May 11, 1943. J. E. GRANT 2,318,849

METHOD OF MAKING TOY STRUCTURAL ELEMENTS

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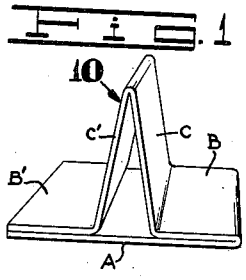


FIG. 1
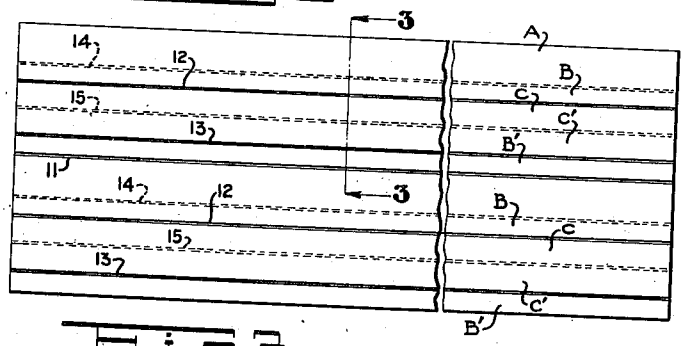


FIG. 2

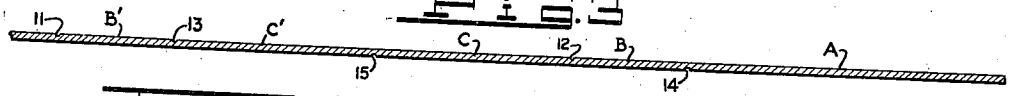


FIG. 3

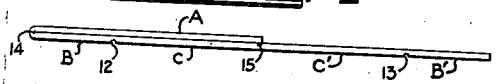


FIG. 4

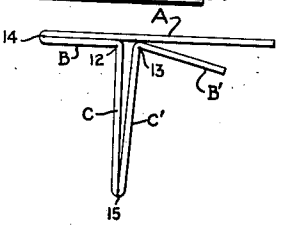


FIG. 7

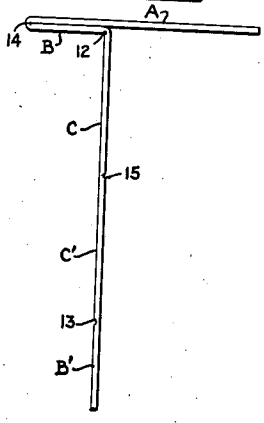


FIG. 5

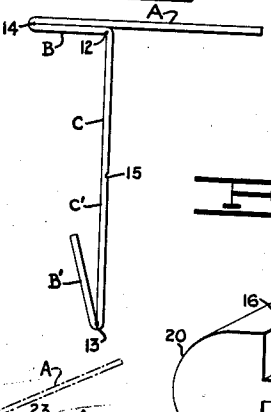
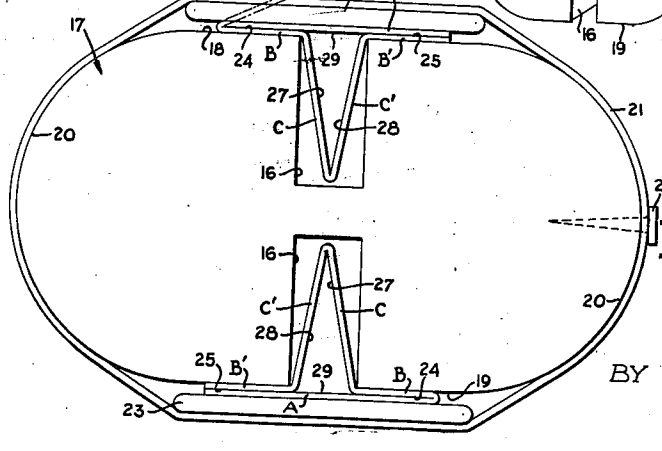


FIG. 6



FIG. 8



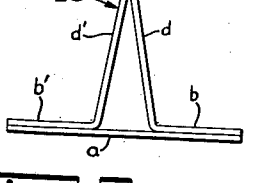


FIG. 10

FIG. 9

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Fig. 11

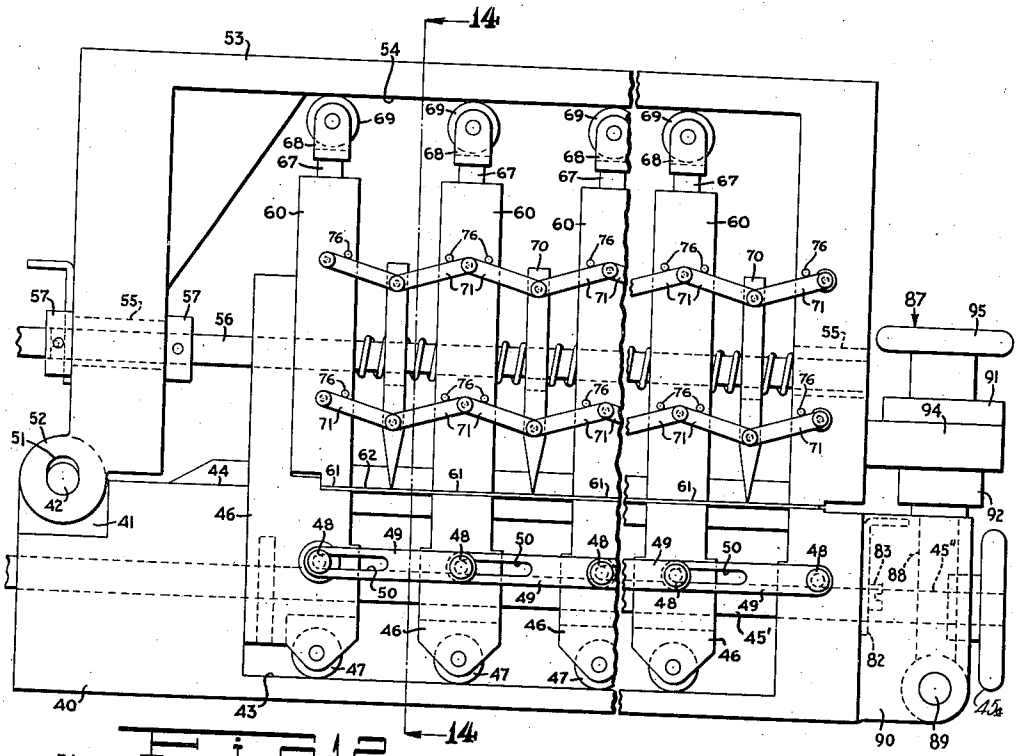


Fig. 12

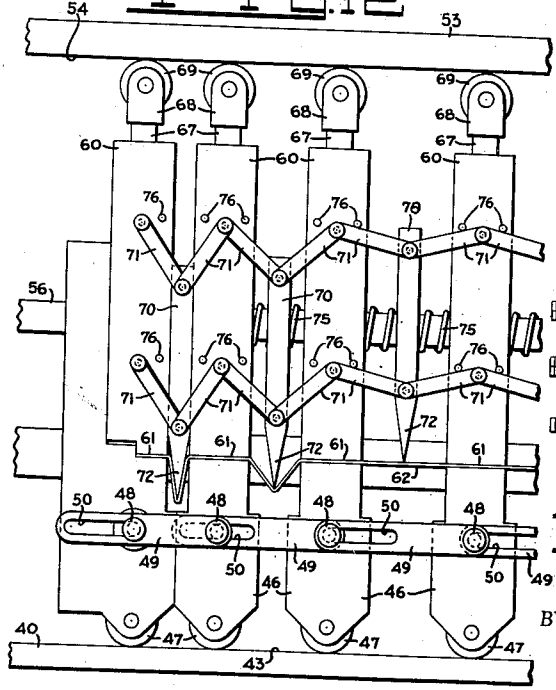


Fig. 15

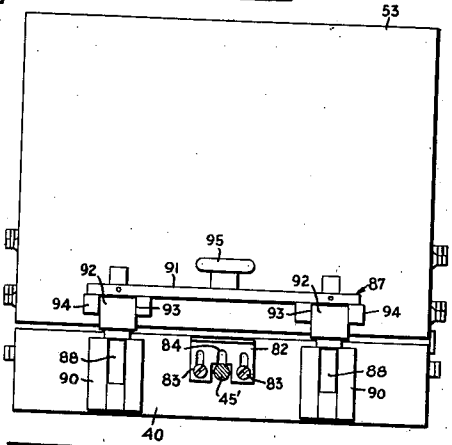
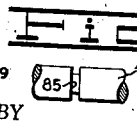


Fig. 15A



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FIG. 13

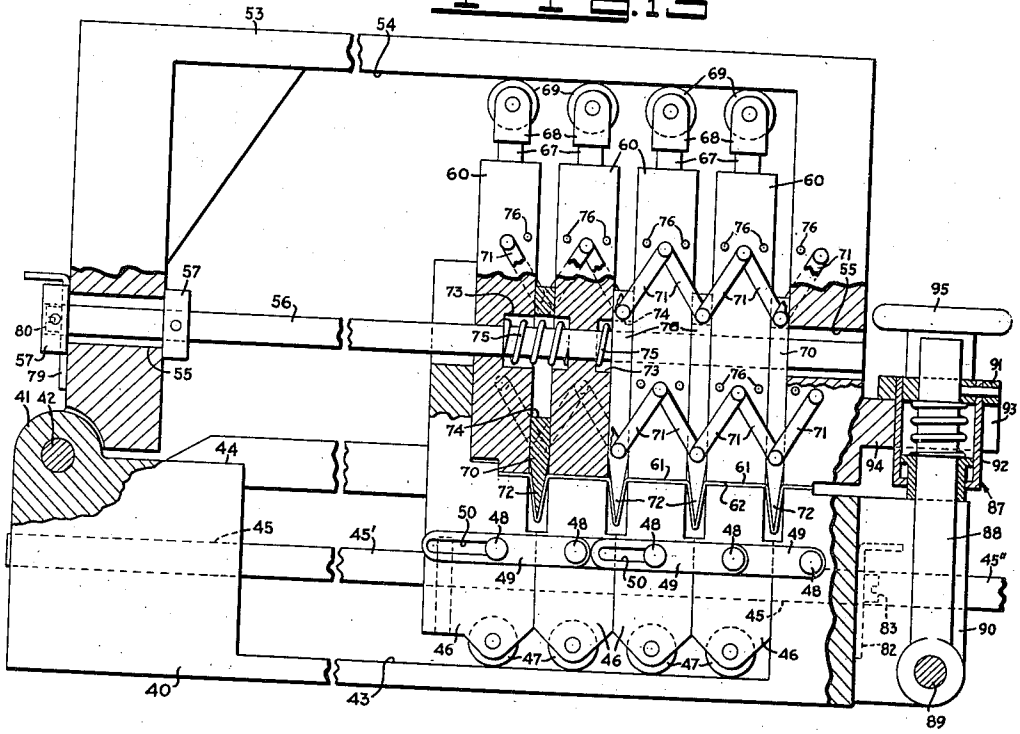


FIG. 17

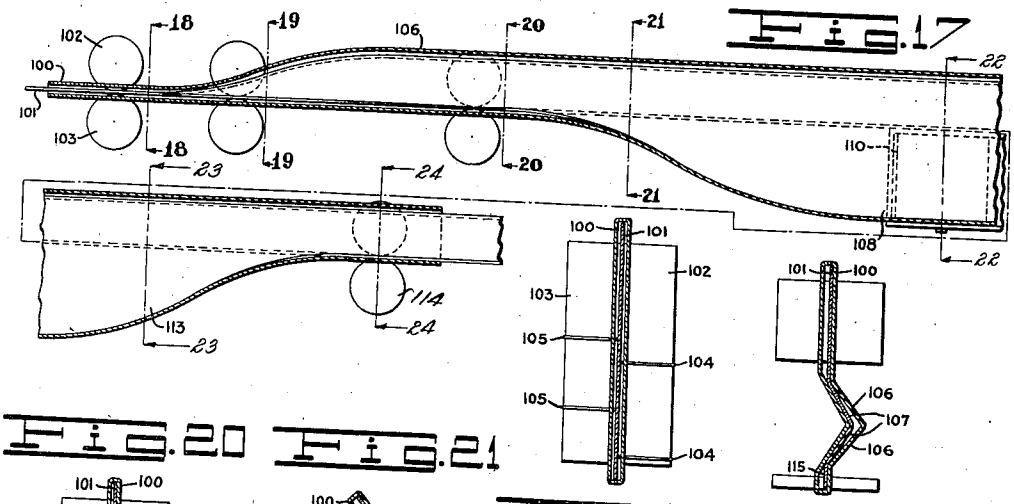


FIG. 20

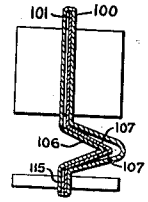


FIG. 21

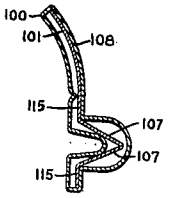


FIG. 18

FIG. 19

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FIG. 14

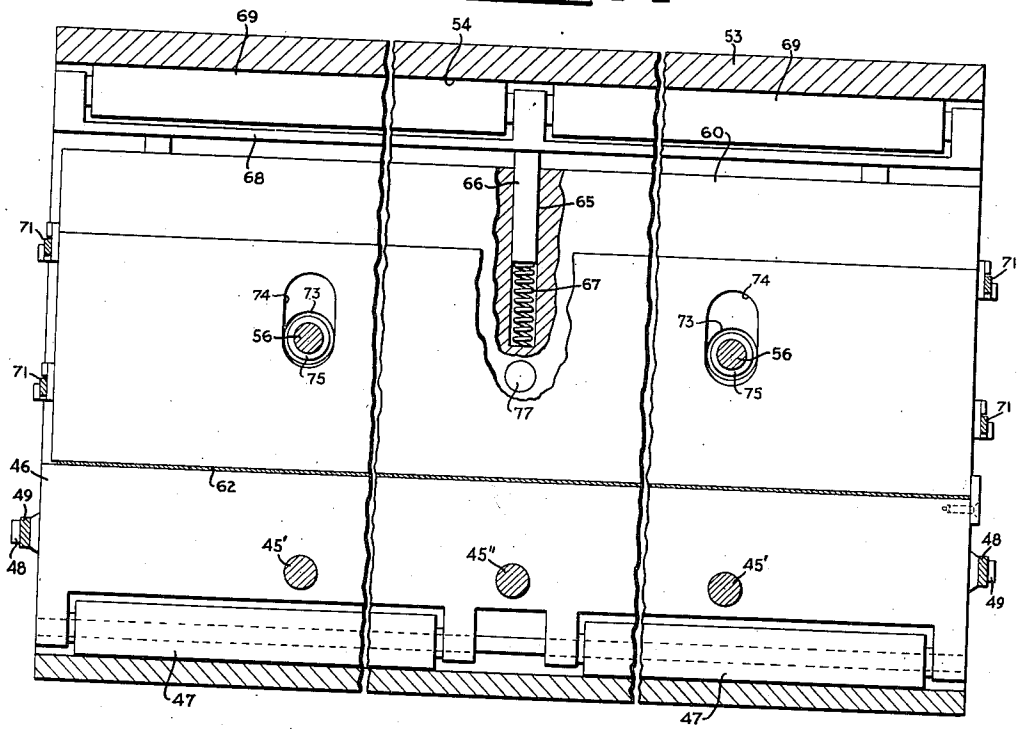


FIG. 22

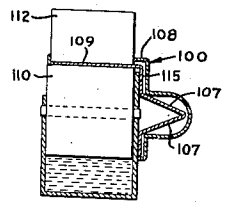


FIG. 23

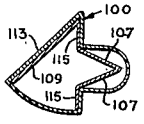


FIG. 16

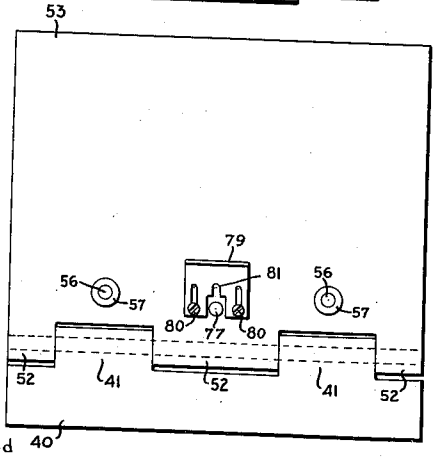


FIG. 16A

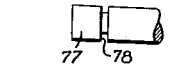


FIG. 24

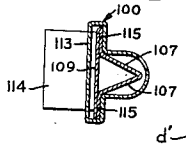
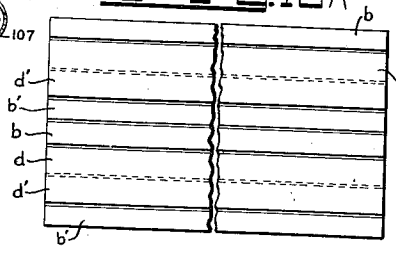


FIG. 10A



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UNITED STATES PATENT OFFICE

2,318,849

METHOD OF MAKING TOY STRUCTURAL ELEMENTS

Joseph E. Grant, Beverly Hills, Calif.

Application February 21, 1941, Serial No. 380,004

4 Claims. (Cl. 93—1)

This invention relates to a method and apparatus for making toy structural elements.

One of the general objects of the invention is to provide an improved method for making a toy structural element.

Another general object of the invention is to provide a novel apparatus for making a toy structural element.

A more specific object of the invention is to provide a novel method of making an elongated ribbed toy structural element from paper or similar flexible material.

A further object of the invention is to provide a novel form member for making a toy structural element.

A more specific object of the invention is to provide an improved apparatus for automatically folding a plurality of toy structural elements.

Another object of the invention is to provide a novel apparatus for simultaneously folding a plurality of toy structural elements.

Other objects and advantages of my invention will be apparent from the following description taken in connection with the accompanying drawings, wherein:

Fig. 1 is a perspective view showing a toy structure element made according to my invention.

Fig. 2 is a top plan view of a blank used for making the elements.

Fig. 3 is a section taken on line 3—3, Fig. 2.

Fig. 4 is an end view showing the first step in folding the blank.

Figs. 5, 6 and 7 are views similar to Fig. 4, showing successive steps in the folding operation.

Fig. 8 is a perspective view of a form member.

Fig. 9 is an end view of the form member, showing folded structural elements thereon.

Fig. 10 is a view similar to Fig. 1, showing a slight modification of my invention.

Fig. 10A is a top plan view of a modified blank.

Fig. 11 is a fragmentary end view showing a folding apparatus embodying the features of my invention.

Fig. 12 is a fragmentary end view, showing the apparatus with the parts in another position.

Fig. 13 is a view similar to Fig. 11 with parts broken away and with the parts in another position.

Fig. 14 is a section taken on line 14—14, Fig. 11.

Fig. 15 is an end view of the apparatus with the pull knob shaft in section.

Fig. 15A is an enlarged fragmentary detail showing the control rod.

Fig. 16 is a rear view of the apparatus on a reduced scale.

Fig. 16A is an enlarged fragmentary detail showing the locking rod.

Fig. 17 is a top plan sectional view through a tube member for forming a structural unit.

Fig. 18 is a section taken on line 18—18 of Fig. 17.

Fig. 19 is a section taken on line 19—19 of Fig. 17.

Fig. 20 is a section taken on line 20—20 of Fig. 17.

Fig. 21 is a section taken on line 21—21 of Fig. 17.

Fig. 22 is a section taken on line 22—22 of Fig. 17.

Fig. 23 is a section taken on line 23—23 of Fig. 17, and

Fig. 24 is a section taken on line 24—24 of Fig. 17.

Referring to the drawings by reference characters, I have shown my invention as employed in making a toy structural element which is indicated generally at 10. This element, as shown, includes a pair of sides B and B', a pair of flaps C and C' and a base A.

In Fig. 2 I have shown two running blanks joined in side by side relation for making two of the toy elements. The blank shown in Fig. 2 is severed along the line 11 and is provided with upwardly directed creases 12 and 13 and downwardly directed creases 14 and 15, which define the sides, flaps and base.

In the folding operation the elongated strip is first folded about the crease line 14 so that the part A overlaps the part B and a portion of the part C. The parts are then folded along the crease line 12, as shown in Fig. 5. The parts may then be folded about the crease line 13 to the position shown in Fig. 6 and finally the parts may be folded about the crease line 15 to the position shown in Fig. 7. After the blank is in the form shown in Fig. 7, it may be inserted in a slot 16 provided in a form member 17, which member has plane upper and lower bases 18 and 19, which are joined by curved portions 20. The form member at each end is provided with a flexible member 21 which may be made of rubber and which is secured in place as at 22. There is one of the slots 16 in the face 18 and another slot in the face 19, so that two of the elements may be simultaneously completed.

After the elements are inserted in the slots, clamping boards 23 are arranged over the ele-

ments and the band 21 is moved to the position shown in Fig. 9.

When the strip is in blank form, the entire area may be coated with glue which will dry and may be moistened again to render it active. The base shown in dotted lines in Fig. 9 is raised when the element is being made and the upper faces of the sides at 24 and 25 are moistened after which the base is lowered and is secured by the glue. The inner faces of the flaps at 27 and 28 and the portion 29 remain with the glue in undisturbed condition so that these portions remain ready to be moistened and secured when they are used in building toy structures.

In Fig. 10 I show an element 10' including a base *a*, sides *b* and *b'* and flaps *d* and *d'* and in Fig. 10A, I show a blank for making the element 10'.

In Figs. 11 to 16 inclusive, I show an apparatus for making a toy structural element from the blank shown in Fig. 10A. As shown, the apparatus includes a base 40 having bosses 41 thereon, which support a shaft 42. The base 40 is provided with a recess 43 and has a top surface 44 about the recess. The base is provided with apertures 45 in each of which a rod 45' is arranged.

The rods 45' slidably support a plurality of lower forming members 46, each of which is provided with a pair of rollers 47 (see Figs. 12 and 14) at its lower end. These rollers 47 engage the wall in the bottom of the recess 43 and support the lower forming members. The forming members are provided on their ends with headed pins 48 on which links 49 are arranged. Each of the links includes an elongated slot 50 and the construction is such that the links limit the separating movement of the lower forming members as shown in Fig. 11.

The shaft 42 is fitted in elongated apertures 51 in bosses 52 in a top member 53 which includes a recess 54 and the end of the top member includes elongated slots 55 in which rods 56 are mounted to slide vertically in the slots. Collars 57 on the rods 56 prevent axial movement thereof. Mounted on the rods I show a plurality of upper forming members 60 which are aligned with the lower forming members and these members have opposed faces 61 which, when the top member is moved to the position shown in Fig. 11, firmly clamp a sheet of cardboard or similar material 62 therebetween for a folding operation to be presently described.

Each of the upper forming members 60 is provided with a plurality of elongated recesses 65 in which a pin 66 moves. This pin is urged upwardly by a spring 67 and the pins support a yoke member 68 which supports a plurality of rollers 69 and the construction is such that the springs 67 normally urge the forming members downwardly.

Between each of the forming members 60 a depressing member 70 is provided which is connected at each end with the adjacent forming members by lazy-tong links 71. Each of the depressing members 70 includes a tapered lower end 72.

In the adjacent faces thereof surrounding the shafts 56 each of the forming members 60 includes an enlarged recess 73 and each of the depressing members 70 includes an elongated aperture 74 in which the shafts 56 are positioned.

Surrounding the shafts 56 between adjacent forming members 60 and positioned in the recesses 73 thereof springs 75 are provided which resiliently urge the forming members apart. Extended movement of the forming members 60 is restricted by pins 76 adapted to be engaged by the links 71.

Between the rods 56 the member 60 which is nearest to the collars 57 has a locking rod 77 secured thereto which extends through the rear wall of the top member 53 and has a peripheral groove 78 therein a predetermined distance from the rear forming member.

Mounted on the rear wall of the top member adjacent the rod 77 a vertically movable plate 79 is secured to the top member by screws 80. The plate 79 has a reduced slot 81 therein which, when the forming members are completely compressed, may be moved down into the groove 78 of the rod 77 to retain the members 60 in a compressed position.

A similar slide latch plate 82 is secured to the outer front face of the base 40 by a plurality of screws 83. The plate 82 has a reduced recess 84 therein which, when the members 46 are in an extreme forward position, is moved into a peripheral groove 85 in a control rod 45'' which is secured to the rear member 46 and retains the members 46 in a forward position.

To releasably retain the top member 53 in engagement with the base 40 a latch mechanism 87 is provided. The latch mechanism 87 includes a pair of spaced pins 88 pivotally secured as at 89 to lugs 90 of the base. Each of the pins 88 is connected to a cross bar 91 through a spring pressed telescopic member 92 which is adapted to be positioned in a recess 93 of a lug 94 on the top member 54. Intermediate the length thereof the bar 91 includes an operating handle 95.

After the cardboard 62 is firmly clamped between the members 46 and 60 as previously described an operator grasps the handle 45*a* on the rod 45'' and pulls it outward thus moving the rear member 46 towards the next adjacent member 46. As the rear member 46 is thus moved it moves the rear member 60 with it which, when thus moved, causes the adjacent depressing member 70 to move downward through the medium of the links 71. The rear member 46 moves forwardly into engagement with the next adjacent member 46 in which position the rear depressing member 70 is engaged by the rear member 60 and engages the next forward member 60.

As the parts thus move the rear members 46 and 60 carry a portion of the cardboard 62 with them and the depressing member 70 moves downward and forces a portion of the cardboard downward to form a V-shaped portion as shown in Fig. 12.

The operator continues to pull the rod 45' forward until all the members 46 contact each other and the forwardmost one contacts the front of the base as shown in Fig. 13. When the device is in this position all the necessary folding operations have been completed and then the operator moves the latch plate 79 into position to retain the members 60 forward and moves the latch plate 82 into position to retain the members 46 forward. Thereafter the operator releases the latch mechanism 87 and swings the top member 53 upward to an open position. Thereafter a sheet of cardboard may be glued to the sheet 62 to form a base for the structural members. Thereafter the formed structural members are removed from the lower members 46.

In Figs. 17 to 24 I have shown a novel apparatus for forming my structural element from a continuous length of material. As shown the device includes a tube 100 into which a flat strip

of material 101 is fed by a pair of opposed rollers 102 and 103. As shown the roller 102 has circular protuberances 104 thereon for scoring certain fold lines on the material 101 and the roller 103 has circular protuberances 105 thereon for scoring other fold lines on the material.

The tube 100 includes an enlarged portion 106 which forms the center portion of the material into a V to form flap portions 107 as shown in Figs. 19 and 20. Thereafter the tube 100 includes a portion 108 which turns the upper portion of the material downward to a horizontal position as shown in Figs. 21 and 22 to form a base portion 109.

Within the portion 108 the device includes a gluing roller 110 which applies glue to the underside of the horizontally positioned portion 109 of the material as shown in Fig. 22. A roller 112 above the gluing roller retains the material in contact with the gluing roller 110.

Thereafter the tube 100 includes a portion 113 which directs the horizontal portion 109 of the material downward to a vertical position as shown in Figs. 23 and 24 and a roller 114 firmly presses the base portion 109 against side flange portions 115 to secure it thereto by the applied glue.

Having thus described my invention I claim:

1. The method of making a toy structural element comprising taking an elongated rectangular blank of flexible material, folding the blank to provide a base, folding a portion to overlie one side of the base to form a side, bending a flap upwardly from the side, bending a second flap downwardly from the first flap, then bending a second side outwardly from the second flap until its edge is coextensive with the edge of the base and thereafter gluing the sides to the base.

2. The method of making a toy structural element comprising taking an elongated rectangular blank of flexible material, bending a portion to form a side, bending a flap upwardly from the side, bending a second flap downwardly from the first flap, then bending a second side outwardly from the second flap and thereafter securing a base which is integral with one of the sides to the lower surfaces of the sides.

3. The method of making a toy structural element comprising taking an elongated rectangular blank of flexible material, bending a portion to form a side, bending a flap upwardly at an obtuse angle to the side, bending a second flap downwardly from the first flap, then bending a pair of connected sides outwardly at an obtuse angle to the second flap, bending a third flap upwardly at an obtuse angle to the outermost of the pair of connected sides and continuing the folding operation until a series of elements are folded and thereafter securing a base to the lower surfaces of the sides.

4. The method of making a toy structural element comprising taking an elongated blank of flexible material, bending up a flap from a side portion of the blank and at an obtuse angle to the side portion of the blank, the flap bending line being spaced inwardly from one edge of the blank, bending down a second flap from the first flap, bending outwardly a second side portion at an obtuse angle to the second flap and in the same plane as the first side portion and then securing a one piece base to the lower surfaces of the side portions while the lower portion of the flaps are spaced apart so that the flaps are held in inverted V-shape.

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