Feb. 28, 1956 B. D. JACOKES 2,736,284

MUFFLER SHELL FORMING MACHINE

Filed Sept. 2, 1950 2 Sheets-Sheet 1

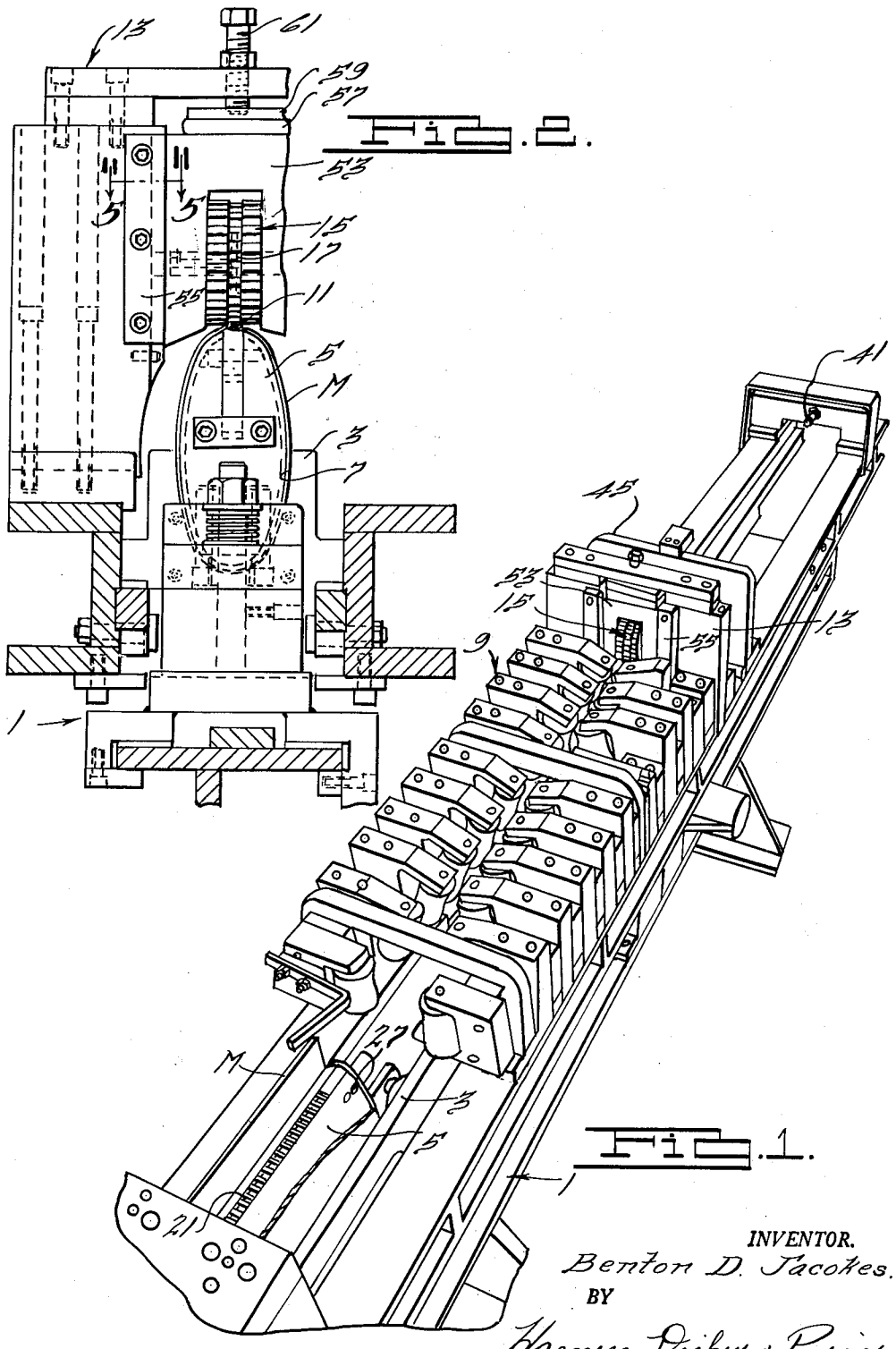

Fig. 2.

Fig. 1.

INVENTOR.
Benton D. Jacokes.
BY
Harness, Dickey & Pierce.
ATTORNEYS.

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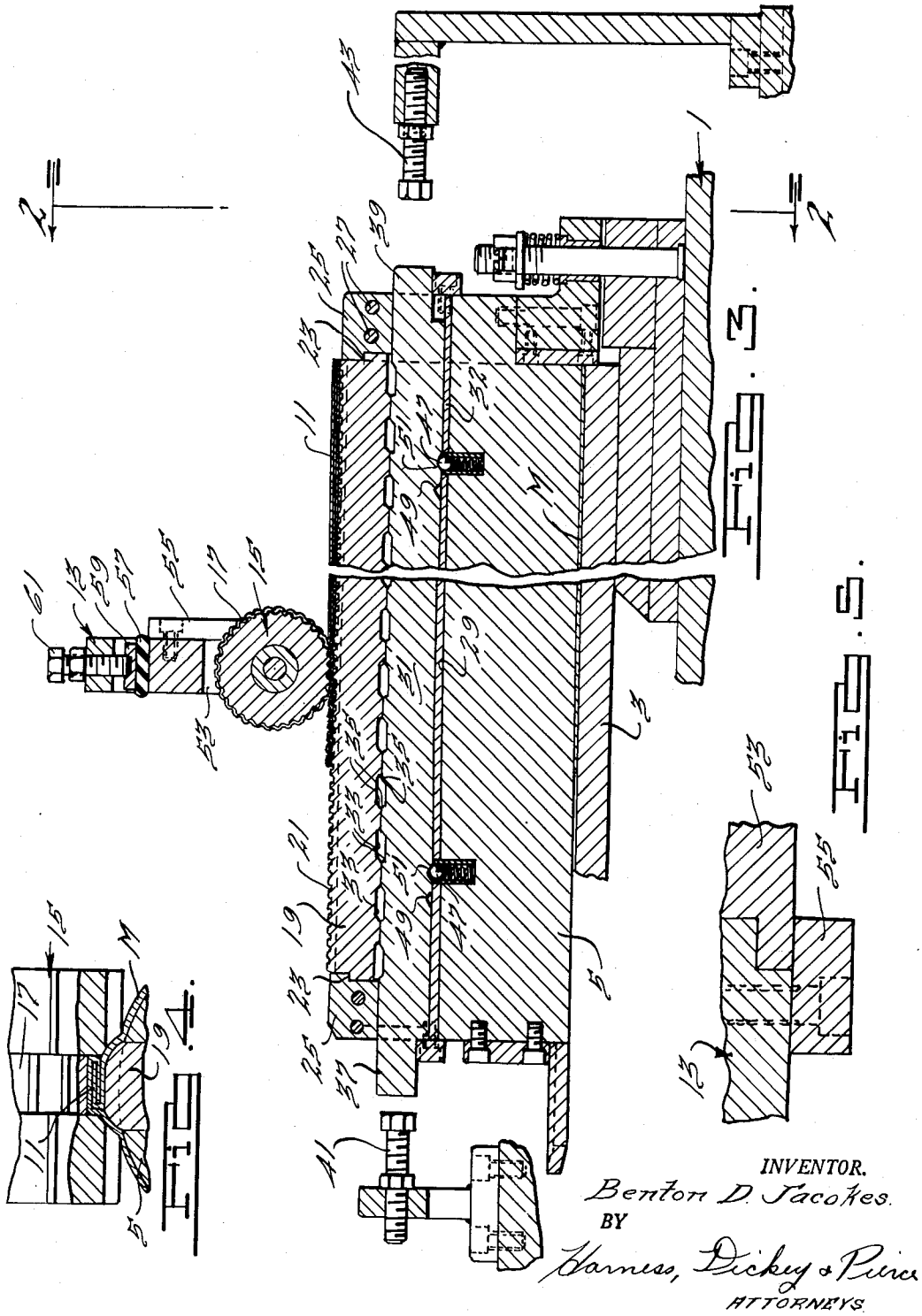

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ATTORNEYS

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MUFFLER SHELL FORMING MACHINE

Benton D. Jacokes, Jackson, Mich., assignor to Walker Manufacturing Company of Wisconsin, Racine, Wis., a corporation of Wisconsin

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4 Claims. (Cl. 113—34)

This invention relates to machines for forming hollow shells, such as used for mufflers, from sheet metal and, in particular, refers to means for interlocking the overlapped side edges of the shell material.

It is important in the construction of mufflers that a leakproof and blow-out proof seam or joint be obtained between the overlapped and interlocked side edges of the metal plate which is formed into the shell. While this could be achieved by welding or brazing, such an operation is rather costly and hence, to that extent, undesirable in the manufacture of a high production, low cost item such as an automobile muffler. Instead of employing the fusion bonding processes, therefore, the art has preferred to interlock the overlapping side edges of the shell by providing interfitting reverse bends, and then mechanically uniting the layers of metal forming the overlapped seam or joint by corrugating or otherwise forcing a series of spaced depressions or deformations in the seam. In the past, it has been possible to form the corrugation in only the outside of the surface of the seam. It is the purpose of the present invention to enable this corrugation to be formed also on the inside of the seam. As a result of the invention, the seam may be formed with two-way corrugation, i. e., one on the inside and one on the outside, so that the strength and integrity of the seam are greatly enhanced.

Shells for mufflers and the like have, in the past, been formed from flat metal blanks in the well known Stolp machine. This machine wraps the flat metal blanks around an arbor and then reverse bends and interfits the side edges of the blank to form it into a shell. While the shell is thus mounted on the arbor, the arbor is moved through a corrugating roll or punch so that the typical undulated shape is formed at the outer surface of the seam to lock the side edges tightly together. In the past, it has not been possible to form the corrugations on the inside of the seam since that would require an undulated surface on the arbor which would interfit with the corrugations on the shell so that the shell could not be stripped from the arbor.

The improvement of the present invention resides in the provision of an undulated surface for the arbor which may be moved radially with respect to the arbor so that after corrugations are formed on the inside of the seam it may be radially withdrawn from the shell. Thus, the shell may be readily removed from the arbor.

The features of construction as well as certain objects of the invention will become evident upon consideration of the accompanying drawings, in which:

Figure 1 is a perspective view of a portion of a Stolp machine showing an arbor embodying the improvement of the present invention as it enters the rolls which interlock the side edges of the blank to form the lock seam;

Fig. 2 is a cross section through a part of the Stolp machine with some parts removed for the sake of clarity and which shows an end view of the present arbor;

Fig. 3 is an axial section through the arbor embodying the present invention and, with liberties through the entire Stolp machine, all parts thereof being removed except the stop surfaces that are provided at opposite ends of the Stolp machine;

Fig. 4 is an enlarged view of the engagement between the lock seam, the roll, and the die bar; and

Fig. 5 is a section taken on line 5—5 of Fig. 2 showing the roller slide mounted on the bridge.

As indicated in Fig. 1, the Stolp machine includes a suitable frame 1 which is adapted to provide suitable ways for joint and relative reciprocatory movement of the boat 3 and the arbor 5. As is well known, the sheet metal blank M is pressed into the boat cavity 7 by a suitable knock-down press which acts in synchronism with the other operations taking place in the machine. The cavity 7 represents about half of the cross section of the shell to be formed and has a contour of the desired shape, such as cylindrical or the oval shape illustrated. When the sheet material is fitted into the cavity 7 of boat 3, the arbor 5 is automatically moved into the boat over the deformed blank M. Both the boat and the arbor 5 are then forced through a set of rolls 9 which wrap the rest of the blank M around the arbor 5 and also reverse bend the side edges of the blank so as to form an interlock joint or seam 11 extending lengthwise of the shell and arbor. The arbor, along with the shell mounted thereon, then passes under a bridge 13 on which is mounted a corrugating roll 15. The periphery of the roll 15 is provided with an annular recess 17 that receives the upstanding portion of the lock seam 11 while the flanking sides engage the sides of the lock seam 11. The roll periphery is corrugated so that the peaks are forced into the softer metal of the lock seam 11 surfaces to undulate them. The pressure of the roll on the lock seam also tends to flatten it and square it into conformity with the cross section of the recess 17.

In accordance with the present invention, a die bar 19 is mounted in the arbor 5 for radial movement toward and away from the roll 15, it being shown in operative position proximate to the roll in Fig. 3. The die bar 19 has a corrugated surface 21 which is shaped to mesh with the corrugations on the roll 15, the outermost surface, i. e., the peaks, preferably being flat to facilitate the interlocking of the side edges as the blank M passes through the Stolp rolls 9. It is evident from Fig. 3 that the die bar 19 enables a corrugated surface to be formed on the inside of the lock seam 11 in addition to the usual corrugations formed by the roll 15 on the outside of the lock seam.

The die bar 19 has upwardly presenting shoulders 23 formed at each end which are engaged by the overlapping portions of insert blocks 25 that are secured by screws 27 in a longitudinal slot 29 formed in the arbor 5. The inserts 25 define the outermost radial position of the bar 19 and it will be observed that the roots of the corrugations 21 as well as the surface of the inserts 25 preferably lie in the general surface defined by the outside of the arbor, which surface corresponds to the inner periphery of the shell formed by the machine. Also mounted in the longitudinal slot 29, in addition to the inserts 25 and the bar 19, are a shift bar 31 and a wear plate 32. The wear plate 32 is suitably affixed to the bottom of the slot and the shift bar 31 is slidable upon it. The adjacent facing surfaces of the bars 19 and 31, i. e., the underside of bar 19 and the top side of bar 31, are provided with a series of longitudinally spaced recesses 33 which have outwardly tapering sides as indicated at 35. It is evident from Fig. 3 that what are, in effect, projections between recesses 33 on each bar fit in the recesses 33 of the other bar so that by longitudinal movement of the lower shift bar 31 gravity will cause bar 19 to drop down the depth of a recess 33, this depth being enough to allow the peaks of the corrugations 21 to fall flush with or below the

surface of the arbor 5 so that the shell may be readily slipped off of it. The shift bar has projections 37 and 39 at the front and the rear which preferably extend forwardly and rearwardly of the ends of the arbor 5 so that they may be contacted by the adjustable stops 41 and 43 that are fixedly mounted at the front and the rear of the Stolp machine at the opposite ends of the reciprocatory stroke of the arbor, though it will be evident that the stops 41 and 43 could just as well be arranged to enter the ends of the slot 29 to contact the ends of the bar 31. Just prior to the arbor reaching its extreme forward position after the shell has been completely formed and lock seamed, the bar projection 37 contacts the stop 41 so that further movement of the arbor is relative to the bar 31 which remains fixed in position. This allows the projecting surfaces on the bars 19 and 31 to enter the recesses 33 so that the corrugating surface 21 drops flush with the surface of the arbor. Upon return movement toward the rear of the arbor 5, the shell may then be stripped off by contact with the stripper plate 45, and when the arbor 5 is close to the rear end of its stroke, the projection 39 contacts the stop 43 so that relative movement occurs between the shift bar 39 and the die bar 19 to force the projections out of their recesses 33 and up the inclined edges 35 and raise the bar 19 so that the corrugations 21 are above the surface of the arbor 5 and in operative position to mesh with the corrugations formed in the roll 15 and form a lock seam on the next shell. Preferably, spring pressed balls 45 are provided in the arbor 5 and extend through wear plate 32 to project into detent recesses 49 and 51 of the bottom of the shift bar 39 to yieldably hold the shift bar in either of its longitudinal positions.

In further accord with the invention, the roll 15 is rotatably mounted on a slide 53 which moves up and down in suitable ways 55 that are provided on the bridge 13. These ways are arranged to prevent longitudinal movement of the roll so as to insure that it meshes with the corrugations 21 in the die bar 19. As an additional precaution, the slide 53 is suspended from the arch of the bridge by a rubber body 57 which is bonded between its top surface and the bottom of a plate 59 that is mounted on the arch of the bridge 13 for vertical adjustment by way of the screw 61.

With the arrangement described, the bar 19 will be in elevated position at the beginning of its stroke as it passes through rolls 9 and approaches the corrugating roll 15. The lock seam 11, consisting of four layers of metal, enters the recess 17 in the roll 15 and is squared up or flattened by the roll as well as pressed into corrugated form on the periphery of the roll and on the surface 21 of the die bar. As the arbor passes longitudinally through the bridge 13, the roll 15 is rotated by virtue of the meshing of its teeth with those on the die bar acting through the lock seam 11 and corrugations are formed on both the inner and the outer surface and along the entire length of the lock seam 11. After the arbor with the shell mounted thereon has left the lock seaming area beneath the bridge 13, the shell cannot be stripped from the arbor because the material has been pressed into the depressions of the surface 21. However, at the forward end of the stroke, the shift bar 37 is held stationary while the arbor moves slightly forward so that the die bar 19 can drop downwardly out of engagement with the lock seam 11. Upon return movement, the shell may then be stripped off of the arbor in the usual manner by the stripper plate 45. When the arbor reaches the other end, the die bar 19 is raised again by contact of the stop surfaces 43 with the shift bar 39 so that it is again in an operative position. While the mounting of the slide 53 is such as to virtually insure meshing of the roll 15 with the corrugations 21, in the event that misalignment should occur, accommodating vertical motion of the roll 15 and slide 53 is permitted by the rubber body 57. This rubber body 57 also tends to provide uniformity of the lock seams obtained on various shells despite variations in the metal thickness.

The benefits of this invention in making it possible to produce shells for various purposes having two-way corrugations will be immediately appreciated by those working in the art. It will also be recognized that certain modifications will be made in the structure disclosed herein without departing from the spirit or scope of the invention.

What is claimed is:

1. In a shell forming machine, the combination of an arbor, a narrow lock seam die bar mounted in a narrow slot on said arbor and movable radially thereof, means for moving said die bar radially, said die bar having a corrugated surface which upon radial movement of the bar may be positioned above or below the surface of the arbor, a roll having a corrugated periphery adapted to mesh with the die bar surface, a frame for supporting the roll, a slide mounted on the frame for motion radial to the arbor but restrained from motion parallel to the arbor, said roll being rotatably mounted on the slide, and a resilient means interconnecting the slide and frame to yieldably resist radial motion of the slide.

2. In a shell forming machine, the combination of an arbor, a narrow lock seam die bar mounted in a narrow slot on said arbor and movable radially thereof, means for moving said die bar radially, said die bar having a corrugated surface which upon radial movement of the bar may be positioned above or below the surface of the arbor, a roll having a corrugated periphery adapted to mesh with the die bar surface, a frame for supporting the roll, a slide mounted on the frame for motion radial to the arbor but restrained from motion parallel to the arbor, said roll being rotatably mounted on the slide, a member mounted on the frame and radially adjustable with respect to the arbor, and a rubber body between the member and slide and bonded to yieldably resist radial motion of the slide.

3. In a shell forming machine, the combination of an arbor, a narrow lock seam die bar mounted in a narrow slot on said arbor and movable radially thereof, means for moving said die bar radially, said die bar having a corrugated surface which upon radial movement of the bar may be positioned above or below the surface of the arbor, a roll having a corrugated periphery adapted to mesh with the die bar surface, said roll periphery including an annular recess adapted to receive the lock seam portion of a shell, a frame for supporting the roll, a slide mounted on the frame for motion radial to the arbor but restrained from motion parallel to the arbor, said roll being rotatably mounted on the slide, and a rubber body interconnecting the slide and frame to yieldably resist radial motion of the slide.

4. In a shell forming machine, the combination of an arbor, means for moving the arbor longitudinally, said arbor having a longitudinal slot opening out of its top surface, a shift bar longitudinally slidable on the bottom of the slot, a lock seam bar having a corrugated top surface supported in said slot on said shift bar, said bars having interfitting wedge means on their engaging surfaces whereby upon longitudinal movement of the shift bar the lock seam bar may be moved toward or away from the surface of the arbor adjacent said slot, means for bending a flat bank around said arbor to form a shell having opposite side edges interlocked into a lock seam located on top of said lock seam bar, means contacted by said shift bar upon movement of the arbor for operating it to raise and lower the lock seam bar, a fixed frame carrying a rotary punch roll having a corrugated periphery adapted to mesh with the lock seam bar surface and to bear upon the top of a lock seam to press it against the top of said lock seam bar.

(References on following page)

References Cited in the file of this patent

UNITED STATES PATENTS

430,266	Briggs	June 17, 1890
472,984	Culver	Apr. 19, 1892
559,714	Kaiser	May 5, 1896
563,255	Briggs	July 7, 1896
697,956	Thompson	Apr. 15, 1902
1,327,641	Stolp	Jan. 13, 1920
1,495,928	Ryker	May 27, 1924
1,651,140	Mauser	Nov. 29, 1927
1,793,629	Meiselbach	Feb. 24, 1931
1,905,839	Forbregd et al.	Apr. 25, 1933
2,241,768	Deremer	May 13, 1941