strip longitudinally from points adjacent its ends and forming corners on said slitted strip by bending the sections so formed on lines extending at an angle to each other and folding the metal along these lines so as to form three thicknesses at the corner.

9. A method of making frames which comprises slitting a strip longitudinally midway of its width and continuously from points adjacent the two ends in such manner that the end portions remain intact, forming corners on said slitted strip by bending the sections so formed on lines extending at angles which are aliquot parts of 360°, and folding the metal upon itself at these points.

10. The method of making frames which comprises slitting a strip of material in a longitudinal direction from between points which are adjacent the two ends, folding said strip in different regions along intersecting lines to form corners of a polygon, one of said lines in each region extending from the outer vertex to the inner vertex of the corner.

11. The method of making rectangular frames which comprises slitting a strip of material midway of its sides in a longitudinal direction from between points which are adjacent the two ends, folding said strip upon itself in four regions along intersecting lines to form corners of a rectangle, one of said lines at each corner extending at 45° to the slit edge of the strip and from the outer vertex to the inner vertex of the corner.

12. The method of making a rectangular frame which comprises slitting a strip longitudinally nearly to its ends and thereafter folding said strip in four regions, there being two at the ends and two on the sides, along lines extending at angles to each other, the said lines in the end regions meeting at points on the inner edge of the slitted strip and the lines in the side regions meeting at points on the outer edge of the strip.

13. The method of making frames which comprises slitting a strip of material longitudinally intermediate the ends, thereafter forming said strip into a rectangular form

by folding the strip in four regions along intersecting lines, two of said regions lying at the ends of said slit respectively and the other two regions being spaced equidistant from the opposite ends of the strip.

14. The method of making rectangular frames which comprises slitting a strip of material longitudinally from points distant from the ends equal to half the width of the strip, thereafter forming said strip into a rectangular form by folding the strip in four regions along intersecting lines, two of said regions lying at the end of said slit and the other two regions being spaced equidistant from the opposite ends of the strip, the points of intersection of the lines in the end regions lying on the slit edge of the strip and the points of intersection of the lines in the intermediate regions, each lying on an outer edge of the strip.

15. The method of making polygonal frames comprising taking a strip equal in length to substantially half the periphery of the frame and equal in width to the sum of the width of two opposite portions of the frame, slitting said strip longitudinally between points which are adjacent the ends, then folding the strip in different regions, there being two at the ends of the strip and the others at the sides, said folds being along lines extending at an angle to each other, the lines in the end regions meeting at points on the inner edge of the slitted strip and the lines in the side regions meeting at points on the outer edge of the strip.

16. The method of making rectangular frames having their sides and ends all of the same width, comprising taking a strip equal in length to one side of the frame plus one end, and equal in width to twice the width of a side or end of the frame, slitting said strip midway of its width longitudinally between points which are distant from the ends by an amount equal to half the width of the strip, then folding the strip in four regions there being two at the ends of the strip and two at the sides, and equidistant from opposite ends, said folds being along lines extending at an angle to each other, the lines in the end regions meeting at points on the inner edge of the slitted strip, and the lines in the side regions meeting at points on the outer edge of the strip.

17. A method of making frames which comprises slitting a strip intermediate of its ends, forming corners on said slit strip by folding the slitted strip upon itself at certain regions to form corners, and crimping the corners to lock them.

18. A method of making frames which comprises intermediately slitting a strip almost but not quite to its ends, forming corners on said slit strip by bending the strip at different regions on sets of intersecting lines, folding this strip upon itself in these

regions and bending portions of the frame at an angle to its sides and extending across the corners of the frame whereby the said corners are locked against opening.

19. The method of forming a frame which comprises slitting a strip intermediately nearly to its ends, creasing the strip along lines intersecting at points situated on a free edge, folding down said strip along the lines so as to bring three thicknesses of overlapping metal together adjacent each set of intersecting lines and bending portions at an angle to the side faces of the strip in said regions to lock the corners in position.

20. The method of making a frame which comprises making a longitudinal slit in the center of a metal strip and intermediate of its ends, folding the strip at different regions along intersecting lines extending at angles which are aliquot parts of 360° to form corners, and thereby a polygonal frame, and crimping the sides of the frame perpendicular to the faces to form a trough along the legs of the frame.

21. The method of making frames which comprises slitting a strip of material longitudinally to within a short distance from its ends, thereafter forming said strip into a rectangular form by folding the strip in four regions along intersecting lines, to form corners with overlapping thicknesses of material, and thereafter crimping the sides of the frame so formed at an angle to the side faces to form a continuous rectangular trough locking the corners in position.

22. A method of making polygonal frames which comprises slitting a strip centrally nearly to its ends, forming corners on said slit strip by bending the material at different regions on sets of intersecting lines, folding this strip upon itself in these regions, stamping a trough in each face and extending along the sides of the polygon whereby the said corners are locked in place, placing fabric over said frame and overlying the edge of the trough and forcing tight fitting members in said troughs to hold the edges of said fabric therein.

23. A method of making a frame which comprises slitting a strip intermediate its ends and then folding the strip in such manner that each slit portion forms one side and one end of the frame which lie approximately in the same plane as the original strip.

24. The method of making a frame which comprises slitting a strip intermediate of but not quite to the ends and forming corners on said strip by bending the strip at different regions on sets of intersecting lines, one of said lines diverging from the direction of the slit.

25. The method of making a frame which comprises slitting a strip intermediate its ends, forming corners on said strip by fold-

ing the slitted strip upon itself on sets of intersecting lines, one of said lines diverging from the direction of the slit and also folding the strip in such manner that the slit portions when folded to form the sides remain in substantially the same plane as the original strip.

26. The method of making a frame comprising slitting an integral strip longitudinally and between points adjacent its end, and then forming corners having three thicknesses of material by bending the material back upon itself along lines intersecting the inner vertex of each corner, and in such manner that all of the sides remain approximately parallel to each other.

27. The method of making a rectangular frame comprising slitting an integral strip longitudinally intermediate but not quite to its ends, and then folding the strip so as to make four corners, two of the corners being formed by means of folds extending along lines meeting on the outer edge of the strip, and the other two corners being formed by folding the strip adjacent the ends thereof

and on lines meeting on the slit edge of the strip.

28. The method of making a frame comprising slitting a strip longitudinally and between points spaced from the ends, said slit portion extending along the middle of the strip, and then folding the strip to provide corners having three times the thickness of the material, said sides being folded in such manner that they remain in approximately the same plane as the original strip.

29. The method of making a frame comprising slitting an integral strip longitudinally intermediate its ends and then folding the slit portions to provide four corners, said folding being accomplished along intersecting lines in each region, whereby two of the regions lie on the side of the slit respectively, and the other two are spaced equi-distant from the ends of the strip.

In testimony whereof, I hereunto affix my signature.

WORTHY D. GEMMILL.