Jan. 27, 1942. K. E. SWANGREN 2,271,107

TOOL FOR FORMING LUGS ON CAPS

Filed Aug. 20, 1938 3 Sheets-Sheet 1

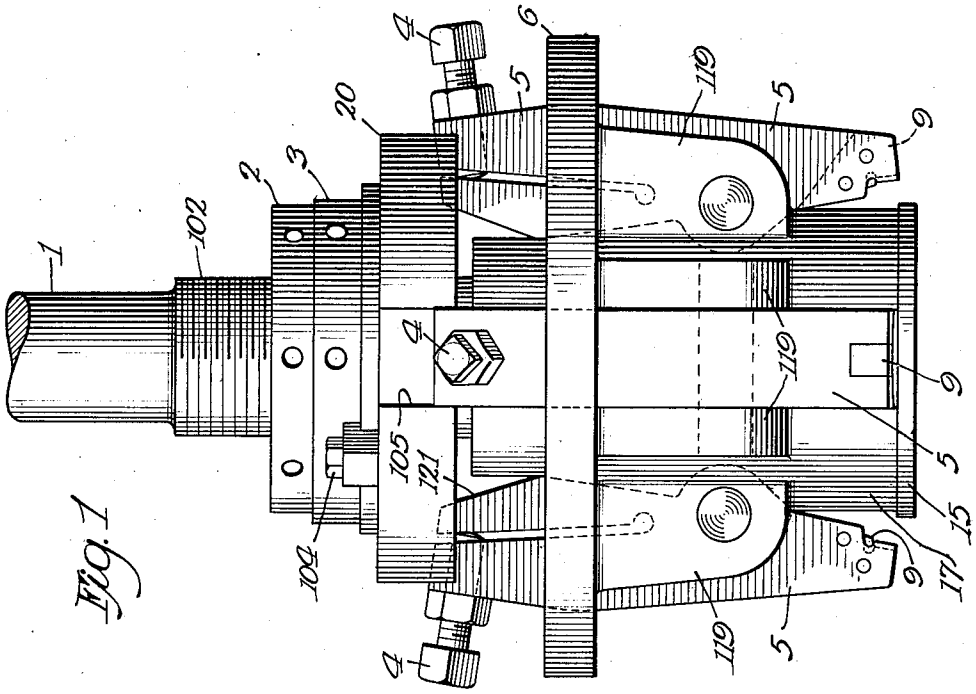


Fig. 1

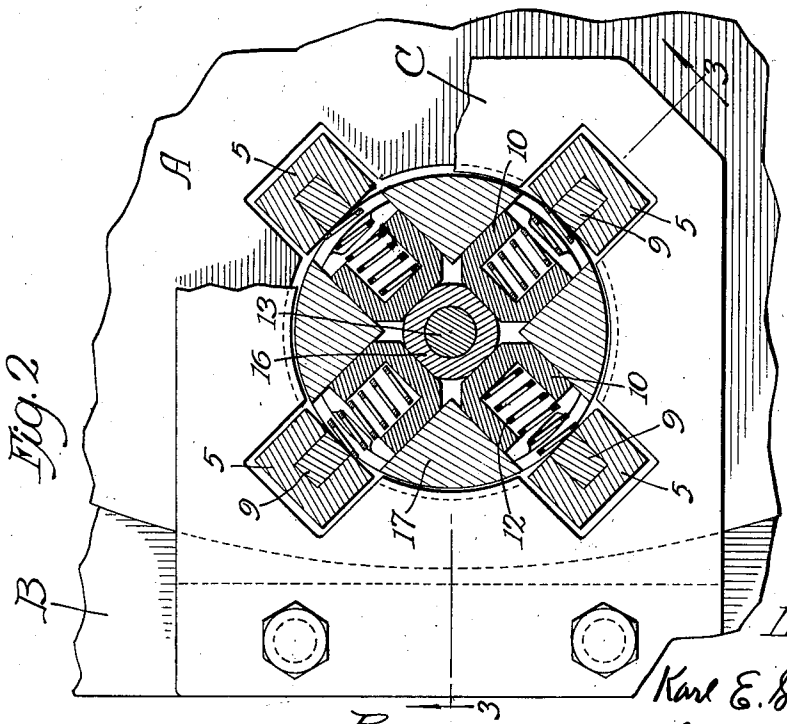


Fig. 2

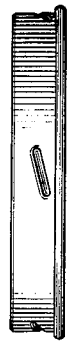


Fig. 9

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TOOL FOR FORMING LUGS ON CAPS

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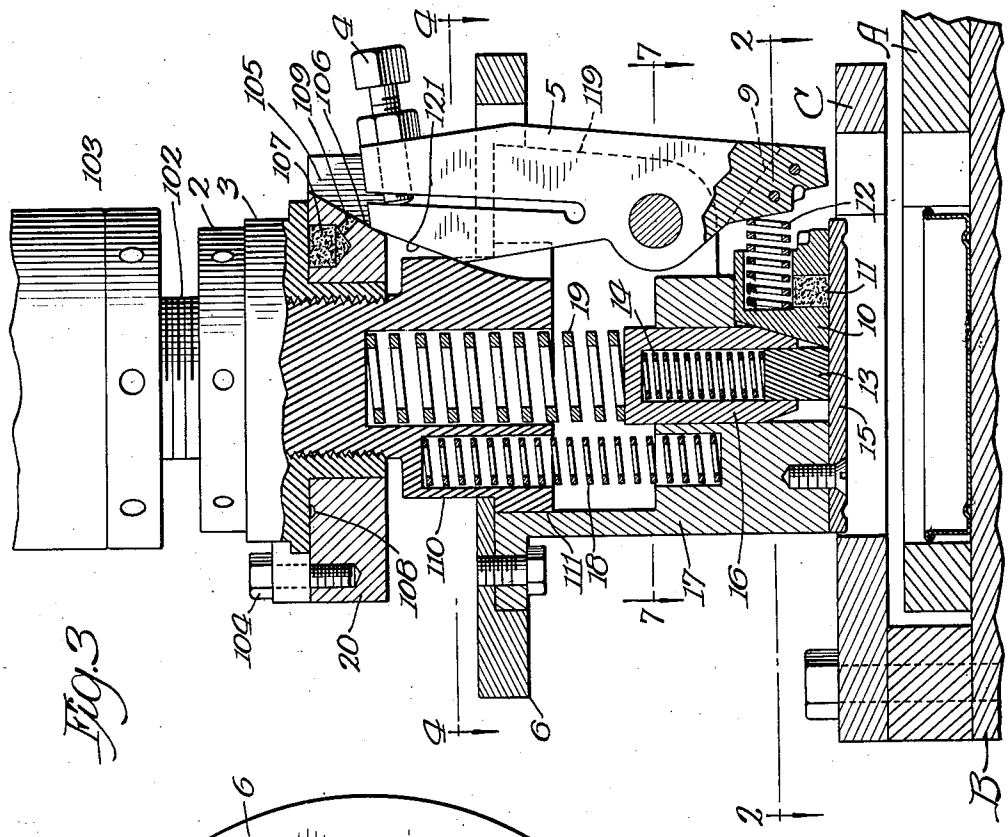


Fig. 3

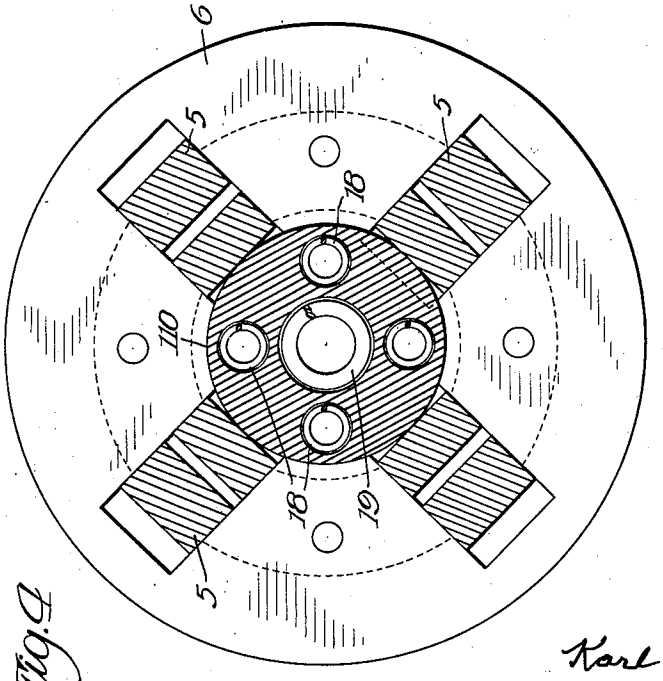


Fig. 4

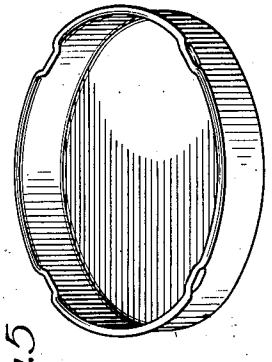


Fig. 5

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TOOL FOR FORMING LUGS ON CAPS

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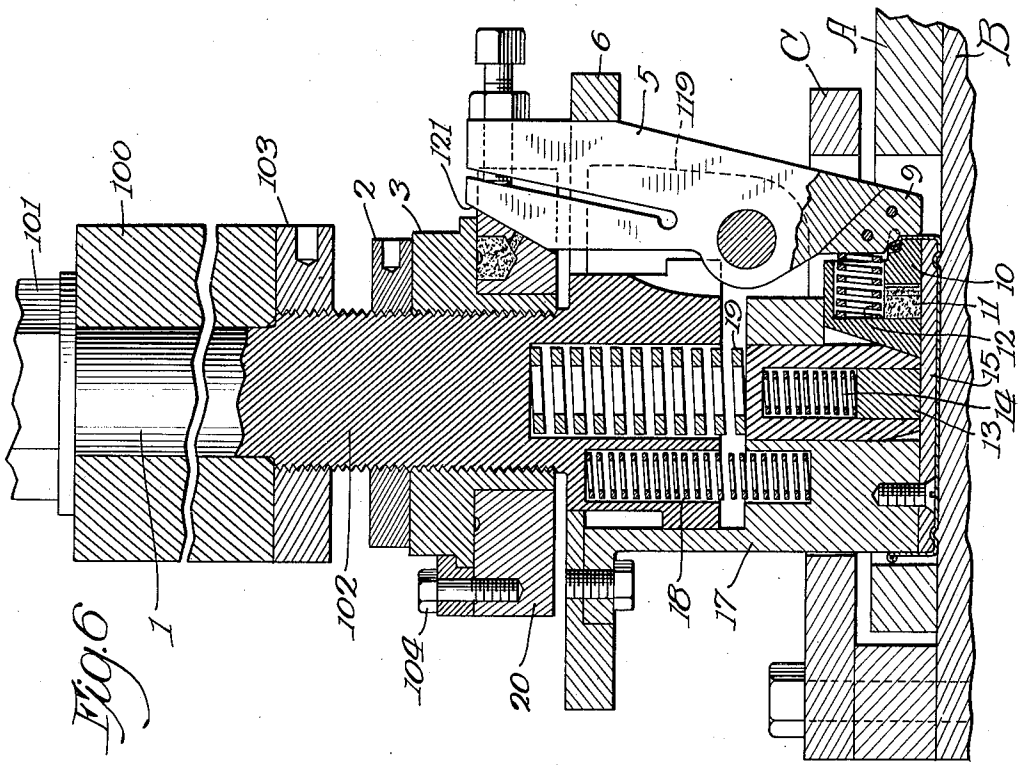


FIG. 6

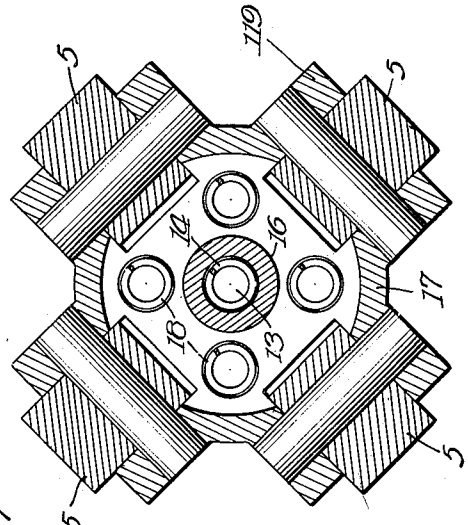


FIG. 7

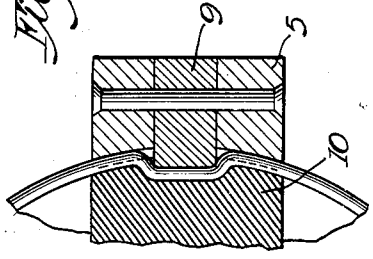


FIG. 8

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UNITED STATES PATENT OFFICE

2,271,107

TOOL FOR FORMING LUGS ON CAPS

Karl E. Swangren, Maywood, Ill.

Application August 20, 1938, Serial No. 225,855

8 Claims. (Cl. 113—48)

My invention relates to a tool consisting of an assembly of connected members adapted to be attached to the reciprocating head of a die press or similar machine, and cooperating with suitable lower supporting members to form in the peripheral flange section of a sheet metal cap or cover, such as those used as closures for bottles, jars, cans or other containers, lugs or other deformations of the flange, to adapt them for special purposes and uses. The particular purpose for which the embodiment of my invention hereinafter described was devised was the use of such mechanism as an addition to and part of a machine for lining metal caps, such as that shown in Patent No. 1,870,151, issued August 2, 1932, upon application of Edwin V. Swangren, to the inventor and W. N. Stevenson. The present application, however, relates particularly to the group of mechanical elements constituting the mechanism for forming lugs on the caps, and not to its employment as an element of a complete machine of which it may form a part.

With this understanding of the scope of the present invention and application, it will be understood that the object of my invention is the provision of a reciprocating forming tool to be used in connection with a cap holder suitably formed to cooperate therewith and arranged to support the cap in inverted stationary position in alignment with the tool during its working stroke, and operating automatically, through power imparted by the die head, or other reciprocating part to which the tool is connected, to form the desired lugs or other deformations upon the flanges of caps being operated upon. With this object in view, my invention consists in the novel arrangement and construction of the associated mechanical parts of the tool, operating as hereinafter described, the essential elements of my invention being more particularly pointed out in the appended claims.

In the accompanying drawings I have, for purposes of description and exemplification, shown my invention embodied in a novel lug-forming tool in connection with associated parts of a machine such as the machine for lining caps described in Swangren Patent No. 1,870,151, before referred to. Of the drawings

Figure 1 is a side view of the assembled tool;

Fig. 2 is a horizontal section through the assembled tool, the plane of the section being indicated by the dotted line 2—2 of Fig. 3;

Fig. 3 is a vertical section in two planes intersecting at the axis of the tool, as indicated by the dotted line 3—3 of Fig. 2, and showing the position of the parts when the tool is in uppermost position;

Fig. 4 is a horizontal section in a plane indicated by the dotted line 4—4 of Fig. 3;

Fig. 5 is a perspective of a cap having lugs formed upon it by operation of the tool;

Fig. 6 is a vertical section corresponding to Fig. 3, but showing the tool in lowermost position, with the parts thereof in the position occupied at the conclusion of the downward stroke;

Fig. 7 is a horizontal section of the tool in a plane indicated by the dotted line 7—7 of Fig. 3;

Fig. 8 is a fragmentary section on a larger scale through the lower end of the lugging jaw and bending die and a portion of the backing block cooperating with such die; and

Fig. 9 is a side view of a modified form of cap which may be formed by my novel tool.

Like reference characters refer to like parts in all the figures of the drawings.

Describing now the specific embodiment of my invention illustrated, the supporting member secured to the reciprocating cross-head 100 of the press and to which the working members are connected is in the form of a vertical stem 1, passing through a bore formed to receive it in the cross-head. The stem is threaded at its top to engage an upper clamping nut 101, and is formed with a lower enlarged threaded section 102 engaged by a lower clamping nut 103 in such manner that by adjustment of the nuts 101 and 103 the stem may be adjustably secured to the cross-head.

The lower threaded section 102 also carries a supporting nut 3, backed up by a locknut 2, and the supporting nut 3 is shouldered on its lower side to receive a cam ring 20 which is secured to said nut in suitable manner, as by screws 104 engaging orificed peripheral lugs on said nut and seated in threaded orifices in said cam ring.

The cam ring 20 is formed with a set of peripheral notches 105, in the present instance four in number, though the number may be greater or less than four, and the inner faces of these notches are inclined inwardly from the top towards the bottom to form cam faces 106 designed to cooperate with cam faces on a corresponding set of rocking lug-forming jaws later to be described. Preferably the upper face of the ring is formed with oil pockets 107 connected by a groove 108, and oil ducts 109 leading from said pockets to the cam faces 106 of the ring.

Below the plane of the cam ring 20, the lower end of the stem 1 is formed with cylindrically curved faces arranged to provide sliding contact

with similarly curved inner faces formed in a body block 17 carrying an assembly of cooperating members including the rocking lug-forming jaws above mentioned. To this end the lower end of the stem is formed with a face 110, the upper portion of which is cylindrical and the lower portion of which consists of four cylindrically curved sections continuous with upper portion, and four cylindrically curved lower faces 111 formed upon a larger radius, the sections of the lower portion of the face 110 and the four faces 111 being separated respectively by notches which are formed in alignment with the notches 105 and cam faces 106 of the cam ring 20. The body block 17 is formed with aligned cylindrically curved interior faces, separated by like notches, to cooperate with the lower faces of the stem member, and a retaining plate 6, bolted to the top of the body block, is formed with inner faces separated by like notches and arranged to slidingly engage the upper faces 110 of the stem member. The shoulder on the stem member 1 between the faces 110 and 111 cooperate with the inner lower face of the retaining plate 6 to limit movement of the parts and prevent their separation under the stress of a set of compression springs 18, in the present instance four in number, which are seated in aligned sockets in the stem member and the body block, and also the stress of a strong compression spring 19 seated in an axial orifice in said stem member and bearing against the top of a hollow feathered expanding plug 16 slidingly mounted in an axial bore in the lower part of said body block in alignment with the bore in the stem member. This hollow plug 16 is yieldingly stressed to upper or inner position in its bore in the body block by a light spring 14 seated in the upper part of the bore of the plug and bearing against a plug 13 in the lower part of such bore. This plug 13 bears against a bottom cover plate 15 secured to the lower face of the body block.

The lower end of the expanding plug 16 is cut away to provide four equidistant cam faces arranged to cooperate severally with corresponding cam faces on the inner or rear sides of four backing blocks 10 which are mounted to slide radially in recesses formed in the body block. The top and sides of each slideway are formed by the top and side walls of a radial slot formed in the bottom of the body block and the top face of the bottom plate 15 constitutes the bottom of the slideway. The sides of the slideway and blocks 10 are arranged in the same plane as the sides of the slots before mentioned in the cam ring 20 and retaining ring 6.

Opposite the aligned slots and backing blocks mentioned the body block is formed with pairs of outwardly extending bearing flanges 119, arranged to pivotally support the rocking lug-forming jaws before mentioned, marked 5, the upper, inner sides of which are formed with cam faces 121 arranged to cooperate with the cam faces 106 of the cam ring 20, and the lower ends of which are equipped with hardened bending dies 9 arranged to cooperate with complementary faces on the backing blocks 10 to form lugs on the flanges of rings interposed between such backing blocks and bending dies.

To provide for accurate adjustment of the cam faces 121 and bending dies 9 with respect to the parts with which they cooperate, the upper end of the jaws 5 are split so that the inner part will yield with respect to the outer, and an adjusting bolt 4, threaded in the outer part and bearing against the inner part, serves to spread the parts more or less, to vary the adjustment as necessary.

The lower ends of the jaws 5 and backing blocks 10 are stressed apart by compression springs 12, and the blocks are preferably lubricated in their slideways by felt oiler plugs 11 arranged in recesses formed in the bottom of such blocks.

In the present instance the caps to be operated upon are presented to the tool above described by a rotating dial plate, marked A, arranged above and closely adjacent to a stationary bed plate B, upon the surface of which the caps are shifted by intermittent movement of the dial plate between the downward movement of the cross-head and tool. Above the dial plate is arranged a stationary stripper plate C to strip the caps from the ascending tool after the lugs have been formed.

The operation of the mechanism, constructed as above set forth, may now be described. In upper position of the tool—see Fig. 3—the body block and parts carried thereby are stressed to extended lower position with respect to the stem by the springs 18, which are normally under some compression, while the central strong spring 19 is under only such slight stress as suffices to balance the much weaker spring 14, which latter maintains the expanding plug 16 in upper position against the substantially expanded spring 19. The compression springs 12 serve both to stress the backing blocks 10 to inner position and to stress the lower ends of the jaws 5 to outer position, as shown in Fig. 3. Upon downward movement of the tool, after the bottom plate 15 has brought up against the inner face of a cup upon the bed plate B, the strong spring 19, overcoming the much weaker spring 14, forces the expanding plug 16 downwardly, thus camming the backing blocks 10 outwardly into contact with the inner face of the flange of the cap being operated upon, and putting the springs 12 under increased tension. The proportions of the parts are such that when the blocks 10 are expanded to outward position the backing blocks 10 will snugly fit the inner diameter of the caps being operated upon. Accurate adjustment of the parts for this purpose, or for taking up wear of the contacting cam faces, may be readily attained by grinding off the lower face of the plug 16 more or less.

Following this initial movement, the cam faces 106 of the cam ring 20, cooperating with the cam faces 121 of the rocking jaws 5, causes the bending dies 9 at the lower ends of the jaws to swing inwardly against the flange of the cap and toward the backing blocks 10, and thus form the lugs on the caps during the concluding portion of the downward movement of the tool. The very obtuse angle betwen the cam faces on the inner sides of the backing blocks and on the expanding plug prevents the backing blocks from yielding inwardly and camming the expanding plug upwardly under the considerable pressure incident to the lug-forming movement of the pivoted jaws.

Upon upward movement of the cross-head and tool the stem backs away from the body block, which is yieldingly held down on the cap by reason of the stress of the springs 18, 19 and 14, while the lower ends of the jaws 5 are shifted outwardly by the springs 12 as permitted by the upward movement of the cam ring 20. When the stem and body block have reached an intermediate point in their relative movement, the

strong central spring will have arrived at substantially its full extension, and thereupon the light spring 14 will lift the expanding plug 16 in its bore in the body block, permitting the compression springs 12 to restore the backing blocks 10 to inward position.

During the upward movement of the tool the cap operated upon is carried upwardly a short distance into contact with the stripper plate 6 which removes them from the ascending tool, upon clearing which the cap falls back into its seat in the dial plate, and by movement of such plate is removed from its stationary position upon the table in alignment with the tool, while another cap is brought into aligned position.

It will be understood that the purpose of the lugs formed upon the caps as above described is to cooperate with projecting inclined ribs formed upon the periphery of the jars or bottles upon which they are designed to be used, to cam the caps downwardly upon the containers and make a tight closure, a compressible liner of treated thick paper, or a rubber sealing ring between the parts being usually employe to make an impervious joint.

It is obvious that while the form of lug illustrated and described is well adapted and is largely used for the purposes mentioned, other forms of deformation of the flanges of caps may be accomplished by suitable alterations in the working faces of the backing blocks and working dies, to produce, for instance, such a form of cap as that illustrated in Fig. 9.

I claim:

1. In combination with means for supporting flanged caps in inverted position, a tool for forming lugs on the flanges of supported caps comprising an assemblage of connected members including a supporting member arranged to reciprocate vertically, a body block mounted on said supporting member and having limited sliding movement with respect thereto, the bottom of said body member being arranged to bring up in the downward movement of the supporting member against the face of a supported cap, spring tension means for stressing said supporting means and body block to expanded position, a plurality of backing blocks slidingly mounted in said body block above its bottom face and arranged to be shifted radially outward into contact with the flange of a cap, a corresponding plurality of rocking jaws pivotally mounted on said body block and provided with bending dies arranged to be shifted inwardly, means connected with said supporting member for actuating said backing blocks to shift them outwardly, and means also connected with said supporting member for actuating said jaws to shift said bending dies inwardly.

2. In combination with means for supporting flange caps in inverted position a tool for forming lugs on the flanges of supported caps comprising an assemblage of connected members including a supporting member arranged to reciprocate vertically, a body block mounted on said supporting member and having limited sliding movement with respect thereto, the bottom of said body member being arranged to bring up in the downward movement of the supporting member against the face of a supported cap, spring tension means for stressing said supporting means and body block to expanded position, a plurality of backing blocks slidingly mounted severally in slideways in said body block above its bottom face and arranged to be shifted radially outward into contact with the flange of a cap, a corresponding plurality of rocking jaws pivotally mounted on said body block and severally formed with a cam face adjacent the top and a bending die at the bottom end of each, means connected with said supporting member for actuating said backing blocks, and a cam ring secured to said supporting member and formed with cam faces arranged to cooperate with said cam faces on said jaws to shift said bending dies inwardly.

3. A tool structure according to claim 2 in which said pivoted jaws are split to provide an inner flexible limb carrying the top cam face and a stiff outer limb equipped with an adjusting bolt, whereby said inner section of a particular jaw member may be angularly adjusted with reference to the pivot of said jaw member.

4. In combination with means for supporting flanged caps in inverted position, a tool for forming lugs on the flanges of supported caps comprising an assemblage of connected members including a supporting member arranged to reciprocate vertically, a body block mounted on said supporting member and having limited sliding movement with respect thereto, the bottom of said body member being arranged to bring up in the downward movement of the supporting member against the face of a supported cap, spring tension means for stressing said supporting means and body block to expanded position, a plurality of backing blocks formed with inclined rear cam faces and mounted to slide radially in said body block above its bottom face, an expanding plug connected with said supporting member mounted to slide axially in said body block and formed with inclined cam faces arranged to cooperate severally with the cam faces of the backing block to force them radially outward into contact with the flange of a cap, a plurality of rocking jaws pivotally mounted on said body block and provided with bending dies arranged to be shifted inwardly towards said backing blocks respectively, and means connected with said supporting member for actuating said jaws.

5. A tool structure according to claim 4 in which said expanding plug is stressed upwardly by a weak spring and is connected with said supporting member by a strong heavy spring.

6. In combination with means for supporting flanged caps in inverted position, a tool for forming lugs on the flanges of supported caps comprising an assemblage of connected members including a supporting member arranged to reciprocate vertically, a body block mounted on said supporting member and having limited sliding movement with respect thereto, the bottom of said body member being arranged to bring up in the downward movement of the supporting member against the face of a supported cap, spring tension means for stressing said supporting means and body block to expanded position, a plurality of backing blocks mounted severally in slideways in said body block above its bottom face and arranged to be shifted radially outward into contact with the flange of a cap, a corresponding plurality of rocking jaws pivotally mounted on said body block and provided severally at their lower ends with bending dies arranged to be rocked inwardly, means connected with said supporting member for rocking said jaws to shift said bending dies inwardly, and springs severally interposed between said backing blocks and the lower ends of said pivoted jaws arranged to stress them apart.

7. In combination with means for supporting flanged caps in inverted position, a tool for forming lugs on the flange of a supported cap comprising an assemblage of connected members including a supporting member arranged to reciprocate vertically, a body block mounted on said supporting member and having limited sliding movement with respect thereto, the bottom of said body member being arranged to bring up in the downward movement of the supporting member against the face of a supported cap, spring tension means normally under compression for stressing said supporting means and said body block to expanded position, a plurality of backing blocks formed with inner cam faces and mounted to slide radially in said body block adjacent its bottom, an expanding plug mounted to slide axially in said body block and formed with inclined cam faces arranged to cooperate with the cam faces of the backing blocks to shift them outwardly, a strong compression spring interposed between said supporting member and said expanding plug, said last-mentioned spring being substantially free from compression in expanded position of said supporting member and said body block, a weak spring tensioning said expanding plug into contact with said strong compression spring, a plurality of pivoted jaws provided at their lower ends with bending dies arranged to be rocked inwardly towards said backing blocks respectively, compression springs between said backing blocks and the lower ends of said pivoted jaws for stressing them apart, and actuating means connected to said supporting means and the upper ends of said jaws for rocking the jaws.

8. A tool structure according to claim 4 in which said supporting member and said expanding plug are yieldingly stressed apart and in which the angle between the cam faces of the backing blocks and the expanding plug is obtuse with respect to the path of movement of the backing blocks, whereby reverse movement of the backing block under stress of the bending dies is prevented.

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