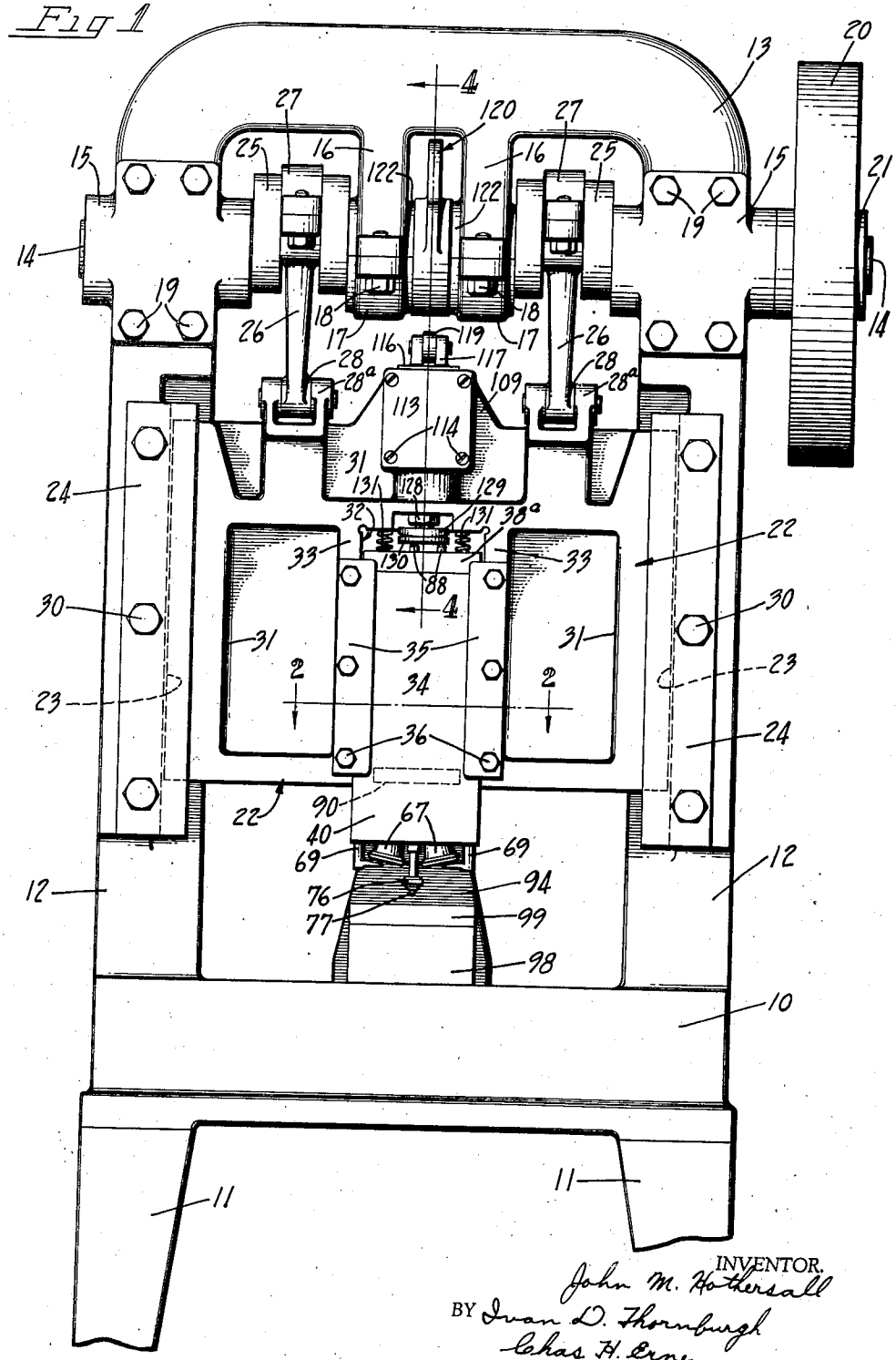
May 18, 1943 J. M. HOTHERSALL 2,319,235

REFORMING MACHINE

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Fig 1



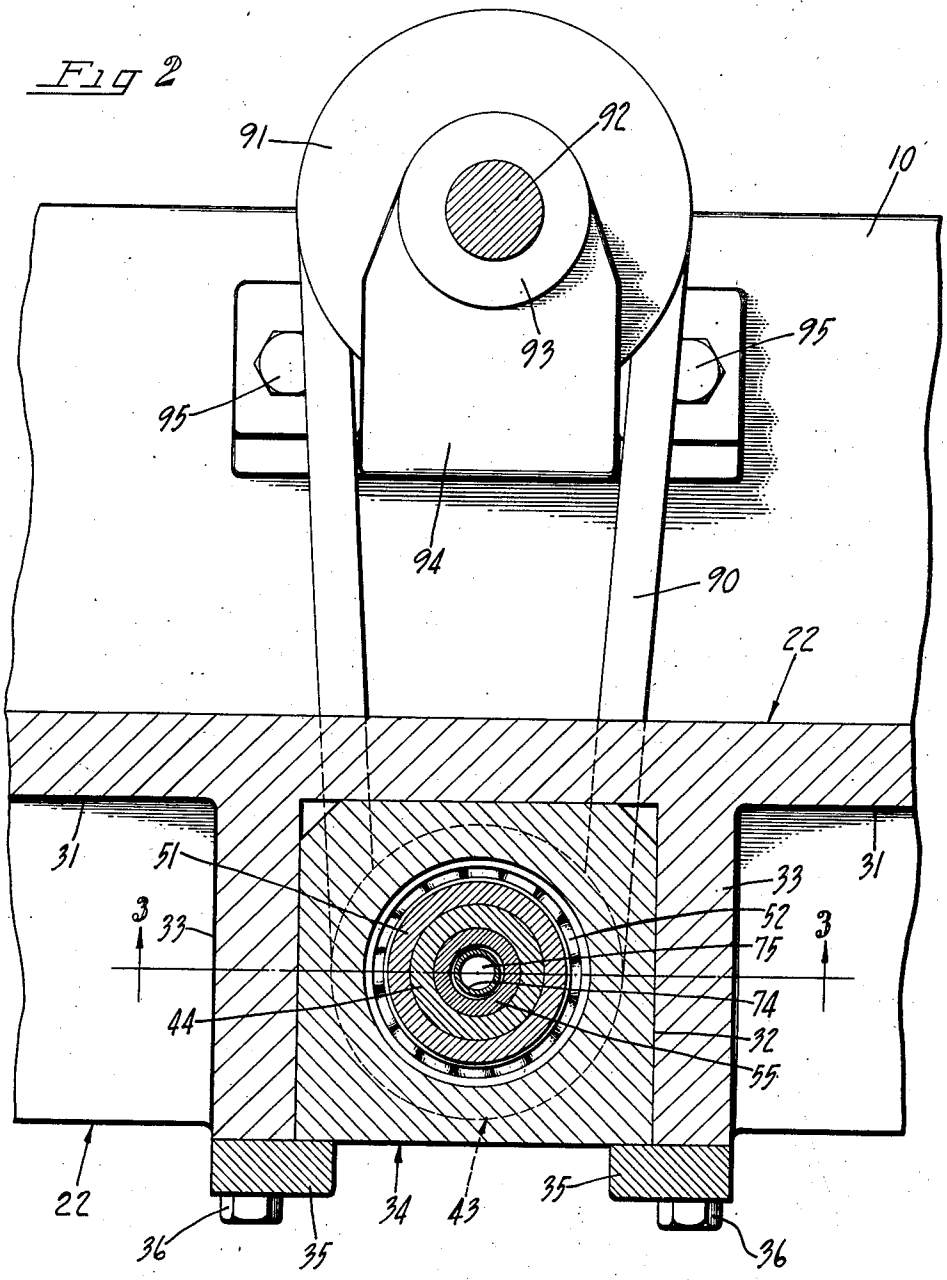
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REFORMING MACHINE

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Fig 2



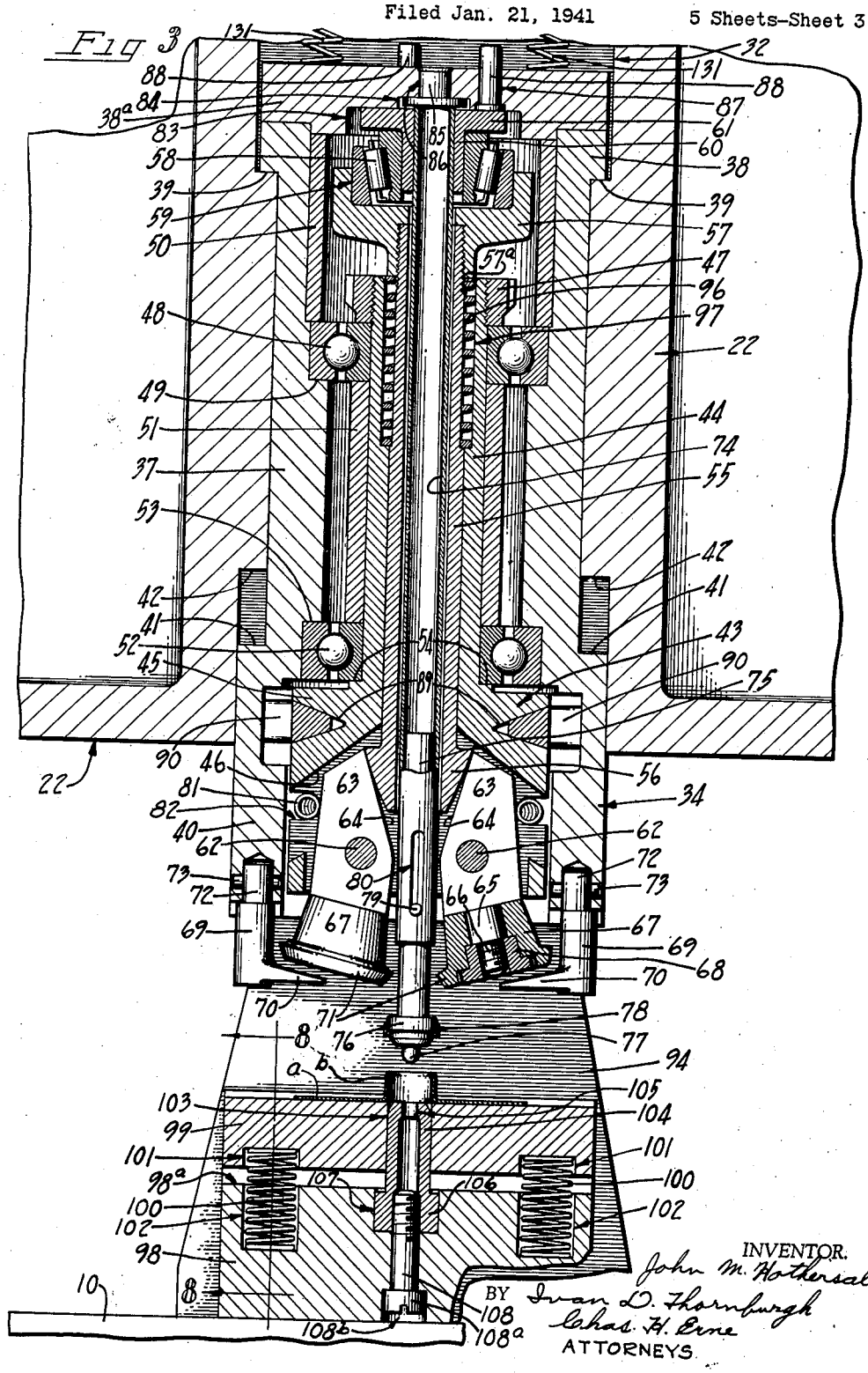
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REFORMING MACHINE

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Fig 3



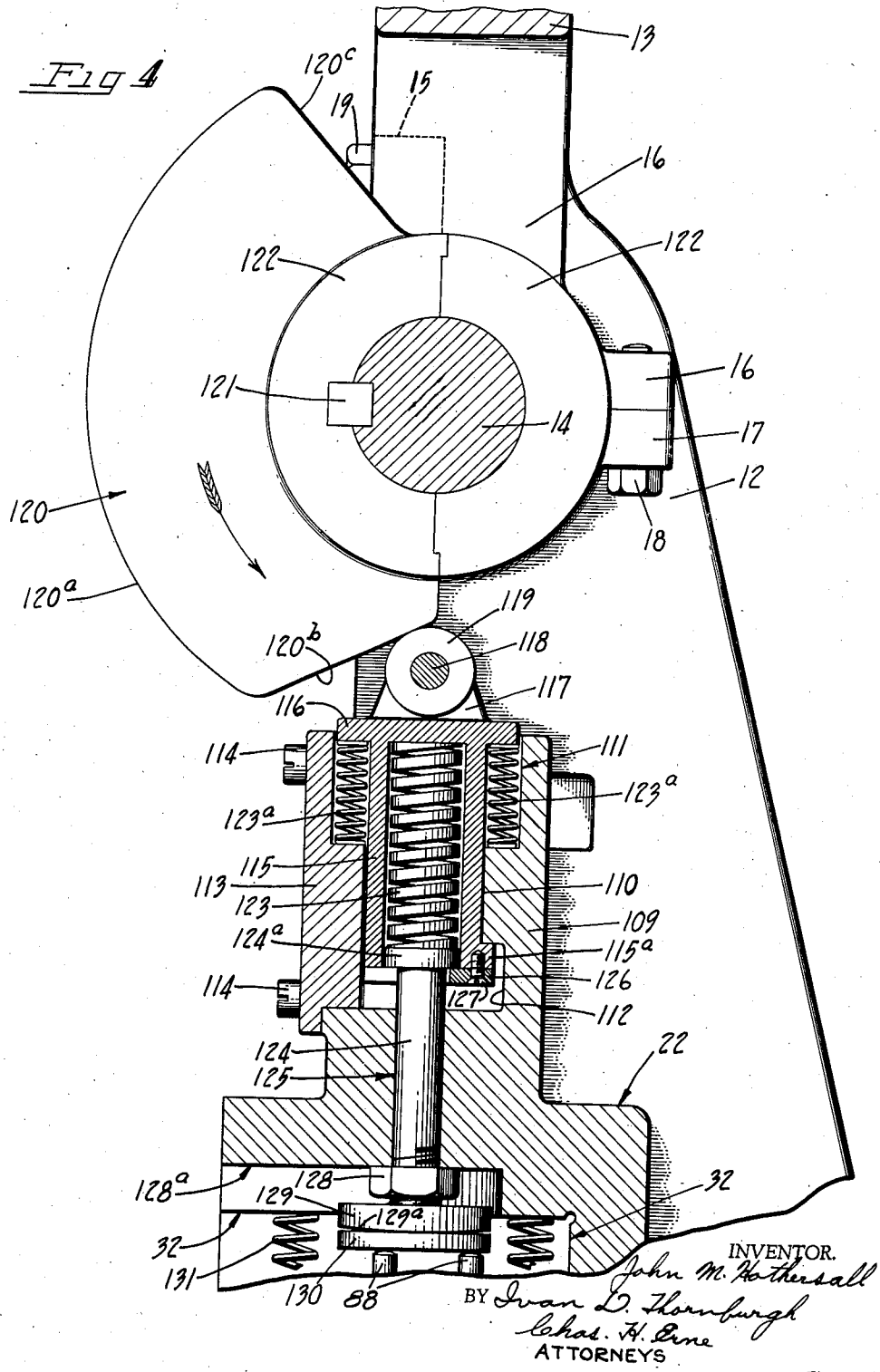
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REFORMING MACHINE

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Fig 4



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REFORMING MACHINE

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Fig 5

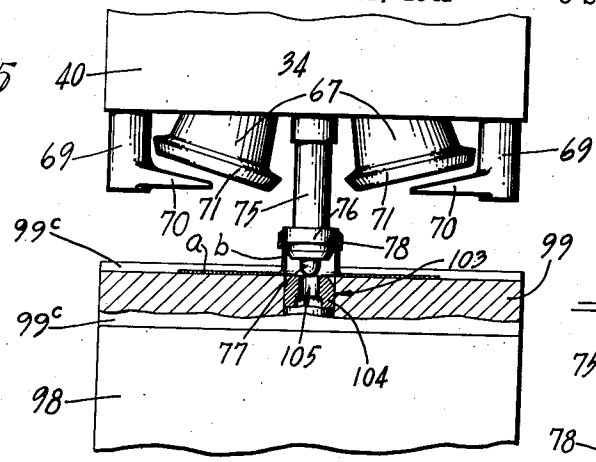


Fig 10

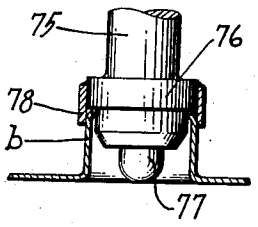


Fig 6

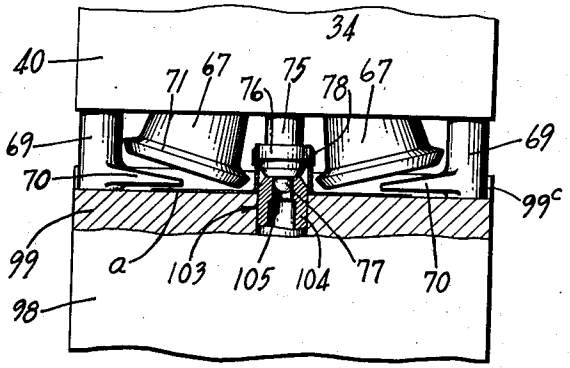


Fig 9

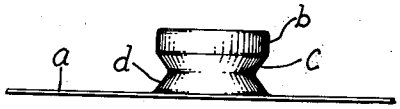


Fig 7

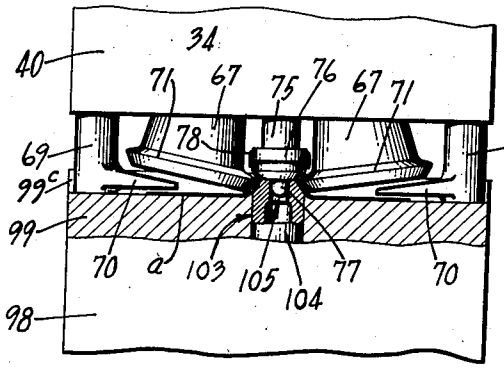
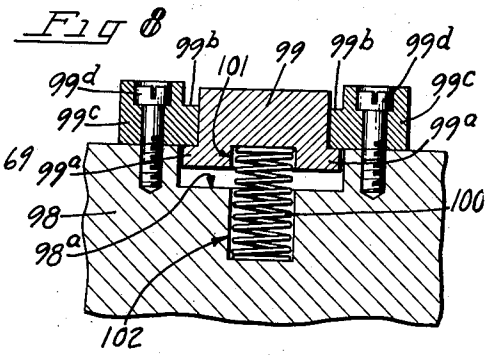


Fig 8



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2,319,235

UNITED STATES PATENT OFFICE

2,319,235

RE-FORMING MACHINE

John M. Hothersall, Brooklyn, N. Y., assignor to American Can Company, New York, N. Y., a corporation of New Jersey

Application January 21, 1941, Serial No. 375,326

9 Claims. (Cl. 153—9)

The invention relates to a machine for roller or die forming sheet metal can parts and has particular relation to a machine for reforming the nozzle portions of can breast members so as to adapt the nozzle for the reception of a can spout member to be secured thereto.

The machine is specifically designed for reforming the nozzle portions of oil can breasts, wherein such cans are usually of elliptical cross section having an upper oval breast portion terminating in an integral central nozzle, in which latter is secured the usual elongated spout having an outer screw cap thereon. The can breast members having the nozzle portions thereof prepared and reformed for spout reception purposes in accordance with the present improvements, are thereafter double seamed to the can body. The latter is then filled, for example with lubricating oil, after which the elongated spout members are crimped or otherwise secured to the can breast nozzles and screw caps automatically applied to the outer threaded portions of the spouts.

An important object of the present invention is to provide a machine of the described character which is capable of rapid and efficient operation in successively reforming the said nozzle portions of preformed oil can breast members by means of rapidly rotating outer die rollers, having a configuration which it is desired to impart to the can breast nozzles, said rollers operating in conjunction with an inner bodily movable die or anvil element having a peripheral configuration complementary to that of the outer forming rollers.

A further important object of the invention is to provide in such a machine automatic means for accurately locating a can breast nozzle to be reformed, relative to the outer roller forming and inner die or anvil elements.

A still further object is to provide a machine of the character described which is automatically operative to release the can breast locating anvil and die forming elements after the die forming operation, said machine being thereafter automatically operative to move the die elements and clamping devices to inoperative position for a sufficient interval to permit a succeeding can part or breast to be positioned for a subsequent roller die forming operation.

A still further object is to provide in such a machine means for automatically insuring the desired movements and operations in proper sequence and in synchronism so that smooth and efficient functioning of the machine under practical operating conditions is insured.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

In said drawings:

Figure 1 is a view in front elevation of a roller forming press machine constituting a preferred embodiment of the invention.

Fig. 2 is an enlarged detail horizontal section on line 2—2 of Fig. 1.

Fig. 3 is a vertical section on line 3—3 of Fig. 2.

Fig. 4 is a vertical section taken substantially on line 4—4 of Fig. 1, on an enlarged scale.

Figs. 5, 6 and 7 are detail views partially in elevation and partly in vertical section of a portion of the mechanism shown in Fig. 3, but with the parts, including the forming rollers, respectively illustrated in different positions.

Fig. 8 is a detail vertical section on line 8—8 of Fig. 3.

Fig. 9 is an enlarged view in side elevation of a completed can breast and nozzle after the reforming operation.

Fig. 10 is an enlarged detail of can nozzle parts in place for reforming and showing part of the adjoining mechanism of Fig. 5.

Referring to the drawings, the can parts or breasts are indicated at *a*, the same being preferably of oval or elliptical configuration in plan and provided with a central upstanding hollow cylindrical nozzle portion *b*, designed for the reception of the usual elongated and tapered oil can spout.

The said can parts are designed to be successively fed by any appropriate and suitable feeding devices into position beneath the roller and die forming elements, which latter are automatically operative to descend, and accurately locate the nozzle for the die forming operation.

At the conclusion of the reforming or necking-in of the nozzle portion of the can breast, the said die elements and clamping devices are automatically elevated to inoperative position for a sufficient interval to permit a succeeding can part or breast to be located relative to the dies, and the operation is repeated.

The machine comprises generally a frame including a bed portion 10 having supporting legs or standards 11 (Fig. 1). The bed portion is provided at its opposite sides with vertically extending side frame members 12 of similar construction which are joined or connected at their

upper ends by a horizontal rigid frame element or member 13.

At the upper portion of the frame, a crank shaft 14 is journaled at its opposite ends in bearing members 15 suitably secured to the side frame elements 12. At its intermediate portion the said crank shaft is journaled in spaced bearing elements each disposed between a pair of frame elements 16 depending from the upper horizontal frame member 13, and a pair of split collar members 17 removably secured to the said frame elements as by means of bolts 18. The end bearing members 15 are removably secured to the frame by means of suitable bolts 19, thereby permitting installation and removal of the crank shaft in the machine.

A driving pulley 20 having a hub 21 is keyed or secured to the crank shaft, whereby the latter may be driven at any desired speed from an appropriate power source.

The crank shaft 14 is designed to impart vertical reciprocatory movement to a press slide member generally indicated at 22, and having slide portions 23 (Fig. 1) at its opposite sides providing sliding engagement within slideways formed in the oppositely disposed gib members 24 carried in the side frame elements 12. For this purpose the crank shaft includes a pair of intermediate spaced crank elements or cheeks 25, one adjacent each side frame member and between the latter and an adjacent depending frame element 16. Each crank element includes a depending connecting rod 26 journaled at its upper end to the crank shaft by means of a split bearing 27 and pivotally secured at its lower end as at 28 to suitably disposed bearing bracket members 28a carried by the upper or cross head portion of the slide member 22 at intermediate portions thereof.

The press slide member 22 is or may be cut away, countersunk or webbed at intervals, as shown at 31, as an economical expedient, and also to decrease the weight of the member.

At its central portion the press slide member 22 is provided with a recess 32 of right angular configuration and defined by outwardly projecting integral web members or portions 33 of the press slide. Said recess is designed to house for sliding engagement therewithin the press forming head generally indicated at 34, and as best seen in Fig. 2 is preferably substantially square in cross section. The forming head is removably confined within the recess 32 of the press slide member by means of removable cover guide plates 35 secured to the press slide member by means of bolts 36 and which guide plate members extend inwardly over opposite front wall portions of the forming head 34.

As best seen in Fig. 3, the forming head 34 includes an intermediate elongated hollow shank portion 37 terminating at its upper end in an enlarged shouldered portion 38 normally resting on and supported by a surrounding shoulder 39 of the press slide member. Said shank terminates at its lower end in an enlarged hollow head element 40 which is open at its lower end and serves as a housing for operative elements and devices of the machine to be described. The open upper end of the forming head is closed by a suitable cover plate member 38a having a shouldered fit on the enlarged shouldered portion 38 of the head. Vertical movement of the forming head relative to and within the press slide member in an upward direction, is limited by engagement of a surrounding shoulder 41 of the head with a vertically aligned lower shoulder 42 of the press slide member.

A housing member 43 for the forming rollers is rotatably mounted within the forming head and includes an intermediate hollow cylindrical shank portion 44 terminating at its lower end in an enlarged head portion 45, which is suitably cut away as at 46 for the purpose of accommodating operative parts contained and carried therewithin.

At its upper end the hollow shank threadedly engages a nut or thrust collar member 47 which seats against the inner rotatable race of an upper anti-friction bearing 48. The outer stationary race of said bearing is seated upon a shoulder 49 of the forming head shank 37. A non-rotatable spacer collar or bushing member 50 is disposed between said bearing and the upper cover plate member 38a of the forming head and may have a driving fit within the hollow shank 37 of the head.

A sleeve member 51 which may rotate with the roller housing member 43 is disposed between the inner race of upper anti-friction bearing 48 and the rotatable inner race of a lower anti-friction bearing indicated at 52. The outer non-rotatable race of said latter mentioned bearing member is seated against a lower shouldered portion 53 of the hollow shank portion 37 of the forming head. The lower end of the inner rotatable race of said bearing seats against a peripheral shoulder 54 of the enlarged head portion 45 of the forming roller housing 43.

A pair of forming roller elements are pivotally mounted upon suitable studs 62 fixed in the cut away portion 46 of the roller housing head 45, and each includes an upper jaw part 63 having an outwardly tapered inner wedge face 64, said jaw elements also having at their lower ends a stud 65 terminating in a reduced threaded part 66. A forming roller 67 is journaled upon each stud 65 and is rotatably maintained in place thereon by a headed bushing 68 threaded upon said reduced part 66. A presser foot 69 is disposed adjacent and outwardly of each forming roller 67 and terminates in an inwardly extending tapered shoe 70 spaced from and extending beneath the enlarged lower head 71 of the forming roller.

In the lowered position of the forming head the presser foot tapered shoe 70 is spaced slightly above the bottom of the presser foot stud arm 69, as shown in Fig. 7. The lower head portion of the rollers 67 is of angular configuration the bottom roller surfaces being parallel to the upper surfaces of the shoes 70. Such an angular shape is such as to best perform the desired necking-in operation on the can breast nozzles, as will be hereinafter explained.

Each presser foot 69 terminates at its upper end in a reduced part 72 seated within a recess in the forming head wall and is maintained against rotation or movement relative to the forming rollers by means of a pin or key 73 extending through said reduced part 72 and seated within a bore of the head 40.

A wedge member in the form of a hollow cylinder having a shank portion 55 and an enlarged conical or inwardly tapered lower head portion 56 is mounted for rotary and sliding movement within the hollow shank 44 of the forming roller housing member 43. Said conical head portion of the wedge element is designed to engage and actuate the forming rollers 67 for the forming operation under appropriate conditions by en-

gagement thereof with the outwardly inclined tapered surfaces of the jaw part 63. Normally the said jaw part of each forming roller element is maintained engaged against the conical wedge portion, which latter normally is in uppermost raised position, by means of a circular contractile coil spring 81 housed within an annular groove or recess 82 of the forming roller housing head 45, so as to press inwardly against the outer walls of the jaw parts 63. The tension of the said spring maintains the forming rollers 67 in their outermost position on their pivot studs 62 when the wedge and elements connected thereto are in uppermost position.

The upper end of said shank 55 of the wedge member has threaded engagement wth a socket or recess disposed within the reduced lower end 57a of a rotatable cup member 57. The latter supports an upper thrust bearing 58, the outer rotatable race of which is firmly seated within a central recess 59 of said cup member. The inner stationary or non-rotatable race of the thrust bearing is fitted upon a depending hollow shank portion 60 of a non-rotatable bushing having an outwardly extending top flange 61 which overhangs said inner stationary race of the thrust bearing 58.

The lower reduced end 57a of the cup member 57 engages the upper end of a compression spring 96, the lower end of said spring seating against the base of a cut away portion 97 formed between the shank 44 of the rotary roller housing 43 and wedge shank 55 and in one or both walls of said shanks, and preferably in the wall of the roller housing shank 44. The tension of said spring normally maintains the said wedge element in uppermost raised position, so as to permit contractile spring 81 to maintain the forming rollers 67 in normal outermost position radially of a forming anvil therebetween.

The said hollow shank 60 of the bushing receives and non-rotatably supports the upper end of an inner sleeve or hollow spindle 74 on which the hollow shank 55 of the wedge member is journaled for rotary and sliding movement. The lower end of the said non-rotating spindle projects beneath the forming head and terminates adjacent and between the forming rollers 67. Said hollow sleeve or spindle houses the shank portion or stem 75 of a depending headed locating anvil or die element 76, shaped to conform to the configuration of the portions 71 of the rollers 67 for a die forming operation on the can part, and which terminates at its lower end in a pilot pin or stud 77. The anvil portion 76 carries and has secured thereto at its upper enlarged end, a ring-like member 78 which depends and is spaced slightly outwardly from the anvil member so as to provide a clearance therebetween slightly in excess of the thickness of the sheet metal of the can breast nozzle element to be reformed.

The stem 75 of the anvil is supported for limited vertical movement within the inner hollow sleeve or spindle 74 by means of a transverse projecting pin 79, the opposite end or ends of which are received by and seated in one or more elongated recesses or slots 80 at the lower portion of said spindle. Vertical movement of the anvil and its stem relative to the spindle and forming rollers is thereby permitted within the limits defined by the longitudinal extent of said slot or slots 80. Normally the stem and its anvil are in the depending outermost position, as illustrated in Fig. 3, with the pin 79 gravitally engaging the lower extremity of the recess and spaced above the can breast nozzle to be operated upon.

The cover plate member 38a is suitably recessed on its lower face as at 83 for the reception of the horizontal flange part 61 of the stationary bushing which supports the upper end of the inner stationary sleeve or spindle 74, and said cover member is further recessed on its under face as at 84 for the reception of the lower flange of a cap plate member having a central vertical stud portion 85 seated within a central recess 86 of the cover plate.

Said flange 84 is seated upon the upper end of the inner stationary hollow spindle 74. Said cover plate is further apertured, preferably at spaced circular intervals, as indicated at 87 for the reception therein of a plurality of vertically disposed thrust pins 88, the lower ends of which are seated on the flange 61 of the bushing, while the upper ends of said thrust pins project vertically above the top surface of the cover plate member 38a of the forming head and into the recess 32 of press slide member 22.

From the structure it will be apparent that the forming head 34 is non-rotatably supported by the press slide member 22, but is capable of limited vertical movement relative thereto within limits defined by the shoulders 41 and 42 of the forming head and press slide member respectively. The forming roller housing 43 and parts carried inwardly thereof, with the exception of the stationary spindle 74, are rotatably mounted within and relative to the forming head 34, to the end that a high speed of bodily rotation may be given to the forming rollers 67 around the inner stationary spindle 74 and the depending stationary or non-rotatable anvil member 76.

The forming roller housing head 45 is suitably recessed as at 89 for the reception of an endless belt member 90, which may be of the V-type (see also Fig. 2). The belt member also passes over a pulley 91 on a vertical shaft 92 journaled in a bearing 93 of a bearing bracket 94 secured as by bolts 95 to the bed 10 of the machine frame at the rear thereof. The shaft 92 and its pulley are driven at any desired speed by a source of power (not shown) derived from the machine or from an outside source, so as to impart the desired speed of bodily rotation to the forming rollers relative to the work.

A stationary block 98 is supported on the bed portion 10 of the frame and in turn yieldably supports in spaced relation therefrom and within a central recess 98a thereof (Figs. 3 and 8), a can breast supporting plate or pad member 99 by means of compression springs 100. Said springs are seated at their upper ends in suitable recesses or sockets 101 in the plate or pad and corresponding sockets 102 in the block. Vertical movement of the pad in an upward direction under pressure of the springs 100 is limited by engagement of oppositely disposed laterally projecting flange portions 99a thereof (Fig. 8) with inwardly projecting portions or lug extensions 99b of adjacently and oppositely disposed retaining blocks 99c. These retaining blocks are rigidly and removably secured in position on the block 98 by means of screw elements 99d or other appropriate securing means.

The pad 99 is centrally apertured at 103 and in vertical or longitudinal alignment with the pilot pin 77 for the slidable reception therethrough of a vertically extending hollow die element or forming post 104, having an upper centrally disposed reduced aperture 105 adapted to receive the pilot

pin 77 when the latter is in lowermost or depressed position during operation of the machine (Figs. 6 and 7). The lower enlarged end 106 (Fig. 3) of the die element 104 is seated within a suitable recess 107 in block 98, said lower enlarged end being threaded for the reception therein of the end of a clamping screw 108 disposed in the central bore of block 98 and having an enlarged head 108a seated within a recess 108b in the bottom of the block 98, and by means of which screw the lower die element or forming post 104 is capable of vertical adjustment.

As best seen in Figs. 1 and 4 the press slide member 22 is provided with a central upward extension 109 which is suitably cut away so as to provide an intermediate reduced recessed portion 110 merging into an upper enlarged recess 111 and a lower enlarged portion 112.

A removable cover plate element 113 normally closes the forward open portion of the recess in the press slide extension 109 and is secured thereto by means of bolt or screw elements 114. Said press slide extension 109 and cover plate 113 together serve to movably house a hollow cam sleeve member 115 having a substantially flat top wall 116 on which is provided a spaced bearing bracket 117 for a shaft 118 on which a cam roller 119 is journaled. Said cam roller at appropriate predetermined and synchronized intervals is designed to be engaged by an edge cam element 120 having an intermediate curved cam surface 120a, and opposite angularly disposed straight cam surfaces 120b and 120c. Said cam element 120 is keyed as at 121 to the crank shaft 14 between two split collar elements 122.

The cam sleeve member 115 houses a relatively heavy compression spring 123 bearing at its upper end against the top wall 116 and engaging at its lower end an enlarged head 124a of a stem or post element 124 slidably contained within a bore 125 provided in the press slide member. The tension of said spring maintains the said post element 124 in lowermost position with its enlarged head pressed into engagement with a retaining stop plate 126 removably secured to a flanged lower portion 115a of the cam sleeve 115 by means of a screw 127 or other securing element.

Light compression springs 123a are housed within the enlarged portion 111 of the said press slide member recess and bear at their upper ends against the top member 116 of the cam sleeve, thereby tending to maintain the same in uppermost position in the path of travel of the cam 120. The vertical position of the cam roller 119 carried by said cam sleeve relative to the cam 120 may be adjustably determined.

The lower end of the post 124 has threaded engagement with an adjusting lock nut 128 bearing against the wall of a recess 128a in the press slide member 22 and by means of which the tension of spring 123 may be varied as desired, and also the vertical position of cam roller 119 relative to rotating cam 120.

A rocker plate member 129 is threaded or otherwise secured to the lower end of the post member 124, the lower curved surface 129a of said plate having rocking engagement with a lower plate or disk element 130, also secured in any suitable manner to the lower end of post element 124. Suitable compression springs 131 are disposed within the upper portion of the central recess 32 of the press slide member, bearing at their upper ends against said member and at their lower ends against the cover plate 38a of the forming head 34 (see Fig. 3).

The purpose of said springs is to yieldably resist vertical movement of the forming head relative to the press slide member under operative conditions, to the end that smooth operation and absence of undue or sudden relative movement between said members, is insured.

It will be understood that the edge cam member 120 is so positioned circumferentially of the crank shaft 14 as to have its rotary movement synchronized with the rise and fall of the press slide member 22, as the latter is vertically reciprocated by the crank shaft 14. The purpose of the straight cam surface 120b is to depress the wedge into engagement with the forming roller jaws so as to move the rollers 67 into operative engagement with the can breast nozzle to be reformed. The purpose of the intermediate uniformly curved peripheral surface 120a of the said cam is to maintain the said rollers in engaged position with the can breast nozzle during and until completion of the reforming operation. The purpose of the straight edge cam surface 120c is to release the wedge 56 from the forming roller jaws after the reforming operation, thereby permitting elevation of said wedge member by the tension exerted by compression spring 96 (Fig. 3).

This permits said forming rollers 67 to be returned to normal and radial outermost position away from the work by the compression exerted by contractile coil spring 81 and to permit the reformed can nozzle and breast to be removed from engagement with the forming rolls and the substitution therefore of a succeeding breast nozzle to be reformed by the rollers 67.

The sequence of operations of the described mechanism for reforming and necking-in the nozzle portions of the oil can breasts is as follows:

The said breast members *a* which may be of generally oval shape and having a centrally disposed upstanding cylindrical nozzle portion *b* are successively fed in any suitable and approved manner to a substantially central position on the spring pressed plate or yieldable pad member 99, and into the position illustrated in Fig. 3. The rotation of the crank shaft 14 at one stage of its cycle depresses the press slide member 22 and its supported forming head 34 until the pilot pin 77 and its associated locating anvil 76 are inserted into the breast nozzle *b*, as shown in Fig. 5. This movement placing the parts as in Fig. 5, also causes engagement of the ring-like member 78, carried by the anvil, over the upper peripheral end of the nozzle and serves to accurately center the breast member for the subsequent operations to be performed on the nozzle portion thereof.

The pilot pin 77, during this partial descent of the press slide member into the position of Fig. 5, strikes home within the forming post 104. The pin thereupon stops in its descent and the stem 75 on which the pilot pin is carried, together with the pin 79, remains in this position while the press slide member continues its further descent. In this movement, the spindle 74 slides down around the stem 75, the upper end of the elongated slot 80 being brought down toward the pin 79.

During this movement and just before reaching the position shown in Fig. 6, the oppositely disposed presser feet 69 engage opposite ends of the yieldable pad member 99. Thereupon the pad

member is depressed against the action of the compression springs 100 finally coming into the position of Fig. 6.

It is during this last movement of the press slide member and while the pad 99 is being depressed that the lower die element or forming post 104 is exposed above the pad surface. Simultaneously, the pilot pin 77 resumes its descent as the breast member being lowered with the pad moves down over the forming post. The nozzle portion of the breast is thus firmly reenforced internally at its upper and lower portions for the subsequent necking-in operation to be performed.

At this stage of the operation the press slide member 22 has reached the lowermost limit of its travel (Fig. 6) so that the forming head thereupon remains stationary while the reforming action takes place. In this reforming operation, the desired necking-in of the oil can breast nozzle is performed by the now properly positioned forming rollers 67.

A straight cam surface 120*b* of cam 120 on the crank shaft 14 (Fig. 4) engages the cam roller 119 and depresses cam sleeve 115 against the tension of the heavy and light compression springs 123, 123*a*, due to the heavier resistance of spring 123. Post 124, rocker plate member 129 and disk 130 are yieldably depressed, thereby in turn engaging and depressing the circumferentially spaced thrust pins 88 (see also Fig. 3). The bushing which comprises the parts 60, 61, the thrust bearing 58, rotating cup member 57, and the elongated hollow cylindrical wedge member 55, 56 are also depressed. This movement is relative to the inner non-rotating sleeve 74, and also to the rapidly rotating housing 43 carrying the forming rollers 67. This action is against the tension of the compression spring 96.

During this depression of parts just described, the wedge portion 56 of the wedge member moves down between the jaw elements or wedge cam portions 63 of the pivotally mounted forming rolls. Such movement forces the wedge cams outwardly so that the rollers are pressed inwardly against the intermediate portion of the can breast nozzle *b* so as to indent and neck-in the same, as shown in Fig. 7. This completes the necking-in of the can breast nozzle. The timing of this part of the cycle of reforming by the rollers is determined by the time of engagement of a curved cam surface 120*a* with the cam roller 119.

It will be understood that the press slide member, the forming head and parts carried thereby remain in the lowered position of Fig. 6 while the crank of the crank shaft is passing through the bottom or dwell stroke of the press. This allows sufficient time for the work of the forming rollers just described.

As soon as the cam surface 120*a* becomes disengaged from the roller, the cam sleeve commences to rise to its normal position (Fig. 4) under the influence of the light compression springs 123*a*. This movement occurs during the travel of a straight cam surface 120*c* over the cam roller 119. The said elevating action permits compression spring 96 to again elevate the wedge member 56 from engagement with the jaw elements 63 of the forming rolls, thereby permitting the latter to be again moved outwardly by the tension of contractile coil spring 81.

The return of the parts to normal position as shown in Fig. 3, also moves thrust pins 88 upwardly relative to the forming head as rocker plate member 129 and disk member 130 are elevated by the aforesaid compression springs 123*a*, at the same time serving to relieve tension on heavy compression spring 123. The tension of this latter spring exerted on the forming rollers permits the latter to perform the necking-in operation under a yielding, as distinguished from a rigid strain, thereby insuring against undue damage or distortion of the can breast nozzle during the necking-in operation. In other words, the operation of reforming the can breast nozzle from the configuration shown in Fig. 5 to that shown in Figs. 7 and 9, is performed under a yielding but substantial pressure which is sufficient to accomplish the desired result.

The anvil member 76 and pilot pin 77 inserted in the can breast nozzle and lower die element 104 serve to back up the nozzle from within at its opposite ends to further insure proper performance of operation by the forming rollers. The completed necked-in condition of the can breast nozzle is illustrated in Figs. 7 and 9.

Immediately after the rollers 67 have been urged to their normal outward position by elevation of the wedge member and the compression of coil spring 81, the shoulder 39 of the press slide member 22 engages the upper shouldered portion 38 of the forming head, and continued movement of the connecting rods 26 in their upward cycle elevates the forming head 34 into the normal inoperative position shown in Fig. 3. Inner non-rotatable sleeve or spindle 74 carried by the forming head is also elevated, moving with it locating anvil 76 and pilot pin 77, by reason of the engagement of said sleeve with the pin 79, which at this time is in engagement with the lower end of slot 80.

When the stem 75, the anvil 76 and pilot pin 77 first begin to move upwardly and away from the forming post 104, the formed nozzle and breast parts may also start to lift from the surface of the pad 99. This lifting action, however, is prevented by the overhanging shoe sections 70 of the presser feet 69. Such shoe sections therefore act as stripping elements and free the formed nozzle parts from the anvil.

This release of the forming head parts from the reformed can breast permits the latter and spring pressed plate or pad 99 to be again elevated by the compression springs 100 into said normal inoperative position of Fig. 3. Lower die element or forming post 104 is thereby retracted into the supporting pad member so that the completed can breast with its reformed nozzle element *b* may be removed for further operations, for example the insertion and securing of a spout member to the reformed nozzle portion thereof.

The completed can nozzle is best seen in Fig. 9 wherein it will be noted the described reforming operation of the rollers 67 and the anvil 76 results in imparting an inwardly and downwardly inclined or tapered wall portion *c* to the nozzle neck, said portion thereafter tapering outwardly and downwardly in a lower wall portion *d* which merges into the breast material or metal *a*. This necked-in or restricted configuration of the nozzle as shown in Fig. 9 permits the usual elongated oil dispensing spout to be seated in the nozzle prior to being suitably crimped or interlocked therewith in a subsequent operation.

It will be understood that the described operations are successively performed upon appropriately positioned or fed can breast members during each cycle of the crank shaft, the speed of which may be appropriately determined and reg-

ulated by the driving speed of pulley **20**. The speed of the forming rollers **67** as they spin about the can breast nozzle may also be varied by appropriate regulation of the driving speed of shaft **92** (Fig. 2).

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a machine for roller forming the nozzle portion of a sheet metal can breast, the combination of means for yieldably supporting the can breast, said means including a stationary can breast centering element, forming rolls engageable with and bodily rotatable around said nozzle portion and movable into and out of engagement therewith for performing a necking-in operation thereon, a vertically movable pilot post engageable with said centering element through said nozzle portion to accurately center the latter relative to said forming rolls, means for positioning said forming rolls in lateral registry with said nozzle portion, means for bodily rotating said rolls, means for forcing said rolls inwardly against the nozzle wall to perform a necking-in operation thereon during said bodily rotation of the rolls, and means movable into engagement with said yieldable can breast supporting means to depress the latter relative to said stationary centering element as an incident to said necking-in operation.

2. In a machine for roller forming the nozzle portion of a sheet metal can part, the combination of a vertically yieldable pad for supporting the can part, means including a forming post projecting through said pad and extending thereabove when the pad is depressed for holding the can part during forming, forming rolls engageable with and bodily rotatable around said nozzle in spaced relation thereto, means for moving said forming rolls into lateral registry with said nozzle and for depressing said pad as an incident thereto, a pilot element also movable with said roll moving means for engaging said forming post through said nozzle to accurately center the latter relative to said rolls as said pad is depressed, means for bodily moving said rolls around said nozzle in spaced relation thereto, and means for moving said laterally registered rolls into engagement with the nozzle wall to perform a necking-in operation thereon during said bodily movement of the rolls.

3. In a machine for roller forming the nozzle portion of a sheet metal can breast, the combination of a pad for supporting the can breast, means including a forming post projecting through said pad, forming rolls normally disposed above said can breast and having means for moving the same into lateral registry with said nozzle, said roll moving means being further operable to engage and depress said can breast supporting pad relative to said forming post, an anvil member also movable with said rolls for engaging said forming post interiorly of said nozzle to accurately center the latter relative to said rolls as said pad is depressed, means for bodily rotating said rolls around said nozzle in spaced relation thereto, and means for moving said laterally registered rolls into engagement with the nozzle wall to force the same inwardly against said anvil member, whereby to perform a necking-in operation on said nozzle during said bodily rotation of the rolls therearound.

4. In a machine for roller forming the nozzle portion of a sheet metal can part, the combination of a vertically yieldable pad for supporting the can part, means including a forming post projecting through said pad and extending thereabove when the pad is depressed, forming rolls engageable with and bodily rotatable around said nozzle in spaced relation thereto, a crank shaft for moving said forming rolls into lateral registry with said nozzle, said crank shaft being further operable to depress said can part supporting pad relative to said forming post, a pilot element also movable with said roll moving means for engaging said forming post through said nozzle to accurately center the latter relative to said rolls as said pad is depressed, means for bodily rotating said rolls around said nozzle in spaced relation thereto, and cam actuated wedging devices synchronized with the movement of said crank shaft for engaging and moving said laterally registered rolls inwardly into engagement with the nozzle wall to perform a necking-in operation thereon during said bodily rotation of the rolls.

5. In a machine for roller forming the nozzle portion of a sheet metal can breast part, the combination of a pad for supporting the can breast part, means including a forming post projecting into said pad, pivotally mounted forming rolls engageable with and bodily rotatable around said nozzle in spaced relation thereto, each of said rolls including a movable jaw part having a wedge face, means for lowering said forming rolls into lateral registry with said nozzle, said lowering means having means thereon for depressing said pad relative to said forming post, a pilot element also movable by said roll lowering means for engaging said forming post through said nozzle to accurately center the latter relative to said rolls as said pad is depressed, means for bodily rotating said rolls around said nozzle in spaced relation thereto, and a vertically reciprocable spring pressed wedge member engageable with the wedge faces of said jaw parts for moving said laterally registered rolls inwardly on their pivotal mountings into engagement with the nozzle wall to perform a necking-in operation thereon during said bodily rotation of the rolls.

6. In a machine for roller forming the nozzle portion of a sheet metal can part, the combination of a pad for supporting the can part, means including a forming post projecting into said pad, pivotally mounted forming rolls engageable with and bodily rotatable around said nozzle in spaced relation thereto, means for depressing said pad to project said forming post therethrough, means for moving said forming rolls into lateral registry with said nozzle in timed relation with the depression of said pad, a pilot element movable by said roll moving means for engaging said forming post through said nozzle to accurately center the latter relative to said rolls, means for bodily moving said rolls around said nozzle in spaced relation thereto, and a cam actuated vertically reciprocable wedge member adapted to be moved into engagement with said laterally registered rolls to move the same inwardly against the nozzle wall to perform a necking-in operation thereon during said body rotation of the rolls.

7. In a machine for reforming the nozzle por-

tions of sheet metal can breasts, the combination of a vertically reciprocable press slide member, a forming head carried by said slide member and movable vertically relative thereto, a rotatable housing contained within said forming head, forming rollers carried by said housing, an anvil die member carried by said forming head between said rollers and movable vertically relative thereto, said die member being normally disposed beneath said rollers and including a can part centering pilot pin, a yieldable pad for supporting the can part to be reformed, a stationary forming post adapted to be projected through said pad in vertical alignment with said die member, said post having a central aperture therein, means for depressing said press slide member to engage said pilot pin with said forming post within said nozzle to accurately center the latter and the can breast relative to said anvil and forming rollers, said depressing movement disposing said anvil die member interiorly of said nozzle, said depressing means being also operable to depress said yieldable pad with its centered can breast relative to said forming post to expose the latter while aligning said forming rollers with said nozzle on opposite sides thereof, and means for bodily rotating said forming rollers around said nozzle and for pressing the rollers inwardly against the side wall of the nozzle while the same is backed up by the exposed forming post, so as to perform a necking-in operation on the nozzle.

8. In a machine for reforming the nozzle portions of sheet metal can breasts, the combination of a vertically reciprocable press slide member, a forming head carried by said slide member and movable vertically relative thereto, a rotatable housing contained within said forming head, forming rollers pivotally mounted in said housing and having resilient means cooperating therewith for normally holding the same in inoperative position, a hollow wedge element slidably mounted in said housing and movable vertically relative to said rollers, a non-rotatable hollow spindle carried by said forming head and extending through said hollow wedge element, an anvil die member carried by said spindle between said rollers and movable vertically relative thereto and to said spindle, said die member being normally disposed beneath said rollers and including a can part centering pilot pin, a yieldable pad for supporting the can part to be reformed, a stationary forming post adapted to be projected through said pad in vertical alignment with said die member, said post having a central aperture therein, a rotating crank shaft for depressing said press slide member to engage said pilot pin with said forming post within said nozzle to accurately center the latter and the can breast relative to said anvil and forming rollers, said depressing movement disposing said anvil die member interiorly of said nozzle, said crank shaft being thereafter operable to further depress said slide member to lower said yieldable pad with its centered can breast relative to said forming post to expose the latter and to align said forming rollers with said nozzle on opposite sides thereof, means for depressing said wedge element to engage and rock said rollers into engagement with the exterior wall of said nozzle to press the same against said anvil die member, and means for bodily rotating said rollers around said nozzle wall while the rollers are yieldingly urged into engagement therewith while said nozzle is interiorly backed up by the exposed forming post, to effect a die-forming operation on said nozzle.

9. In a machine for roll forming can parts having interior and exterior walls, the combination of a yieldable depressible pad for supporting the can part to be formed, a die element projecting through said pad and extending thereabove only when the paid is depressed, roll forming means movable into and out of engagement with said part for performing a forming operation thereon, a reciprocable head carrying said roll forming means and for moving the same into lateral registry with said can part, means carried by said head and movable therewith and with said roll forming means for depressing said pad to project said die element therethrough into engagement with the interior wall of said can part for centering said part relative to said roll forming means, and means for moving said roll forming means inwardly into engagement with the exterior wall of said can part to be roll formed thereby while said part is interiorly supported by said die element for the forming operation.

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