Feb. 12, 1935. F. E. ADAMS ET AL 1,990,579

MACHINE FOR MAKING SHEET METAL CONTAINERS

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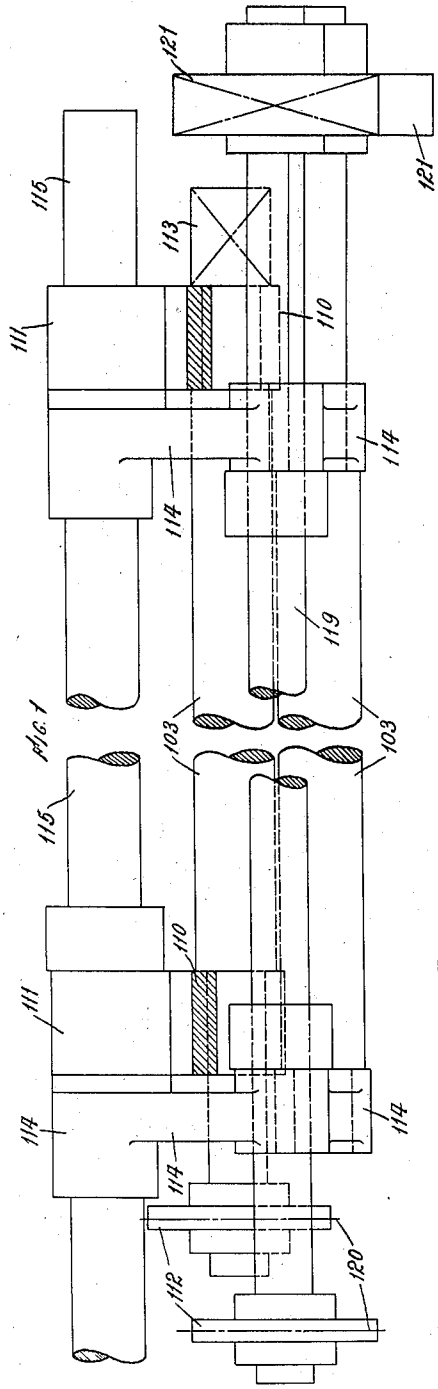


Fig. 1

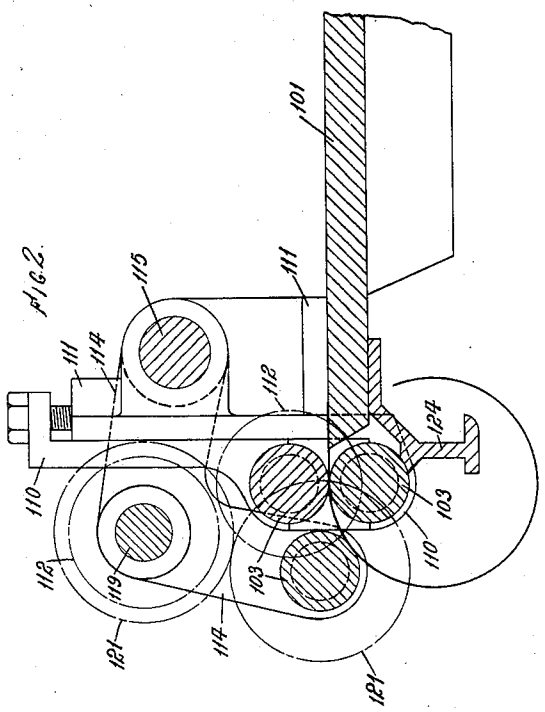


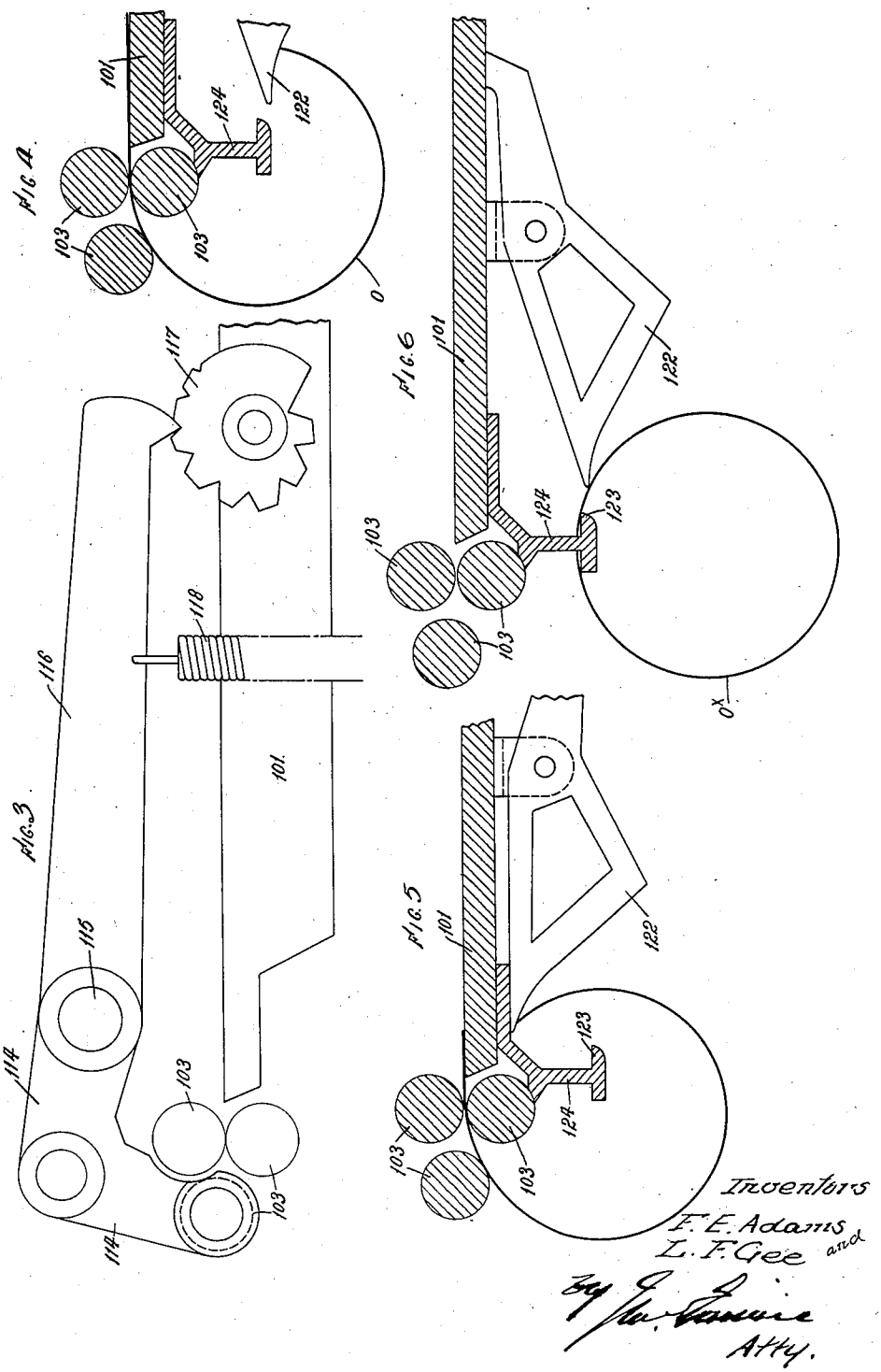
Fig. 2.

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MACHINE FOR MAKING SHEET METAL CONTAINERS

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MACHINE FOR MAKING SHEET METAL CONTAINERS

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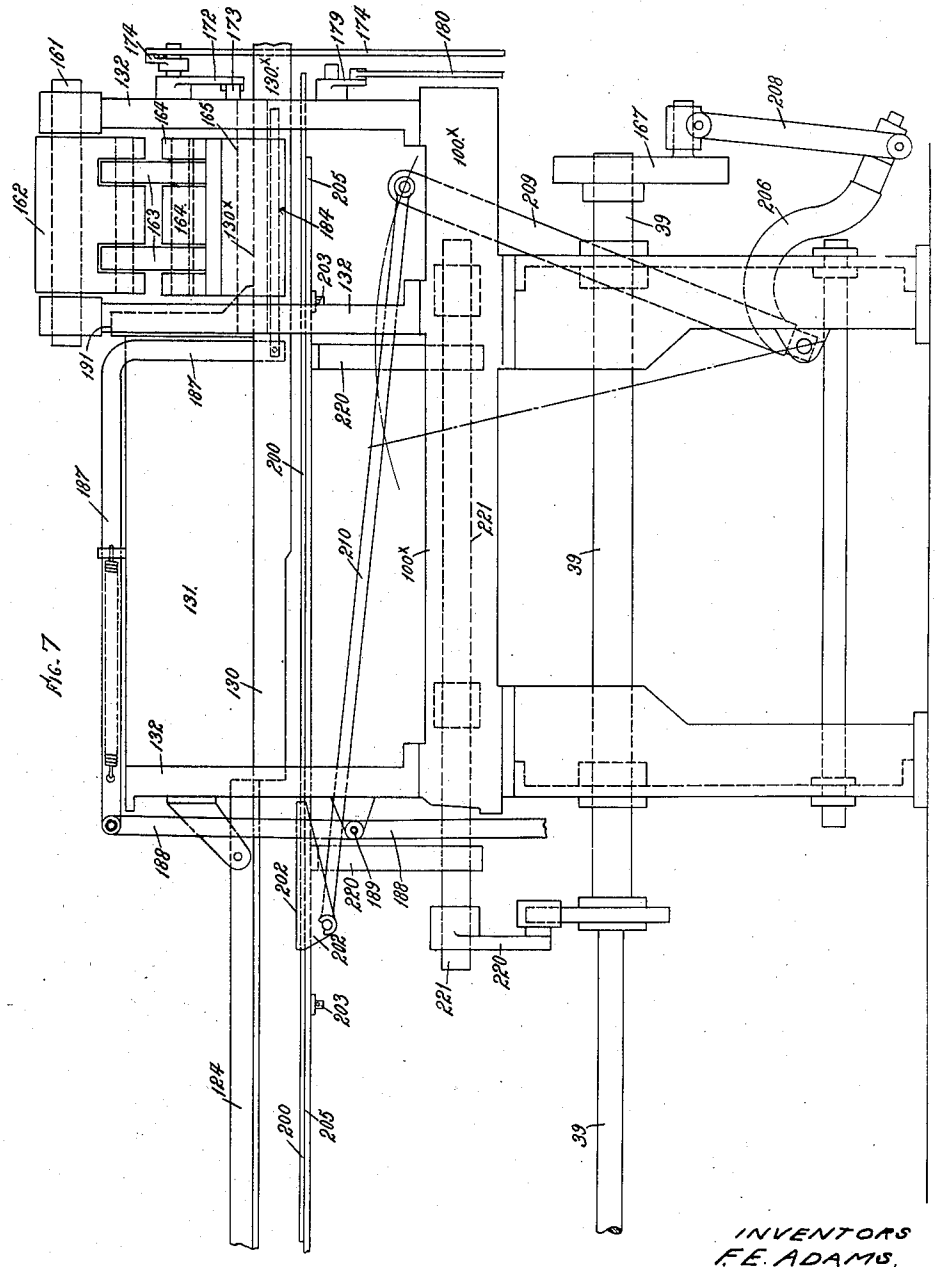


FIG. 7

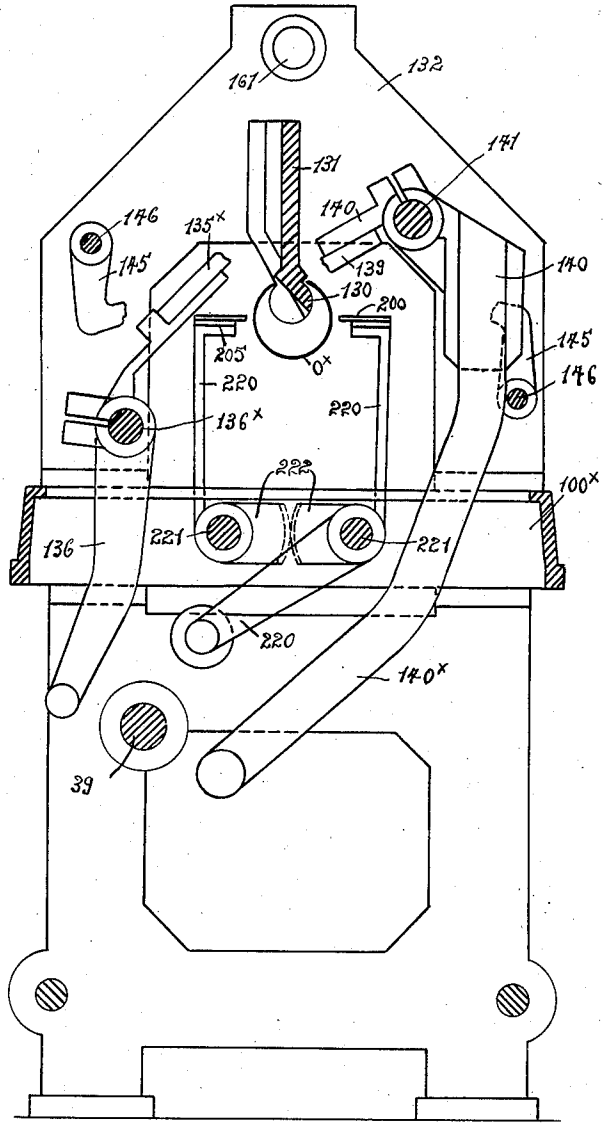
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MACHINE FOR MAKING SHEET METAL CONTAINERS

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FIG 8



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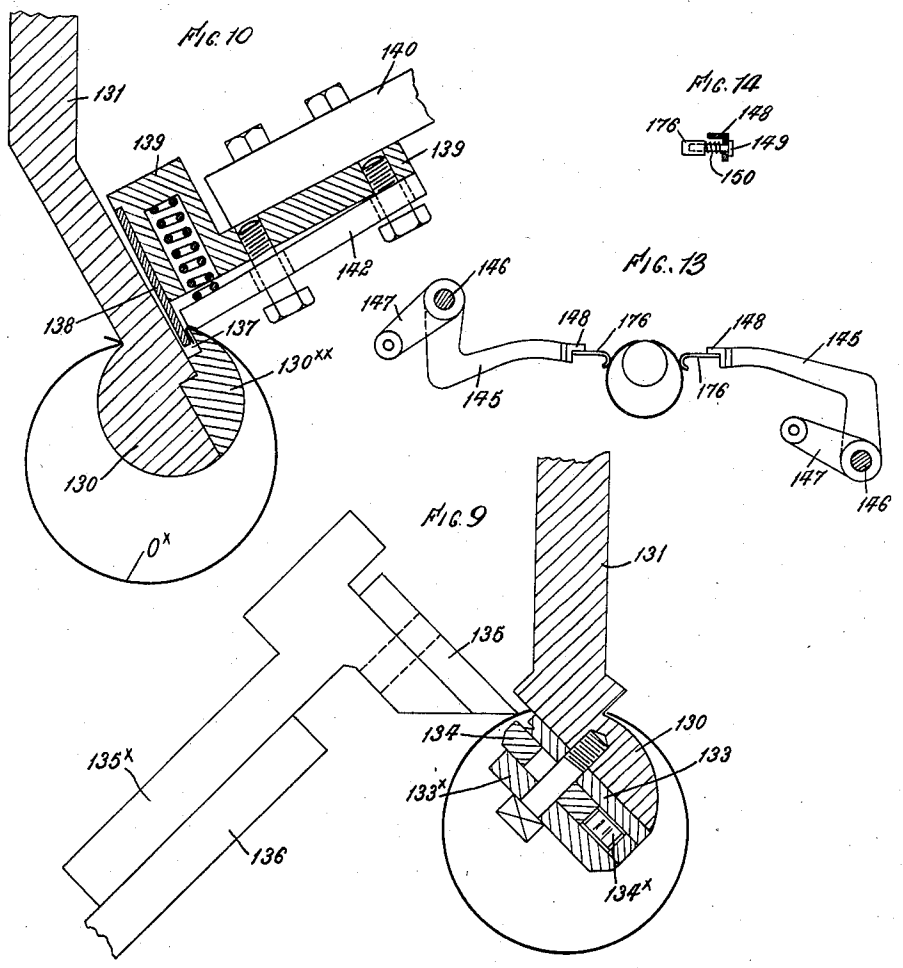
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MACHINE FOR MAKING SHEET METAL CONTAINERS

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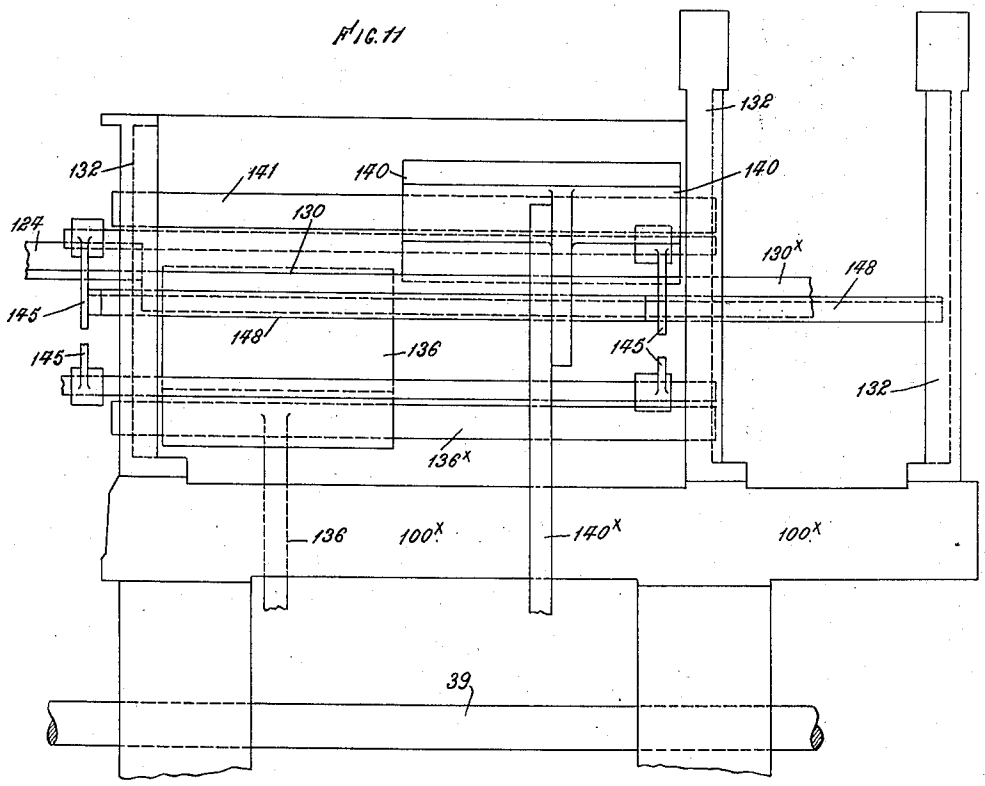
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MACHINE FOR MAKING SHEET METAL CONTAINERS

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FIG. 11



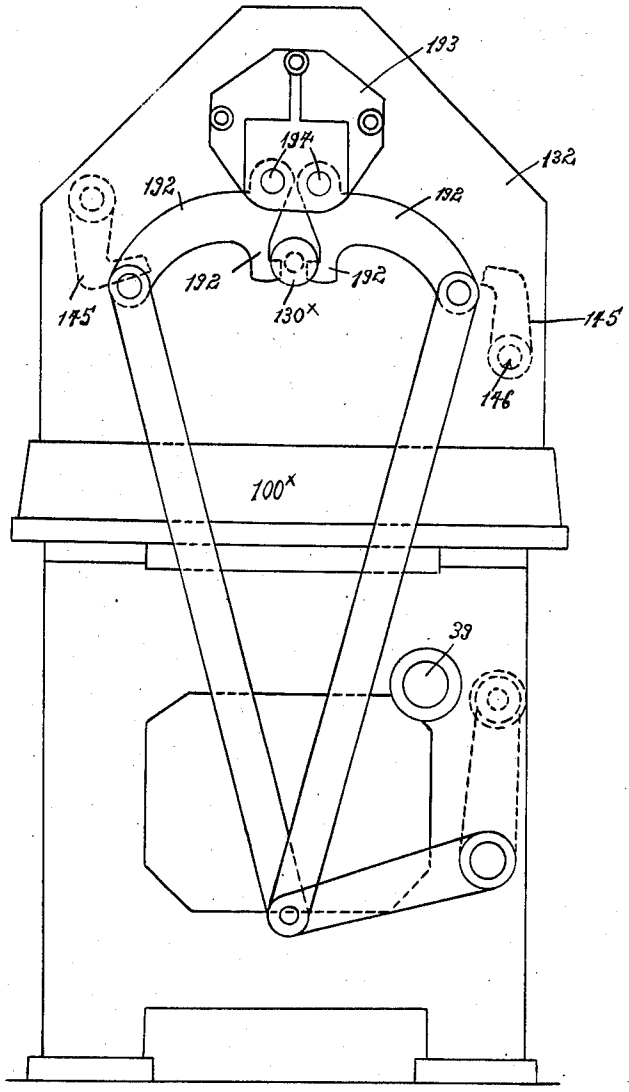
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MACHINE FOR MAKING SHEET METAL CONTAINERS

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FIG. 12



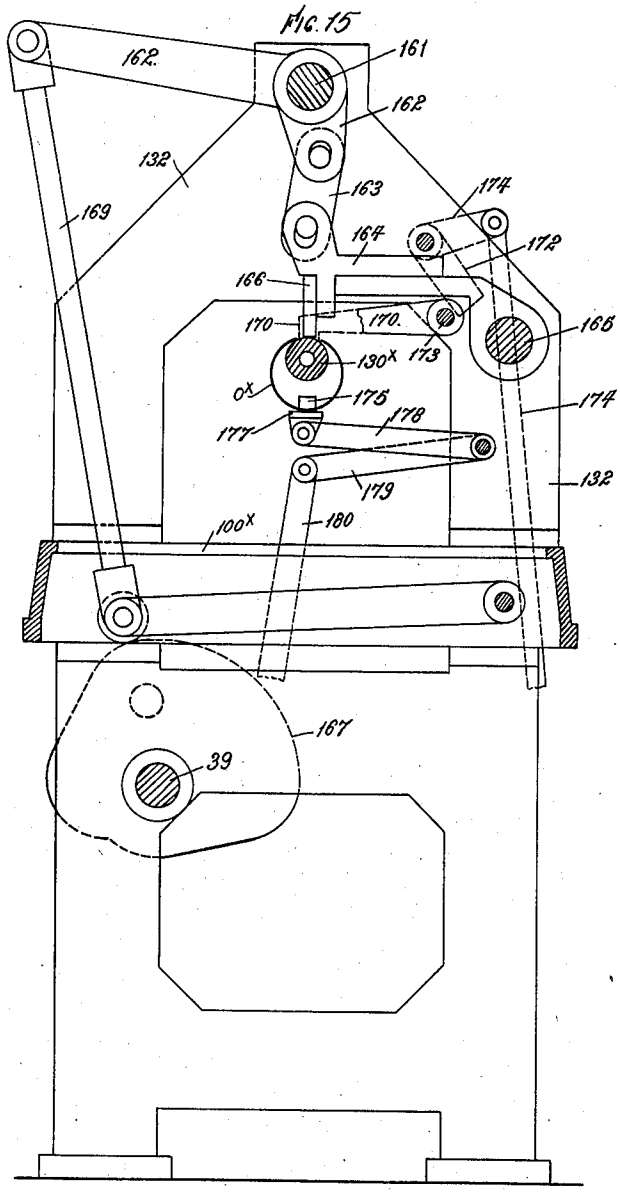
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MACHINE FOR MAKING SHEET METAL CONTAINERS

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FIG. 15



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FIG. 16

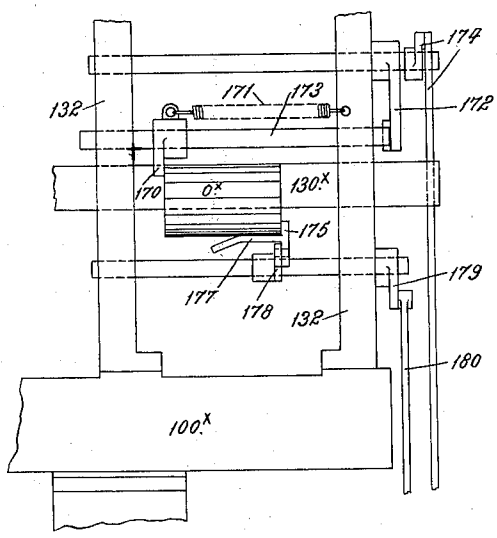


FIG. 17

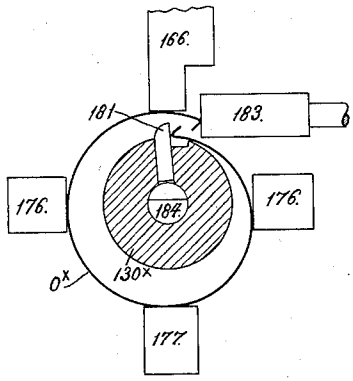


FIG. 18

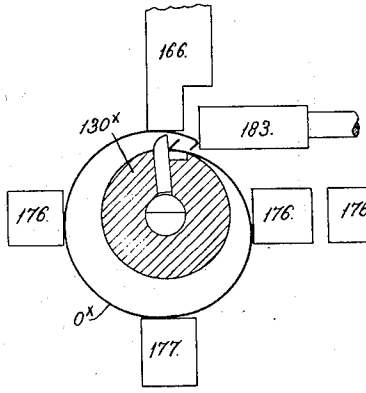


FIG. 19

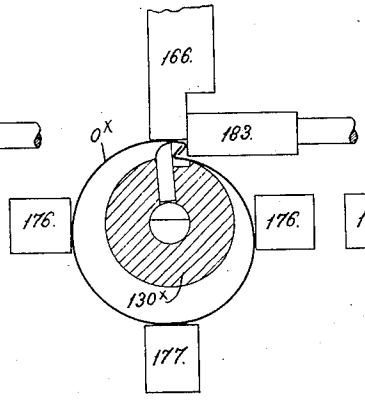
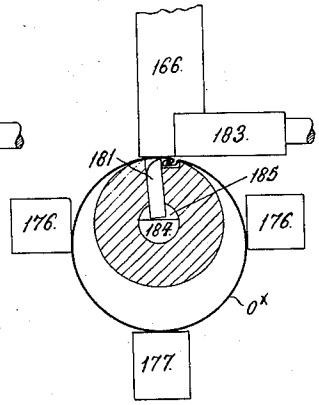


FIG. 20

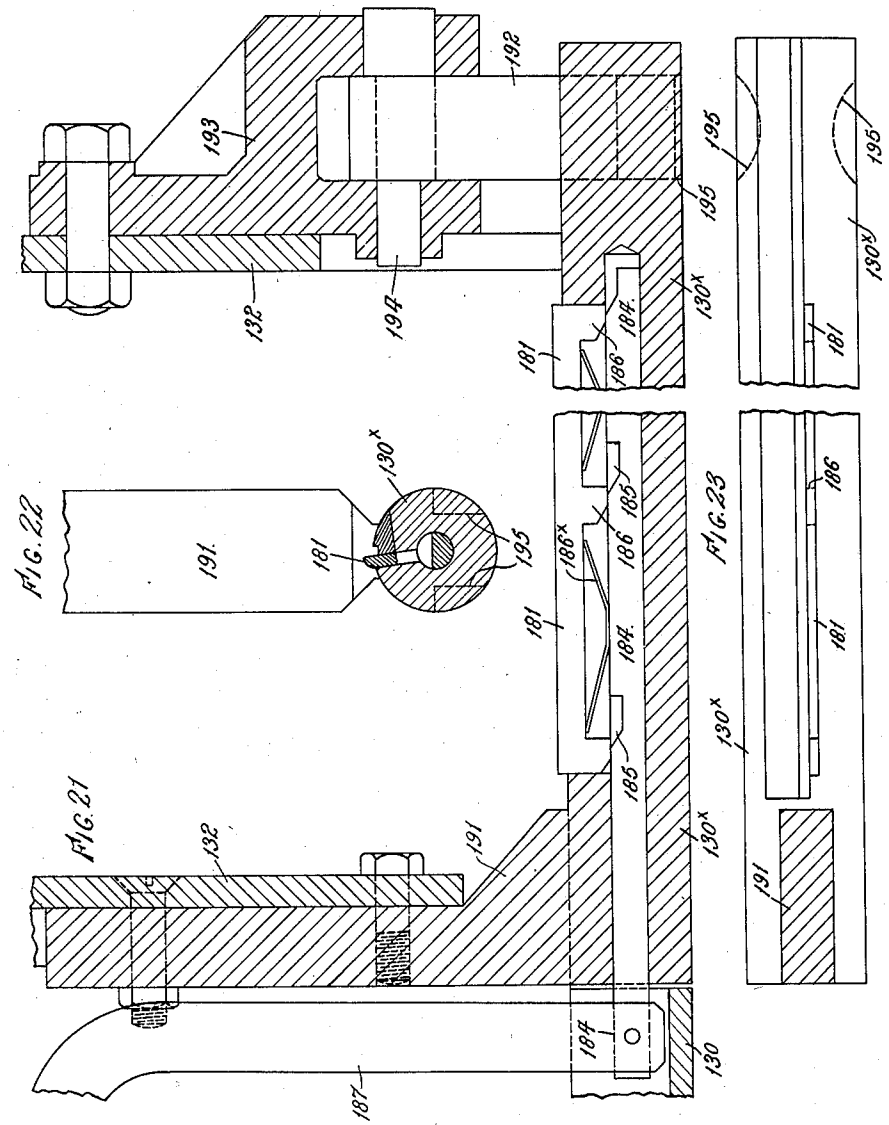


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MACHINE FOR MAKING SHEET METAL CONTAINERS

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MACHINE FOR MAKING SHEET METAL CONTAINERS

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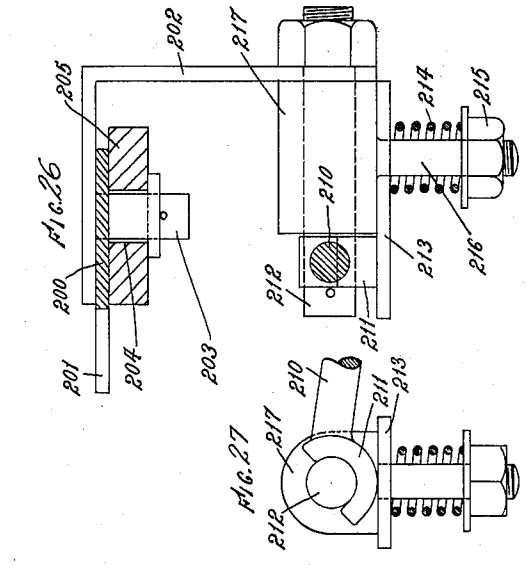


FIG. 26

FIG. 27

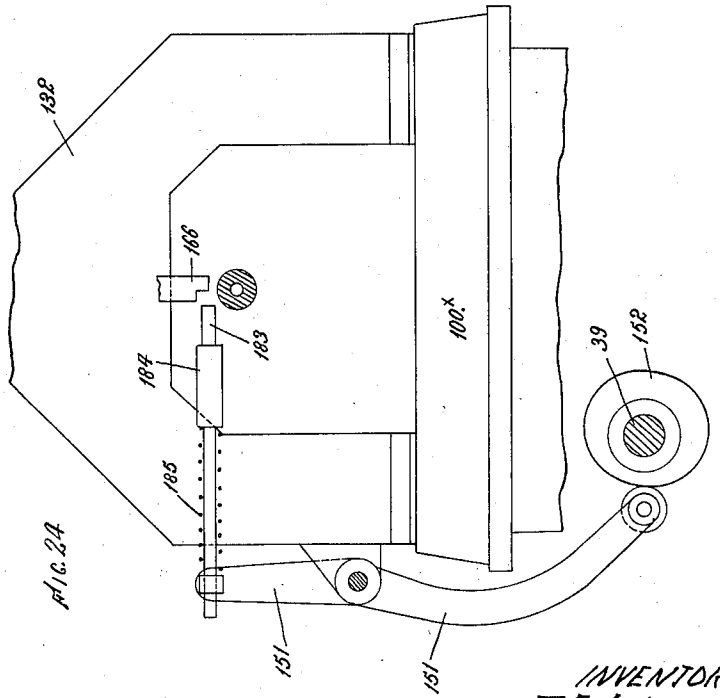


FIG. 24

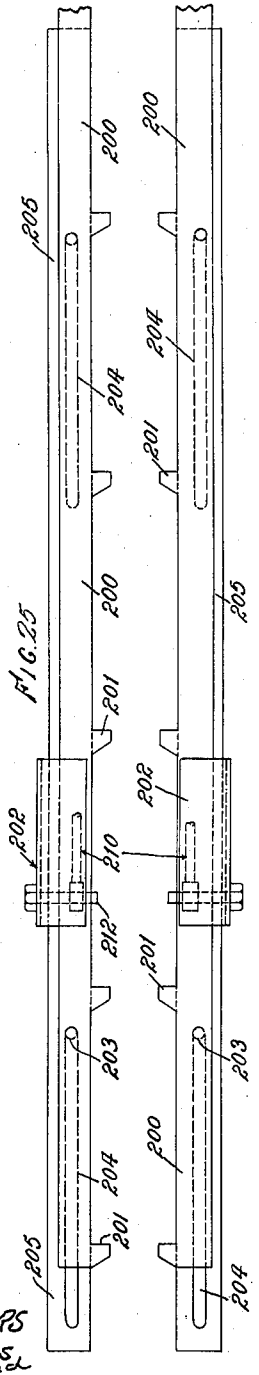


FIG. 25

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Patented Feb. 12, 1935 1,990,579

UNITED STATES PATENT OFFICE

1,990,579

MACHINE FOR MAKING SHEET METAL CONTAINERS

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Application September 19, 1932, Serial No. 633,896
In Great Britain September 22, 1931

2 Claims. (Cl. 153—54)

This invention has reference to machines for making the bodies of sheet metal boxes of the kind comprising a number of parts which are afterwards assembled and joined together.

According to this invention the bodies (cylindrical) are made from flat sheets of sheet metal fed from a table sheet by sheet to the sheet feeding driven rollers, which feed the sheets one by one forward by gripping them and pressing them forward onto and over the surface of a third bending roller which bends same and curls them into cylinders, and round part of a conveyor rail along which the curled or cylindrical bodies are adapted to be conveyed mechanically to subsequent operating mechanisms.

From the curling mechanism the curled bodies (the two edges of which are to be connected or seamed together) are conveyed on the conveyor rail to a mechanism which bends the longitudinal edges of the bodies into the form of hooks, which are subsequently engaged together and pressed so as to form a seam.

The circular or cylindrical bodies produced by the curling mechanism are adapted to drop onto flanges or projecting parts of the conveyor rail which extends longitudinally of the machine, and are conveyed longitudinally along it to the said operating station and mechanism for forming continuous hooks along its edges for enabling same to be joined together. This mechanism consists of two parts which are of a similar character, one for forming the hook which will be external to the body surface, and the other for forming the hook which will be internal to the body.

The prepared body is conveyed from this mechanism by a reciprocating hook conveyor to a mechanism, by which the two hooks are caused to engage one another; and when so engaged are squashed together tightly so as to make a close joint or seam; and in all these hook forming and joint making mechanisms, the bodies will be supported internally on a mandrel onto which they are moved from the supporting rail on which they are suspended after leaving the rolling or curling mechanism.

The invention will be further described with reference to the accompanying drawings, in which:—

Figures 1 and 2 are plan and cross section showing the curling mechanism in detail, and Figures 3, 4, 5 and 6 are cross sectional view illustrating the curling operation.

Figure 7 is a side elevation of the machine in which the body is provided with hooks and in which the hooks are squashed together so as to form a seam.

Figure 8 is a cross section of same.

Figure 9 shows the first hook forming mechanism in cross section.

Figure 10 is a detail of the second hook forming mechanism.

Figure 11 is an elevation of this mechanism.

Figure 12 is an end elevation of same.

Figure 13 is a detail of the side gauges.

Figure 14 is a detail of the outer portion of one of the gauges.

Figure 15 is a cross section of the squashing mechanism.

Figure 16 is a front elevation of part of same.

Figures 17, 18, 19 and 20 are details illustrating the hook forming parts.

Figure 21 is a sectional elevation.

Figure 22 is a cross section.

Figure 23 is a plan, being details connected with the mandrel and its supporting means.

Figure 24 is an end elevation showing a back gauge for the hook interlocking mechanism.

Figures 25, 26 and 27 illustrate the conveyor mechanism for conveying the curled bodies through the machine.

Referring to the drawings, and more particularly to Figures 1 to 6, the roller mechanism proper consists of two guiding and feeding rollers 103, and a forming or curling roller 103^x, and the sheets are fed into these rollers 103 from a table 101.

The feeding and guiding rollers 103 into which the sheet is first fed are mounted at their ends in a vertical sliding bearing 110 supported in the bracket 111 fixed on the table 101; and these rollers are positively revolved by sprocket gear, namely a sprocket wheel 112 is mounted on the end of the extension of the shafts of the top roller 103, and the lower roller is driven from this roller by a toothed wheel 113 which meshes with a corresponding toothed wheel on the axle of the lower roller, so that the latter is driven from the upper one, and the sprocket wheel 112 is driven by a sprocket chain, which extends to a driving sprocket wheel on a power transmitting shaft not shown.

With regard to the outer curling or forming roller 103^x, the periphery of this roller will extend below the plane of the sheet as it comes through the other two rollers; and as it is pressed forward, its leading end is pressed down, consequently curling it to about the diameter of hollow body required; and this curling roller can be adjusted nearer to or further from the actual

feeding rollers by mounting it at each end in a bearing in bell crank levers 114 fixed on the ends of a shaft 115, mounted in the bearing 111, and a lever 116—also fixed on the shaft 115—so that by moving this lever up or down and holding it there, the front curling roller will be moved nearer to or further from the other rollers.

The adjustment of the lever 116 is effected by employing in connection with it a notched cam 117 fixed on the table 101, and with the notched of which a pointed end of the lever 116 can be engaged; and these notches being of different radii, the lever 116 will be set at different heights, so that the curling roller is moved nearer to or further from the two feeding rollers. The lever 116 is normally pulled down into engagement with the notched cam by a spring 118.

The curling roller 103^x is rotated from a shaft 119 supported by bearings at the angles of the bell crank levers 114 on which shaft is mounted a sprocket wheel 120 driven from a suitable part of the machine; and motion from the upper shaft 119 to this front curling roller is effected through toothed wheels 121 one of which is fixed on the shaft 119, and the other on an extension of the curling roller.

The operation of curling is illustrated more particularly in Figures 3, 4, 5 and 6, in which mechanism there is used a hinged tappet 122 disposed under the table 101; and as the sheet is curled in cylindrical form by means of the rollers, the leading end of the sheet will come in contact with the tip of this lever, and lift it up about its hinge; and when the tip strikes the underside of the table 101, the leading edge of the body will be stopped, and the rest of the sheet which is still on the feeding-in side of the rollers 103 will be forced out beyond the rollers, and so the curled body 0^x is free and will drop down, and its two edges will fall on to and rest on the flanges 123 of a rail 124 fixed to the underside of the table 101, the fall being assisted by the weight of the inner end of the lever 122.

The curled body—the edges of which owing to the spring of the metal may be assumed to naturally overlap—will thus be suspended by its edges on the flanges 123 of the rail 124; and it is moved along this rail so suspended to the next mechanism where and by which the hook forming operations on the edges are performed; and at this station the loose bodies are transferred from the rail 124 to a mandril over which they slide.

The curled body is moved by a reciprocating conveyor from the rolling or curling mechanism along the rail 124 to the hook forming and squashing machinery where it is discharged from the end of said rail on to a mandril 130, the body resting on the flanges 123 and passing over the leading end of the mandril. This mechanism is illustrated in Figures 7 to 27.

This mandril proper 130 is supported from above by a plate 131 which is bolted at the ends to brackets 132 fixed on the top of the table or bed 100^x.

The first hook, say the out-turned one is made in the first half of this mandril mechanism, and the other in the last half, the bodies being moved by the conveyors from one station to the other in the required manner.

The first portion of the mandril 130 is, as described, supported by the vertical plate 131 carried by the two brackets 132 at the left and right hand ends of the plate, the brackets being mounted on the bed 100^x.

The left hand or leading end of the mandril supporting plate 131 is of the form shown in Figure 9, whilst the right hand end is of the form shown in Figure 10; and in connection with the part of the mandril shown in Figure 9 the external hook of the body is formed, while by the part shown in Figure 27 the internal hook is formed.

First, with regard to Figure 9. The operative part of the bottom of the mandril is inclined at an angle of 45°, to which part a notched plate 133 is rigidly fixed by means of a bolt, and between which plate and an outer plate 133^x is an outwardly pressed plate 134, normally pressed outwards by a spring 134^x.

The position shown in Figure 9 is that just prior to the action of the hook forming tool 135 which is carried on a carrier 135^x fixed on the upper end of a lever 136, and which is clamped on to an operating shaft 136^x—see Figure 8—the lever 136 being operated by a cam—not shown—on the cam shaft 39.

Thus, when the body 0^x is in the position shown in Figure 9, the lever 136 is operated, and the bevel point of the tool 135—which is at least of equal length to the body—will press the end portion of one edge of the body from its circular form shown in Figure 9, into the recess in the edge of the fixed plate 133, and thus forms a hook.

In the earlier portion of this operation, the edge of the sliding plate or bolster 134 will be pressed upon by the tool 135, and be pressed inwards compressing the spring 134^x, the tin thus being gripped between the active edge of the holder 134 and the bevelled underside of the tool 135.

The other edge of the tin in this operation will be held on the mandril as shown in the figure, its edge lying in the bottom of a V recess shown in the drawing.

For forming the inside hook, the mandril 130 is formed as shown in Figure 10, the body 0^x provided with the former hook described having been moved on to the right hand end of the mandril within the frames 132.

Of the two portions of the mandril 130 shown in these two figures, and which are solid with the carrier plate 131, that shown in Figure 10 has a part 130^{xx} attached to it, which at its operative upper part is provided with a recess 137, and before this hook forming operation the edge of the body to be formed into the hook will lie over the mouth of this recess; and in the operation it is pressed into the recess as indicated in the figure by a tool 138, fixed on a carrier head 139, secured to a rocking lever 140 fixed on a rocking shaft 141; the long arm 140^x of the arm 140 being operated from a cam not shown on the cam shaft 39.

In this operation of forming the hook, a downwardly spring pressed plate 142, secured loosely to the underside of the part 139, comes down on to the edge of the body and presses it into the angular top edge of the mandril part 130^{xx} as indicated in the figure; and being thus held, the edge of the body is pressed down by the tool 138 into the recess 137, and the hook forming operation is complete.

With regard to the means for holding the body in these hook forming and joining operations, details of the lateral supports are shown in Figures 13 and 14; and as will be seen in Figure 13 the active ends of these supports are bent round, and are carried on an angle bar 148 on the end of bent arms 145 mounted on shafts 146 on each side of the machine; these shafts being adapted

to be moved to and fro by cranks 147 connected to and operated by any suitable motion from the machine for imparting a to and fro action.

When the cranks 147 are operated in one direction, they will move the side gauges 176 up to the body, and then in the other direction away from same.

Figure 14 shows a modified form of gauge device. In this case the gauges proper 176 may be of rubber and have free movement; that is they are carried on headed pins 149 which pass through holes in the angle bar 148, and are pressed outwards by a spring 150; the pin 149 being loose in the hole in the bar 148, so that it is permitted to move in all directions to a suitable degree.

With such a construction of gauge the body will be enabled to be moved up by the lower gauge hereinafter described, after it has come in contact with the side gauges.

With regard to the mechanism for effecting the engaging of the hooks together, and the squashing of same to make a close joint, this consists of bearing frames 132, mounted on the bed or base 100^x, and supporting at their upper ends a spindle 161 carrying a bell crank lever 162, which operates through a toggle link 163, a lever 164 mounted on a shaft 165 which is rocked about its axes by suitable cam mechanism; the outer end of this lever having fixed on it the actual squashing tool 166. The toggle device lever 162 is operated from the cam 167 on the shaft 39 by a connecting rod 169; and the squashing action takes place when the can body has been moved into the required position under the tool 166 by the conveyors.

The portion of the mandril which lies between the two right hand frames 132 is marked 130^x, and the correct position of the body on this part of the mandril, prior to this squashing operation, is illustrated in Figure 16; and when the body is moved forward into this position, the gap between its adjacent edges will be such that it will permit these edges to pass on either side of the spring retained holder 170, which is normally pulled to the right hand direction by the spring 171. But before this action, the holder 170 will have been pressed to the left by means of a lever 172, which has on its end an incline or cam part, which acts on the end of the carrying spindle 173 of the holder 170; so that when this lever is worked by a crank and connecting rod 174 by suitable cam mechanism, the body will have been moved up to a stop 175 by the body conveyors, whereupon the spindle 173 is freed by the return of the lever 172, when the body will be held in its correct position for being operated upon by the parts 170 and 175. In this condition the opposite sides of the body are pressed together and held by the pressure gauges 176.

The stop 175 forms part of a lower gauge 177 hereafter described.

In this condition, the interlocking operation of the outer and inner hooks takes place; and this is effected by the lifting of the lower lifting gauge 177, which is mounted on the hinged lever 178, operated suitably from the mechanism through another lever 179 and connecting rod 180, and of other subsequent actions. Namely, by these operations the hooks are brought first to the position shown in Figure 17. Then the hooks are pressed into the position shown in Figure 18 by the lowering of the tool 166; after which they are moved to the position shown in Figure 19 by the gauge 183. The tool 166 is then pressed further down on to the can, and the joint is squashed as shown in Figure 20, the seam being pressed into a groove in the mandril.

During all these latter operations, the outwardly projecting hook is in contact with a longitudinal tongue 181, which is carried in and adapted to slide radially in a slot in the mandril 130^x as later described with reference to Figures 21, 22 and 23.

With regard to the manner of operating the gauge 183,—see Figure 24—it is moved up to and away from the squashing tool 166 by means of a lever 151 operated by a cam 152 on the cam shaft 39, the gauge itself being guided in a guide 184 suitably carried from the frame of the machine, and normally pressed backwards by the spring 185.

With reference now to Figures 21, 22 and 23, prior to the actual squashing operation, the tongue 181 which lies in the slot in the top of the mandril, will be moved up as illustrated in these figures; and this is effected by springs 186^x, the outward position being retained by the projections 186 resting on a surface of the core rod 184 as shown in Figure 21. The core rod 184 is adapted to be slid in and out of the mandrel 130^x by means of a rod 187, operated to and fro, by a lever 188 pivoted at 189, and operated by a cam mechanism from below, so that by the moving to and fro of the core rod 184 the tongue 181 can be moved in and out, the projections 186 of the tongue fitting in the gaps 185 in the core rod 184 when the tongue is pressed inward.

The core rod 184 having now been withdrawn, by the moving down of the tool 166 the tongue is pressed down into its slot as shown in Figure 20.

With further reference to the mandril and its method of support, it is carried at its forward end by the forward supporting bracket 132 by an upwardly projecting part 191 of the mandril, which is bolted to one of the webs of the brackets 132 as shown in Figure 21; while the other end is supported from below by hooks 192 hinged to a suspending bracket 193 fixed to the end supporting frame bracket 132.

Figure 12 shows in elevation the supporting hooks 192, the hooks 192 proper being on their lower ends; and when the hook levers are pulled down the hooks proper enter gaps 195 in the underside of the mandril 130^x. When the squashing tool 166 is pressed down on to the top of the hook joint of the tin body, the pressure on the mandril will be taken by the hook supports 192, and it will be rigidly held.

After the squashing action has taken place, the hooks 192 are moved about their pivots 194, and the hooks proper are removed from under the mandril, so that the body can be moved forward along the mandril, by the conveyors hereafter described. The hooks 192 will be suitably operated by cam motion and connections such as those shown from the main cam shaft 39.

Regarding the reciprocating rod conveyor for moving the bodies 0^x step by step forward through the machine from the body curling mechanism to the body hooking and finishing machine, this is illustrated in Figure 7 in side elevation, Figure 8 in end elevation, Figure 25 in plan, and Figures 26 and 27 in detail.

The conveyor bars proper are marked 200, and their teeth 201, and they are moved to and fro by means of shoes 202 attached to them; and to the bars 200 pins 203 are fixed, which pass through elongated slots 204 in other bars 205, which are stationary so far as longitudinal movement is

concerned, but are movable laterally, that is up to and away from one another.

The movement of the bars 200 through the shoes 202 is effected by and from a crank cam 167, on the cam shaft 39, and a lever 206 fixed to a pivot pin 207 operated by a connecting rod 208, motion from which is transmitted to the shoe 202 by a pivoted lever 209 and a connecting rod 210, the outer end of which is in the form of a semi-circular ring 211 extending about half round a pin 212 attached to the shoe 202. The semi-circular ring 211 is normally held up into engagement with the pin 212 by means of a plate 213, which is held up in position by a spring 214, supported at its lower end by a nut 215 on the end of a pin 216, attached to a sleeve 217 carried on the pin 212.

By this means, normally, by the rotation of the crank 167 the shoes 212, and the finger bars 200 will be reciprocated to and fro; but in the event of a can body becoming damaged, and the machine jammed, on the back stroke of the shoe the ring or jaw 211 will free itself from the pin 212, in which action the plate 213 will be pressed downwards to a certain degree.

The rod 210 being thus free, it can fall down, and by this fall it may be adapted to strike and actuate a stopping or throw out gear of any known suitable kind for shifting a driving belt of the machine from a fast to a loose pulley, or any other suitable known kind of disengaging or stop motion.

To move the bars 200 closer to or further from one another, which is necessary for the step by step action on the successive bodies, the bars 205 are supported on pivoted levers 220 mounted on rocking shafts 221, which are rocked to and fro by short levers 222 fixed on the shaft 221, and having rack teeth on their adjacent edges which engage with one another, so that by the movement of the lower arm and the lever 220, both the upper arms 220 will be moved simultaneously, so that the motion of the two bars 205 is identical.

Through this movement of the bars 205 towards and away from one another, the bars 201 will be moved in a similar manner and simultaneously with same, through the connecting pin 203.

After the bodies leave the hook interlocking portion of the machine above described, they may be passed or conveyed on to a machine in which they are flanged and they are provided with ends; or the bodies may be discharged from the squashing portion of the body making machine to be subsequently operated upon.

What is claimed is:—

1. In a machine for making the cylindrical bodies of sheet metal boxes from flat sheets of sheet metal, sheet feeding driven rollers adapted to feed the sheets one by one, a bending roller onto which the sheets are pressed by the feeding rollers and by which they are curled into cylinders of the required diameter, a conveyor rail having a relatively wide lower part onto which the curled bodies are delivered, and along which they are adapted to be conveyed mechanically, and a pivoted oscillatory weight device adapted to be moved about its pivot by the forward edge of the curled body, and subsequently to press the curled body down onto the relatively wide lower part of the conveyor rail.

2. In a machine for making cylindrical bodies of sheet metal boxes from flat sheets of sheet metal, sheet feeding driven rollers adapted to feed the sheets one by one, a bending roller onto which the sheets are pressed by the feeding rollers and by which they are curled into cylinders of the required diameter, a conveyor rail having a relatively wide lower part onto which the bodies are delivered and along which they are adapted to be conveyed mechanically, reciprocating conveyors comprising finger conveyor bars proper, slide bars adapted to support but permit longitudinal movement of the finger conveyor bars, means for moving the finger conveyor bars longitudinally of the slide bars, and means connected with the slide bars adapted to bring them nearer to and further from each other, so that in the forward movement of the finger conveyor bars proper they will be moved into engagement with the bodies to be conveyed along the machine, and subsequently on the return movement of the finger conveyor bars the slide bars and the finger conveyor bars mounted upon them will be moved out of engagement with the bodies.

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