June 26, 1962 S. R. JOHNSON 3,040,798

CAN BODY FORMING MACHINE

Filed Dec. 18, 1958

3 Sheets-Sheet 1

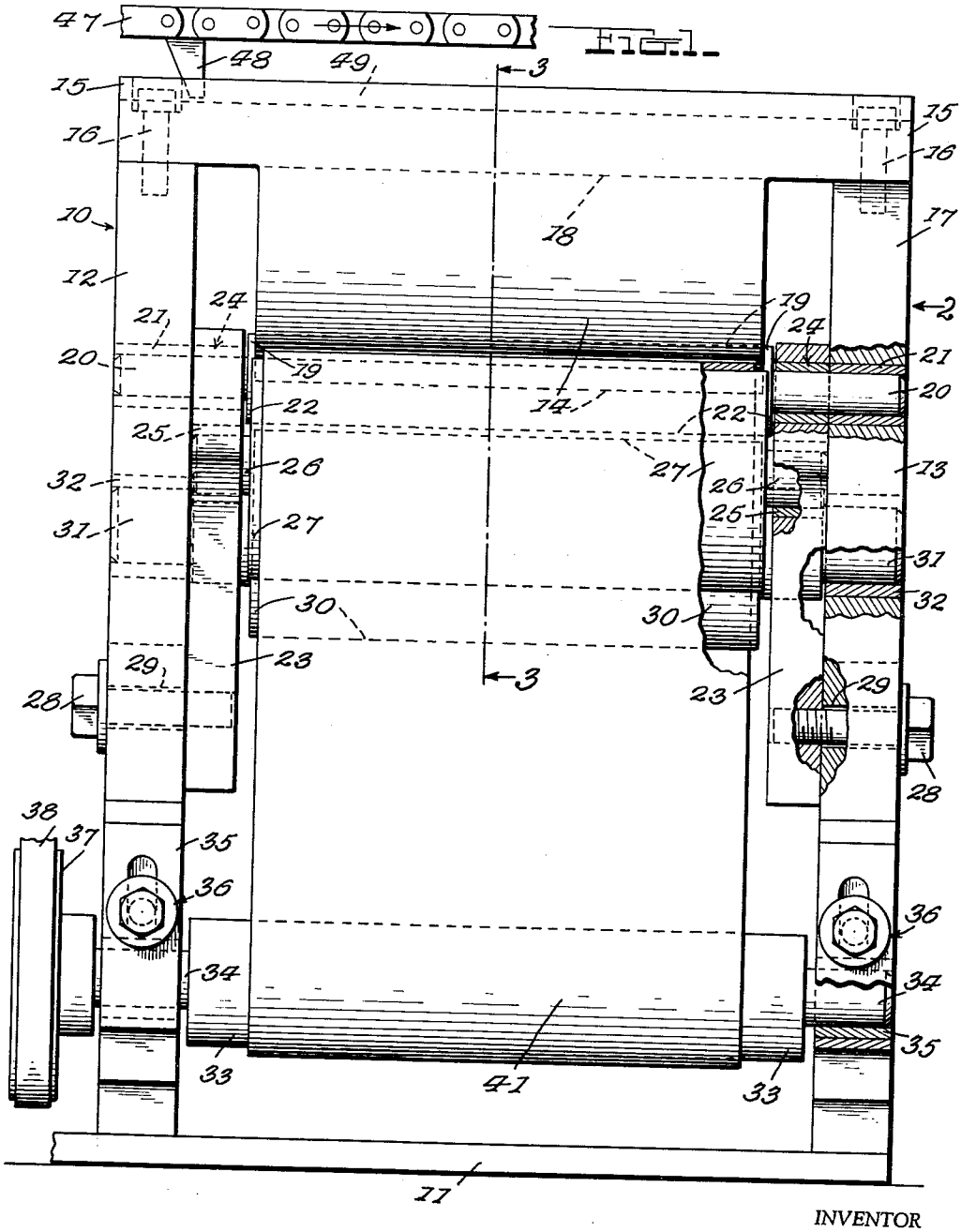

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FIG. 2

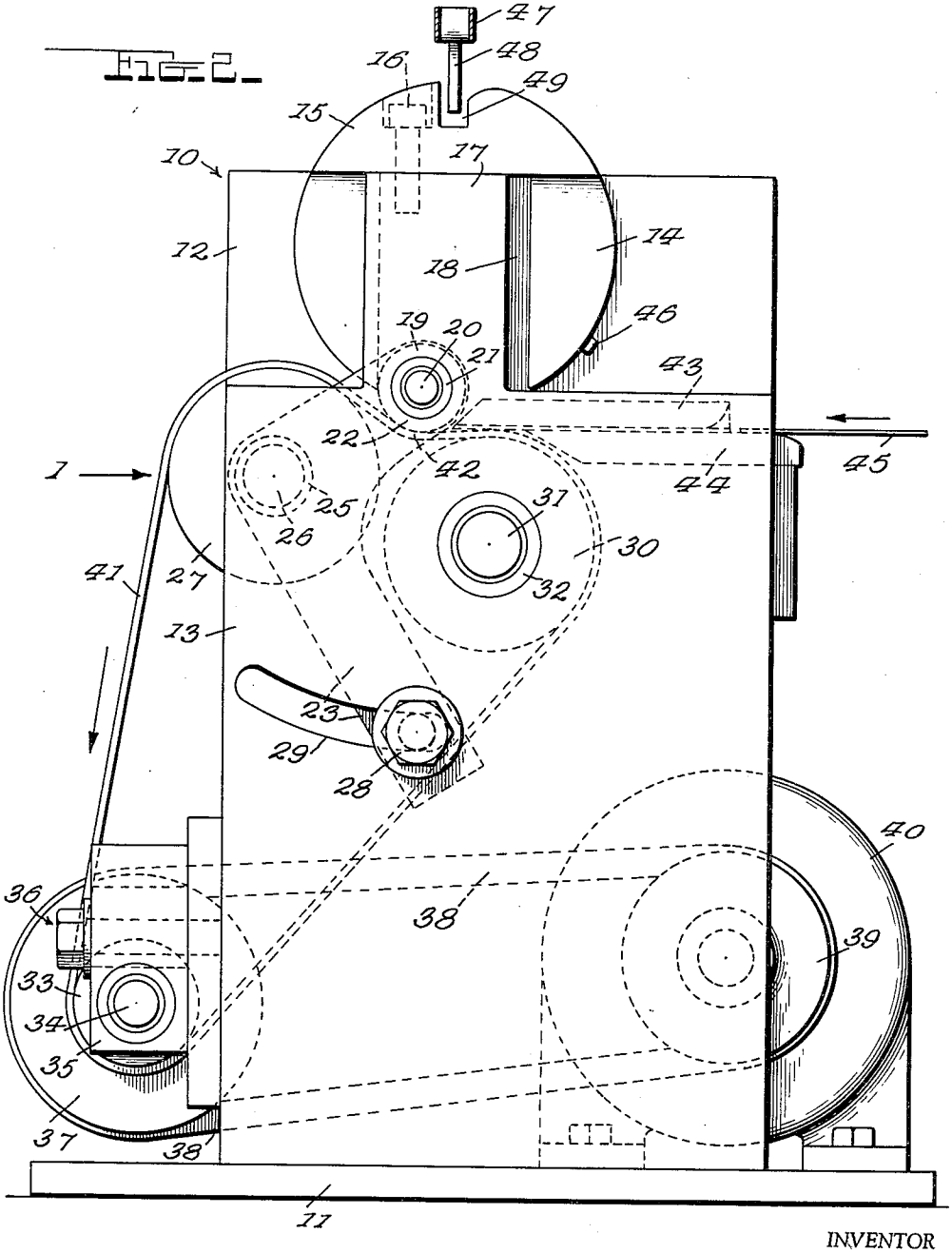

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FIG. 3.

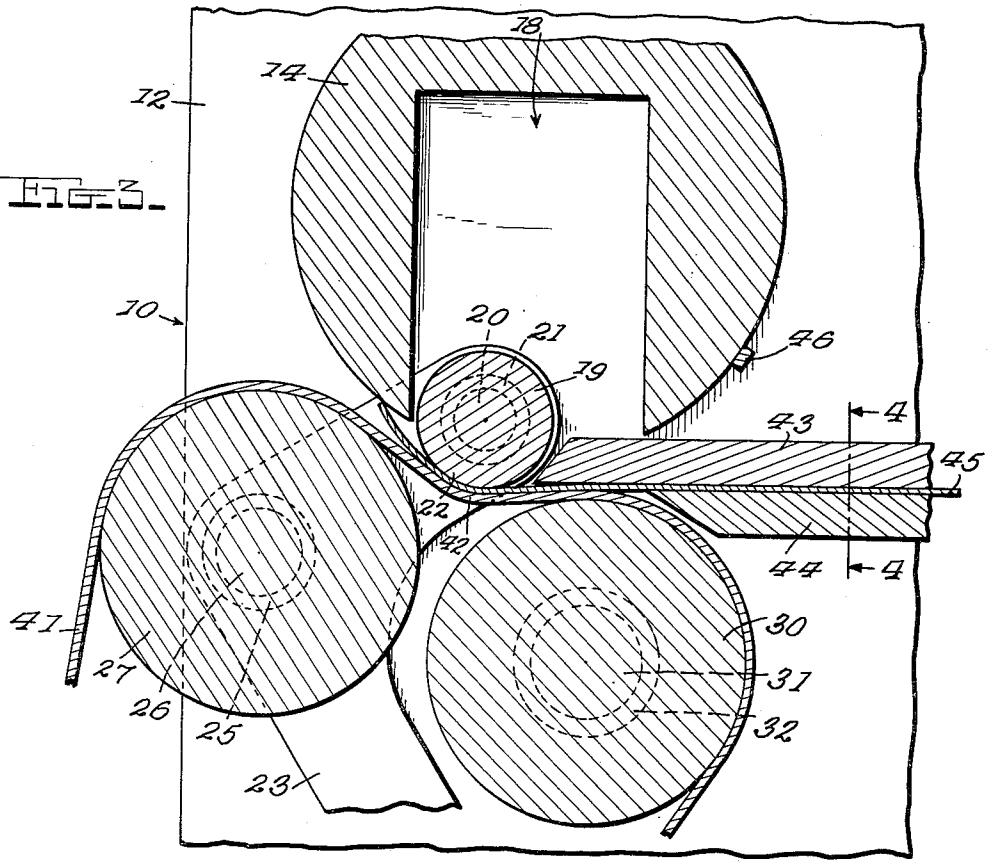


FIG. 4.

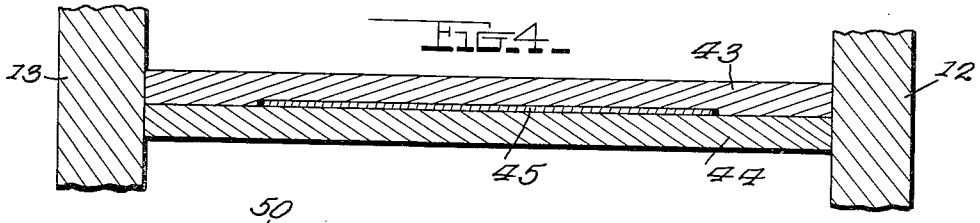


FIG. 5.

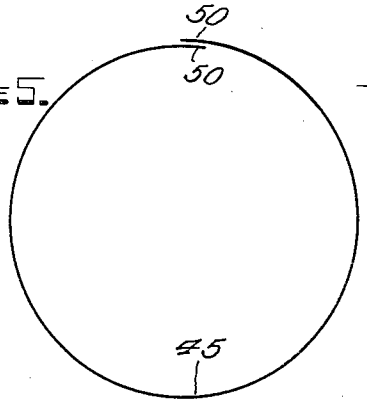
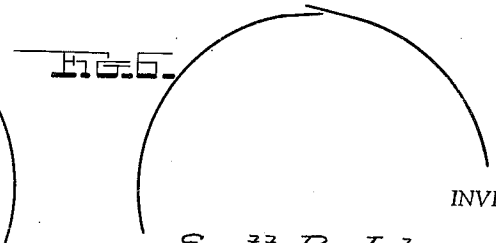


FIG. 6.



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CAN BODY FORMING MACHINE

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8 Claims. (Cl. 153—54)

In the art of can manufacture, the desirability of bending the can body blanks into truly cylindrical shape in readiness for side seaming has long been recognized. However, conventional can body forming mechanisms have proven to be inadequate for this purpose as they impart a somewhat ovate shape to the formed bodies, leaving each body with plane seaming zones tangential to the body curvature and complicating side-seaming of the bodies, particularly when simple lap seams are to be employed, whether such seams are to be soldered or adhesively secured. Moreover, some conventional mechanisms, instead of imparting uniform curvature to all portions of the can body circumference, bend the body blanks in restricted circumferentially spaced zones and thus form each body with relatively flat panels connected by the bent zones: and such bodies are liable to cause inward bulging of the completed cans when sealed under vacuum.

The present invention has aimed to overcome the prior difficulties by the creation of a novel body forming machine capable of producing can bodies of uniform curvature at all portions of their circumference and thus well adapted for easy and effective side seaming.

In carrying out the above end, a more specific object has been to provide a can body forming machine in which: one, a bending roll is mounted in the peripheral portion of a fixed mandrel and projects somewhat beyond the peripheral surface of said mandrel; two, in which a driven belt coacts with an extensive area of the exposed portion of the bending roll in causing the required curved bending of the body blank; three, in which the blank is fed onto the mandrel as it is bent; and four, in which the uniformly curved can body formed by the bending operation is slid endwise from the mandrel for side seaming.

Another object has been to provide a can body forming machine of the character above set forth, in which novel provision is made for positionally adjusting one of the rolls used in mounting and driving the belt.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a rear elevation partly in section, of the machine, as indicated by arrow 1 of FIGURE 2.

FIGURE 2 is a side elevation as indicated by arrow 2 of FIGURE 1.

FIGURE 3 is an enlarged fragmentary vertical sectional view on line 3—3 of FIGURE 1.

FIGURE 4 is a fragmentary vertical sectional view on line 4—4 of FIGURE 3.

FIGURE 5 is a diagrammatic end view of a can body formed by the machine.

FIGURE 6 is a similar but fragmentary view of a can body formed by a conventional machine.

A frame structure 10 is provided consisting of a base 11 and two upstanding end plates 12 and 13. A cylindrical mandrel 14 extends horizontally between the upper ends of the end plates 12 and 13 and the ends of said mandrel 14 have lugs 15 secured at 16 upon said end plates. The upper end 17 of the end plate 13 is narrowed to prevent it from interfering with endwise sliding of the cylindrically bent blanks from the mandrel 14. This mandrel is formed with a longitudinal recess 18 which opens through its lower side.

A cylindrical bending roll 19 is disposed longitudinally within the mandrel recess 18 and has trunnions 20 mounted in bearings 21 carried by the end plates 12 and 13. A peripheral portion 22 of the bending roll 19 projects downwardly beyond the periphery of the mandrel 14.

Two roll mounting angular arms 23 are pivotally mounted at 24 (FIGURE 1) on the trunnions 20 and are disposed at the inner sides of the end plates 12 and 13. The arms 23 have bearings 25 in which trunnions 26 of a rear belt guiding roll 27 are mounted. This roll 27 is disposed under the mandrel 14 and its axis is rearwardly offset from the axis of said mandrel. The roll 27 may be positionally adjusted with respect to the mandrel by swinging the arms 23 forwardly or rearwardly: and clamping screws 28 are provided to lock said arms after adjustment. The screws 28 extend through slots 29 in the end plates 12 and 13 and are threaded into the lower ends of the arms 23.

A front belt guiding roll 30 is spaced forwardly from the rear roll 27 and is disposed under the mandrel 14. This roll 30 has trunnions 31 mounted in bearings 32 carried by end plates 12 and 13.

A lower belt guiding and driving roll 33 is located at the rear of the frame 10 and has trunnions 34 mounted in bearings 35 which are adjustably secured at 36 to the end plates 12 and 13. One of the trunnions 34 has a pulley 37 belted at 38 to a pulley 39 on the shaft of an electric motor 40 which is mounted on the base 11.

A substantially inelastic belt 41 is tightly trained around the three rolls 27, 30 and 33 and this belt has an upper rearwardly travelling reach 42 which extends under and partway around the projecting peripheral portion 22 of the bending roll 19. The front portion of the belt reach 42 is about horizontal but the rear portion of said reach inclines rearwardly. The reach 42 preferably extends around substantially 35° of the bending roll 19. The belt 41 may be formed from any appropriate material such as leather, textile fabric or reinforced rubber and the latter has been found most satisfactory.

Upper and lower plates 43 and 44 extend between the front portions of the end plates 12 and 13 and jointly form a guide to direct the sheet metal blanks 45 into the pinch between the belt reach 42 and the lower portion 22 of the bending roll 19. Consequently, said reach 42 and roll portion 22 coact in curvedly bending each blank 45 and feeding it onto the mandrel 14 as it is being thus formed. A suitable stop 46 is provided to arrest the rather rapid movement of the formed blank around the mandrel.

A driven chain 47 is shown for sliding the formed blanks endwise from the mandrel 14. This chain has lugs 48 operable in a groove 49 in the mandrel.

During travel of the blank partway around the bending roll 19, it temporarily conforms to the peripheral curvature of said bending roll but after leaving said roll, the curved blank springs back to less curvature and passes smoothly around the mandrel. The extent of spring-back depends on the characteristics of the blanks being handled, and by proper correlation of the machine elements, can bodies of the required diameter may be produced. For relatively large diameter bodies, larger bending rolls are employed than for bodies of smaller diameters. When making such a change of bending rolls, the arms 23 and/or the bearings 35 may be adjusted as required.

When any of the formed blanks is completely on the mandrel 14, its longitudinal edges are, of course, rather widely separated but the diameter decreases when the formed blank is slid from the mandrel and the can body is then so truly cylindrical that its longitudinal edges 50 (FIGURE 5) may be seamed together without difficulty,

instead of encountering the condition shown in FIGURE 6, as with conventional machines. Moreover, the can body possesses uniform curvature instead of having relatively flat panel portions as with some machines.

From the foregoing, it will be seen that a novel and advantageous construction has been disclosed for attaining the desired ends. However, attention is invited to the possibility of making variations within the scope of the invention. Moreover, it will be seen that the invention is not necessarily limited to the manufacture of can bodies.

I claim:

1. In a machine for bending a sheet metal blank into cylindrical form, a fixedly mounted cylindrical formed blank supporting mandrel having a longitudinal recess which opens through its periphery, a cylindrical bending roll disposed longitudinally of said mandrel, said bending roll being rotatably mounted in said recess but having a portion of its periphery projecting outwardly beyond the peripheral surface of said mandrel, a substantially inelastic belt, means for mounting and driving said belt and providing it with a tight reach which curves partway around said projecting peripheral portion of said bending roll, and means for guiding a blank into the pinch between said tight reach and said projecting peripheral portion of said bending roll, said tight belt reach and said bending roll being cooperable to curvedly bend the blank and to feed the thus formed blank onto said mandrel, said mandrel being so mounted that the formed blank may be slid endwise therefrom.

2. A structure as specified in claim 1, in which a driven chain disposed outside of said mandrel and having lugs is provided for sliding the formed blanks from the mandrel, said mandrel having a longitudinal groove in which said lugs travel.

3. In a machine for bending a sheet metal blank into cylindrical form, a frame structure including two spaced vertical end members, a fixed cylindrical formed blank supporting mandrel extending horizontally between the upper ends of said end members, said mandrel having a longitudinal recess which opens through its lower side, a cylindrical bending roll extending longitudinally of said mandrel, said bending roll being disposed in said recess but having a portion of its periphery projecting downwardly beyond the peripheral surface of said mandrel, a front belt guiding roll and a rear belt guiding roll extending longitudinally under said mandrel, a third belt guiding roll below said front and rear belt guiding rolls, means rotatably mounting said bending roll and belt guiding rolls on said frame end members, a substantially inelastic belt tightly trained around the three aforesaid belt guiding rolls, said front roll, said rear roll and said bending roll being so related as to provide said belt with an upper reach which extends under and partway around the aforesaid projecting peripheral portion of said bending roll, means for driving at least one of said belt guiding rolls to cause rearward travel of said upper belt reach, and a blank guide secured between said frame end members in position to rearwardly guide a blank into the pinch between said upper belt reach and said bending roll, said upper belt reach and said bending roll being cooperable to curvedly bend the blank and to feed the thus formed blank onto said mandrel, said mandrel being so mounted that the formed blank may be slid endwise therefrom.

4. A structure as specified in claim 3, in which the mounting means for the aforesaid rolls includes two arms on which the ends of said rear belt guiding roll are mounted, said arms being disposed at the inner sides of said frame end members and being pivotally mounted coaxially with said bending roll, and releasable means normally securing said arms to said frame end members.

5. A structure as specified in claim 3, in which a driven chain disposed above said mandrel and having lugs is provided for sliding the formed blanks endwise from the mandrel, said mandrel having a longitudinal groove in which said lugs travel.

6. A structure as defined in claim 1 wherein said bending roll is of a smaller diameter than the desired final diameter of the formed blank and said mandrel is of a larger diameter than the desired final diameter of the formed blank, whereby the edges of the blank are spaced apart when the formed blank is on the mandrel to clear said bending roll and said guide.

7. A structure as defined in claim 1 wherein said bending roll is of a smaller diameter than the desired final diameter of the formed blank and said mandrel is of a larger diameter than the desired final diameter of the formed blank, whereby the edges of the blank are spaced apart when the formed blank is on the mandrel to clear said bending roll and said guide, and a stop on said mandrel for engagement by a first formed edge of the blank to position the formed blank on said mandrel.

8. A structure as defined in claim 3 wherein said bending roll is of a smaller diameter than the desired final diameter of the formed blank and said mandrel is of a larger diameter than the desired final diameter of the formed blank, whereby the edges of the blank are spaced apart when the formed blank is on the mandrel to clear said bending roll and said guide, and a stop on said mandrel for engagement by a first formed edge of the blank to position the formed blank on said mandrel.

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