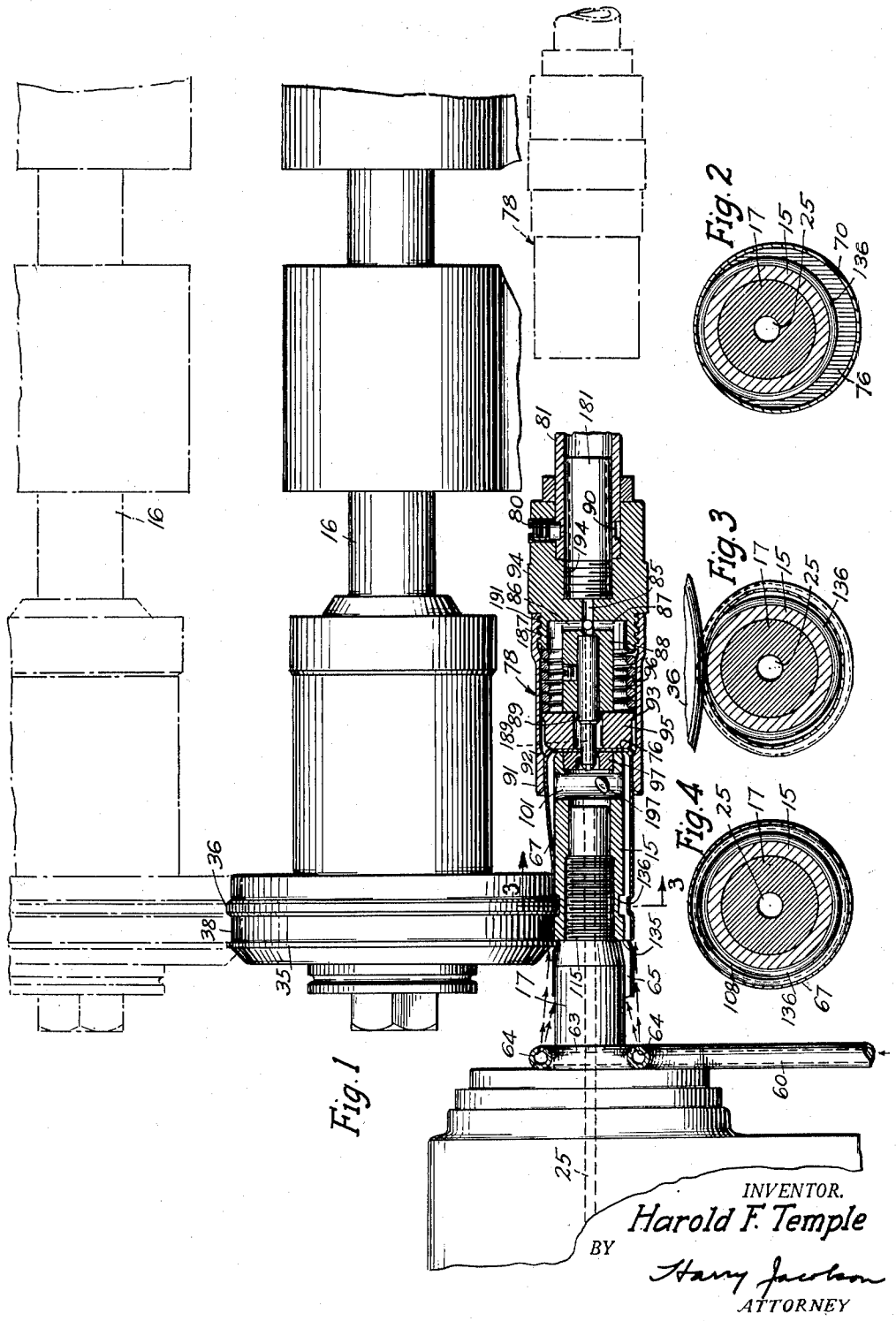
Jan. 22, 1952 H. F. TEMPLE 2,583,521

TUBE TRIMMING AND PIERCING MACHINE

Filed March 2, 1950 2 SHEETS—SHEET 1



Jan. 22, 1952 H. F. TEMPLE 2,583,521

TUBE TRIMMING AND PIERCING MACHINE

Filed March 2, 1950 2 SHEETS—SHEET 2

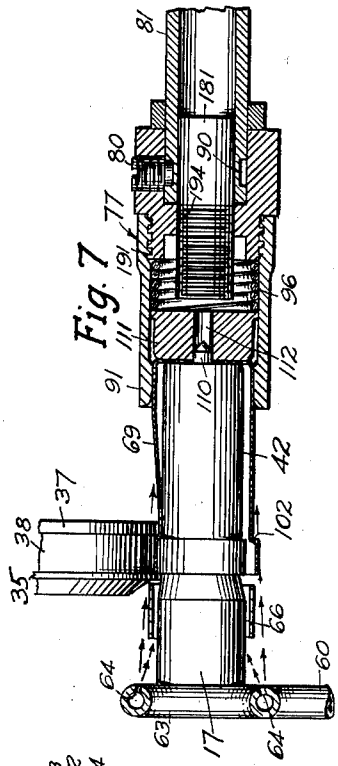


Fig. 7

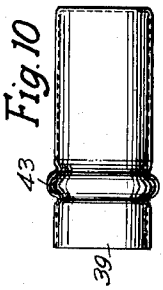


Fig. 10

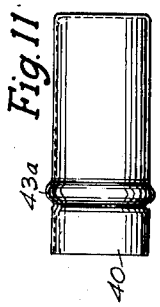


Fig. 11

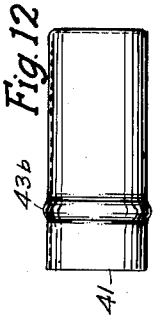


Fig. 12

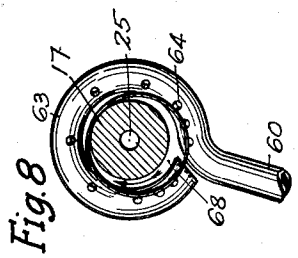


Fig. 8

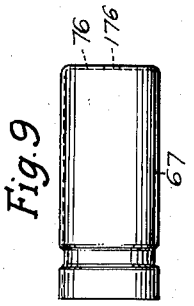


Fig. 9

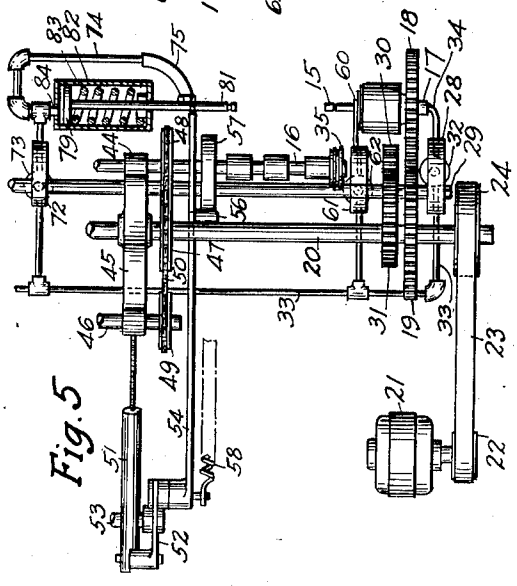


Fig. 5

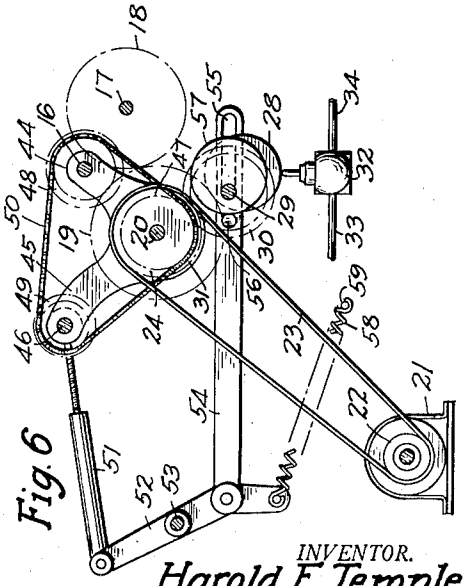


Fig. 6

INVENTOR.
Harold F. Temple
BY
Harry Jacobson
ATTORNEY

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TUBE TRIMMING AND PIERCING MACHINE

Harold F. Temple, Elmont, N. Y., assignor to Victor Industries Corporation, Brooklyn, N. Y., a corporation of New York

Application March 2, 1950, Serial No. 147,189

20 Claims. (Cl. 164—11)

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This application is a continuation in part of my application for Can Trimming Machine and Method, Serial No. 585,169, now abandoned.

The invention relates to trimming machines for operating upon small diameter thin metal cans or tubes open at one end and closed at the other and relates particularly to the means for holding the cans in place during operation thereon and for dismounting them when finished, and for trimming, beading or otherwise shaping and piercing the cans at the same time.

In trimming machines of the type mentioned, there are customarily provided a rotatable arbor or mandrel on which the can is mounted loosely and an oscillatory tool holder having a revoluble shaft. Difficulty has been experienced not only in holding the work on the mandrel in the exact position required for accurate operations thereon, but also in performing accurate trimming and other operations on the work such as to form an open end tube of an exact length within narrow limits such as is necessary for example in radio tube shield cans, condenser cans and the like. Difficulty has also been experienced in removing the scrap piece or waste material left from the trimming and piercing operations, which removal has often been necessarily done manually. Nor has it been possible to pierce the end of the rotating can on the mandrel while the trimming or shaping operations are performed.

This invention therefore contemplates the provision of means acting on the closed end portion of a tubular work piece for holding and maintaining the work in an exact predetermined position on a mandrel, said means including fluid pressure applying means and mechanical pressure applying means acting just before and while the work is engaged by the trimming and shaping tools, such engagement occurring at the same relative point of each piece mounted in the machine.

The invention further contemplates the provision of means for piercing the closed end of the rotating can while other operations such as trimming and beading, filleting or other shaping operations are performed on the lateral surface of the can.

The invention further contemplates the provision of simple, inexpensive but effective means for dismounting the can and any scrap material resulting from the operations, thereby attaining a finished can trimmed to length, beaded or filleted or otherwise shaped if desired, and also pierced if desired and dismounted in a single manual set-up of the can on the same mandrel of the same machine.

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The invention further contemplates the provision of revoluble means for adequately holding the closed end of the can concentric with the mandrel during the trimming and other operations which temporarily spring or distort another part of the can into a position eccentric of the mandrel.

The various objects of the invention will be clear from the description which follows and from the drawings, in which

Fig. 1 is a front elvational view of part of the machine showing the mandrel and the holding and piercing means for the work partly in section and in dotted lines in the retracted positions thereof, and also showing the trimming tools in dotted lines in the retracted positions thereof.

Fig. 2 is a vertical sectional view of the mandrel and of the can as they appear while the work hangs freely on the mandrel out of engagement with the trimming and beading tools and the piercing punch.

Fig. 3 is a similar sectional view taken on the line 3—3 of Fig. 1, showing the can slightly and temporarily distorted by the revolving tools.

Fig. 4 is a similar sectional view of the mandrel and of the finished work, showing the approximate position assumed by the latter and the clearance between the mandrel and the work when the work is blown off the mandrel.

Fig. 5 is a top plan view, partly in section, of the means for actuating the moving parts and for timing the blasts, the frame of the machine being omitted.

Fig. 6 is a front elevational view of the same, partly in section.

Fig. 7 is a fragmentary front elevational view and vertical section of the work holding and piercing means in a modified form.

Fig. 8 is a side elevational view of the blow-off pipe surrounding the mandrel.

Figs. 9–12 are front elevational views of some of the various cans or tubes which can be produced on the machine by the use of suitable revolving tools and correspondingly shaped mandrels.

The typical machine to which the invention is applicable includes a revolving mandrel as 15 and an oscillatory and revoluble tool carrying arbor as 16 adapted to carry one or more revolving tools toward and from the mandrel and to maintain the tools in contact with the work blank for one or more revolutions of the mandrel. By means of the present invention, it becomes possible to perform substantially simultaneously, a number of highly accurate operations in a single set up of the work on the mandrel and

thereby to produce the required can accurately and in quantity on the same machine, and similarly to produce any one of a number of differently shaped cans merely by changing the tools or the work mounting and holding devices, or both.

As best seen in Figs. 5 and 6, the work or mandrel arbor 15 is rotated by the shaft 17 to which it is operatively connected in any well known manner, said shaft being rotated through the gear 18 thereon which meshes with the gear 19 on the driven shaft 20. A suitable motor as 21 drives said shaft 20 through the motor pulley 22, the belt 23 and the pulley 24 on the shaft 20. To supply a timed blast for automatically ejecting scrap resulting from the end piercing operation after the cycle of operations has been completed, the mandrel shaft 17 has a longitudinal hole 25 therethrough and communicating with the interior of the mandrel 15. The timing of the blast is controlled by a suitable cam as 28 on the cam shaft 29 which is driven by the gear 30 thereon through the gear 31 on the shaft 20. The cam opens the spring-closed valve 32 of any well known type such as a "Schrader" valve at the proper time to permit a blast of compressed air or the like which has been supplied to the pipe 33 connected to one side of the valve, to pass into the pipe 34 on the other side of the valve and thence to enter the opening 25.

The tool arbor 16 is designed to hold, rotate and oscillate toward and from the mandrel, any number of suitable circular tools such as the trimming tool 35 (Figs. 1 and 7), the grooving tool 36 (Figs. 1 and 3) or the fillet forming tool 37 (Fig. 7) with suitable spacers as 38 therebetween. While the tools for shaping the various forms of beads of the cans 39, 40 and 41 of Figs. 10, 11 and 12 are not shown, such tools are well understood and need not be described in detail. The mandrels 15 of Fig. 1 and 42 of Fig. 7 are suitably shaped and dimensioned to cooperate with the revolving tools 35, 36, 37 or the like to shape or cut that part of the can or tube pressed therebetween in a well known manner. For example, in Fig. 10 the shaping operation is the formation of the bead 43, which is mainly convex outwardly but which is bounded by outwardly concave edges. The mandrel in that case would have a bead bounded by similar concave edges and of the same cross sectional size and shape as that of the inner surface of the bead. In Fig. 11, the bead 43a is bounded by only one concave edge portion and in Fig. 12, the bead 43b has no concave edges. Shapes other than beads may obviously be formed as may be found necessary, and the tools and mandrel in that case, are shaped accordingly.

To oscillate and rotate the tool shaft 16, an oscillatory bifurcated frame is provided, said frame being pivoted on the driven shaft 20 (Figs 5 and 6) and having one arm 44 supporting the shaft 16 and another arm 45 supporting the auxiliary sprocket shaft 46. The shaft 20 carries the sprocket wheel 47 while the shafts 16 and 46 carry the respective sprocket wheels 48 and 49. Passing around said wheels is the chain 50 whereby rotation of the shaft 20 causes rotation of the shaft 16. An adjustable rod 51 is secured at one end to the arm 45 of the sprocket frame and at the other end is connected to an end of the crank lever 52 pivoted to the frame of the machine as at 53. The other end part of the crank lever is connected to the bar 54 having a slot 55 therein through which slot passes the cam shaft 29. Projecting from the bar 54 is the pin 56 drawn into contact with the cam 57 on the shaft 29 by the tension spring 58. Said spring is connected at one end to the crank lever 52 and at the other end to the frame of the machine as at 59, whereby the spring, when permitted to do so by the cam 57, pulls the shaft 16 in a counter clockwise direction as viewed in Fig. 6 and away from the mandrel 15. Said cam is properly shaped to move the pin 56 and the bar 54 toward the left at the proper time thereby to rotate the lever 52 in a clockwise direction, moving the rod 51 toward the right and rotating the frame and the parts carried thereby in a clockwise direction to move the tool shaft 16 toward the mandrel.

To time the work blow-off blast through the pipe 60, the cam 61 on the cam shaft 29 operates the spring-closed valve 62 interposed between the pipe 60 and the air supply pipe 33. Said pipe 60 terminates at its upper end in a loop 63 (Figs. 1, 7 and 8) concentric with and in slightly spaced relation to and around the mandrel shaft 17. The loop is provided with a number of holes 64 unevenly spaced circumferentially around the loop and inclined to the axis of the mandrel and on the side of the loop nearer the revolving tools for the discharge of a dismounting air blast along the mandrel 15 or 42. The holes 64 are preferably concentrated more closely toward one side and near the bottom of the loop as best seen in Fig. 8, because the scrap and the released work tend to hang on the mandrel tangent thereto at a point off the vertical center line of the mandrel owing to the rotation of the mandrel in the direction of the arrow of Fig. 8. Most of the holes 64 are therefore provided where the space 68 between the work and the mandrel is greatest and where the greatest amount of blast fluid is therefore required to perform the blow-off operation. The blast emerges from the holes 64 in the form of a hollow cone as shown generally by the arrows of Figs. 1 and 7, and applies dismounting pressure in a direction generally longitudinal of the mandrel as well as around the outside of the mandrel and the inner and outer surfaces of the scrap piece 65 of Fig. 1 or 66 of Fig. 7 and on the finished work 67 of Fig. 1 or 69 of Fig. 7.

The work to be trimmed and shaped is in the form of a tube blank as 70, Fig. 2, and is mounted on the mandrel manually. To permit easy mounting and also to permit easy dismounting of the finished can or tube after it has been beaded or grooved, the diameter of the mandrel is made sufficiently less than the diameter of the inside of the tube as is well understood in the art, or in other words the tube is considerably larger than the mandrel. Consequently, the tube blank merely hangs on the rotating mandrel in about the position shown in Fig. 2 before it is pressed into trimming and shaping position by the means for holding the end portion of the tube or by the revolving tools. However, means are provided to assist the operator to mount the blank and to relieve the operator of the necessity for moving the blank all the way on to the mandrel. It will be understood that the longer the operator's hand remains in contact with the blank, the greater the danger of injury to her by her failure to withdraw her hand in time, or the slower the speed of the machine to give her sufficient time for that purpose.

Said mounting means takes the form of a properly timed blast acting on the closed bottom 76 of the tube as it is released by the operator, the blast passing through the reciprocating centering, holding and piercing mechanism 77 of Fig. 7 and

78 of Fig. 1 and through the piston rod or pipe 81 to complete the mounting of the tube after it has been partially mounted by the operator, thereby giving the operator sufficient time to withdraw her hand before the holding mechanism engages the end portion of the tube or the revolving tools engage the lateral surface of the tube. Exact synchronization of the operation of the tools becomes unimportant when the mounting blast is used, since said blast positions and holds the work properly against the end of the mandrel until either the tools or the holding means come into operation. The passages for the blast through the holding means will be later described in connection with the description of said means. The blast is operative when the tool shaft 16 is retracted from the mandrel as shown by the dotted lines of Fig. 1 and when the holding means is also retracted. The blast is timed to operate alternately with the dismounting blast through the holes 64 of the pipe 63. For this purpose, the cam 72 mounted on the cam shaft 29 operates the valve 73 which is interposed between the air supply pipe 33 and the pipe 74 leading to the pipe 81 through the flexible pipe 75.

The pipe 81 serves also as a piston rod, carrying at the end thereof the piston 79 reciprocating in the cylinder 82 and urged away from the mandrel by the spring 83. Air is supplied behind the piston at the proper time through the branch pipe 84 to force the piston, together with the pipe 81 and the holding and piercing parts carried thereby, toward the mandrel against the action of the spring 83.

In the form of the holding and piercing means shown in Fig. 1, the punch holder 94 is revolubly secured to the end part of the pipe 81 as by means of the set screw 80, the inner end of which is inserted into and runs in the groove 90 around the pipe. A second pipe as 181 screwed to the holder 94 as at 194 and arranged inside of the pipe 81 may serve if desired as an additional bearing for the latter. To permit the blast to pass out of the pipes 81 and 181, a central hole 85 is provided in the punch holder and communicates with the radial holes 86 and 87 leading to the circumferentially spaced holes 187 through which the blast emerges from the holder. In the extension 88 of the holder is mounted the suitable punch 89 of such length that its operative end lies within the sleeve 91 at all times, the punch having the central blast passage 189 therethrough communicating with the hole 85. At one end thereof, the sleeve is removably secured to the holder 94 as by the screw threads 191 whereby another similar sleeve may be substituted when the tube diameter is changed. At its free end, the sleeve is rounded, bevelled or flared properly to guide the end portion of the tube blank into engagement with the inner cylindrical surface of the sleeve and to center said end portion accurately and concentrically around the corresponding end of the mandrel 15, when the sleeve is moved to the position shown in Fig. 1 in which it embraces the tube end portion and the end part of the mandrel. Near the end of the sleeve is provided the internal stop shoulder 92 against which the outstanding flange or shoulder 93 of the movable member or button 95 is pressed by means of the compression spring 96 arranged within the sleeve, when the holding means is retracted off the mandrel.

When air is supplied to the pipe 81 and to the cylinder 82, the blast discharged longitudinally through the punch passage 189 and through the

sleeve around the punch through the holes 187 automatically completes the mounting of the blank 70 on the mandrel 15, the mounting having been initiated manually. At the same time, the pipe 81 together with the parts secured thereto move longitudinally toward the mandrel under the air pressure on the piston 79. The closed end part of the tube blank then enters the flared part of the sleeve and is guided to a position concentric with the mandrel, while the end wall 76 of the blank engages the button 95 and moves said button into the sleeve against the action of the spring 96, thereby pressing the end wall of the tube firmly against the end surface of the mandrel and holding the blank firmly on the mandrel. The air pressure on the piston and the blast may persist during operation of the tools on the shaft 16. However, as the blank moves into the sleeve to the position of Fig. 1, the punch 89 pierces the end wall of the blank in cooperation with the female die 97 of the mandrel, to punch out a small disc and to form the desired hole in the end of the blank. The tools 35 and 36 or 37 in the meantime have descended toward the rotating mandrel, the tool 35 to trim the blank to length, the tool 36 to indent or groove the blank or the tool 37 to form the corner fillet as 102, Fig. 7. The closed end part of the blank being held concentrically of the mandrel, it is obvious that the pressure of the rotating tools upon the blank to close the space 108, Fig. 4, between the unstressed blank and the mandrel, distorts the blank momentarily as shown in Figs. 1 and 3 at the successive points where the tools apply such pressure. The distortion, however, is so slight and of such short duration that the tube, even though thin, springs back to its normal shape as soon as it is released by the tools. Pressure of the tools on the work causes the work to rotate, as does the pressure of the button 95 on the blank. Rotation of the mandrel is thereby imparted not only to the blank but also to the button, sleeve and punch, making it possible to pierce a rotating blank while or just prior to the trimming and shaping of the blank.

It has been hereinbefore explained that the mandrel is suitably shaped to cooperate with any selected revolving tools in the shaping and trimming of the tube blank. For example, the trimming tool 35 cooperates with the shoulder 135 of the mandrel to shear the blank to length. The groove 136 similarly cooperates with the grooving tool 36, but is so shaped and dimensioned as to avoid sticking of the work therein, thereby to permit the tube to be readily blown off the mandrel. Preferably therefore, the mandrel groove 136 is slightly deeper than the depth of the groove to be formed in the blank or the depth of the projecting part of the beading tool, so that the inside surface of the bottom wall of the groove in the blank is not quite in contact with the outer face of the annular groove in the mandrel. Similarly, the side walls of the beading tool converge somewhat inwardly, while the side walls of the groove 136 are parallel and in planes perpendicular to the axis of the mandrel as shown in Fig. 1. When the work 67 is released by the tools and the sleeve 91, the blast through the pipe 60 and the holes 64 thereof becomes effective to raise the work out of contact with the mandrel sufficiently for the blast to perform its dismounting function, the inner diameter of the groove in the work being slightly greater than the outer diameter of the mandrel as shown by the space 108 therebetween in Fig. 4. It will be understood that the air blast through

the punch hole 189 and through the hole 187 of the punch holder is cut off during the retraction of the sleeve so as not to interfere with the dismounting operation, which dismounts the scrap piece as well as the work.

In that form of the mandrel and of the support means for the closed end of the tube shown in Fig. 7, the punch 110 projects axially from the free end of the mandrel 42 and cooperates with the button 111 to pierce and to punch out a disc from the end of the tube, the punch entering the hole 112 in the button. The blast through the pipes 81 and 181 serves to eject the scrap or punching deposited in the hole 112 by the punch. The remaining parts of the holder 77 being similar to those of the holder 78, no further description thereof appears necessary. In this form of the invention, the mounting blast through the pipes 81 and 181 is ineffective to mount the tube blank all the way on the mandrel because of the interference of the punch 110. However, the work holder 77 is effective to complete the mounting of the blank, to arrange the end of the blank in proper concentric relation to the end part of the mandrel and to punch the hole in the end wall of the blank just before the revolving tools engage the blank. The button 111 presses the end wall of the blank against the free end of the mandrel 42 during the shaping operations on the blank, but such shaping operations follow the punching operation on the rotating work so closely that the punching and shaping operations may be said to take place substantially simultaneously. The pressure of the work holder on the end of the blank causes the button to rotate and also cause the entire holder to rotate about the pipe 81, the end of the holding screw 80 running in the groove 90 as previously explained and constituting a rotatable mounting for the work holder. The blast through the holes 64 of the dismounting loop 63 also floats the scrap piece 66 and the finished tube 69 around and off the mandrel as previously described in connection with the scrap and work of Fig. 1, said blast operating during the retraction of the work holder 77 and of the revolving tools 35, 37 and while the blast through the pipe 81 is discontinued.

It will be noted that the mandrels are hollow and readily replaceable by similar mandrels of different sizes and shapes peculiarly designed for the formation of the particular finished tube. As shown in Fig. 1, the mandrel 15 is hollow and is screwed on to the mandrel shaft 17 by the coacting screw threads 115. A female die 97 fixed in the end part of the mandrel cooperates with the punch 89 to cut the small disc as 197 out of the end wall 76 of the blank thereby to produce the hole 176. Suitable radial holes 101 in the mandrel receive the waste punchings and permit them to drop out of the mandrel when the scrap piece 65 and the work are blown off the mandrel. Should the punchings 197 fail to drop out of the holes 101, the blast through the opening 25 effects the ejection thereof.

It will now be understood that the present invention provides means effective to complete the mounting of a tubular blank on a smaller mandrel after the mounting operation has been manually initiated, then to trim, shape and pierce the blank substantially simultaneously while the blank rotates, the piercing being accomplished by a punch which is revolubly mounted, that the closed end of the blank is centered concentrically of the mandrel during the operations on the blank while the other part of the blank is pressed against the

mandrel and is consequently arranged temporarily eccentrically with respect thereto, that simple but adequate fluid pressure applying means have been provided to dismount the finished work as well as the scrap resulting from the operations, and that the structure provided is well designed to meet all practical requirements.

While certain specific forms of the invention have herein been shown and described, various changes may obviously be made therein without departing from the spirit of the invention defined in the appended claims.

I claim:

1. In a tube trimming machine, a revoluble mandrel constituting a first support means for a generally cylindrical tube having one closed end and the other end open, the tube normally hanging eccentrically on the mandrel, a revoluble tool, means for moving the tool toward and from the mandrel to press the tube between the tool and the mandrel, and means for holding the closed end portion of the tube concentrically with the mandrel during the operation of the tool on the tube thereby temporarily to distort the tube, said holding means comprising a sleeve arranged in axial alignment with the mandrel, means to reciprocate the sleeve longitudinally toward and from the mandrel, the inner diameter of the sleeve being greater than the outer diameter of the mandrel, said sleeve receiving the mandrel and the closed end portion of the tube therein when the sleeve is nearest the mandrel, a spring pressed rotatable button constituting a second support means for the tube and mounted for longitudinal sliding movement in the sleeve into a position in pressed contact with the closed end of the tube to press said end against the end of the mandrel and a revoluble mounting for the button and sleeve.

2. The machine of claim 1, a piercing punch carried by one of the support means and rotatable therewith, the other of the support means having a central hole therein to receive the punch on the reciprocation of the sleeve.

3. The machine of claim 1, the button having a central hole therein, and a punch projecting from the mandrel and arranged to enter the hole in the button on the reciprocation of the sleeve.

4. The machine of claim 1, the pressure of the button against the tube aiding to rotate the tube, the mandrel and the button each having an axially arranged hole therein, a punch carried by and rotatable with the sleeve and in axial alignment with the hole in the button, the punch entering the hole in the mandrel on the reciprocation of the sleeve thereby to pierce the end of the rotating tube.

5. The machine of claim 1, the tool being a trimming tool, the mandrel having a trimming shoulder thereon cooperating with the tool to trim a cylindrical tubular scrap piece from the open end part of the tube, a pipe loop around the inner end part of the mandrel, said loop having a plurality of circumferentially spaced blast discharge holes in the side wall thereof, the axes of the holes being inclined to the axis of the mandrel, and means for delivering a blast through the loop to blow the scrap piece and the tube off the mandrel on the retraction of the sleeve and the tool away from the mandrel.

6. The machine of claim 1, the tool being a trimming tool, the mandrel having a trimming shoulder thereon cooperating with the tool to trim a tubular scrap piece from the tube, and a pipe loop around the mandrel and having circum-

ferentially spaced apart blast discharge openings therein shaped to deliver a hollow conical blast circumferentially upon the scrap piece and the tube to dismount said piece and tube from the mandrel.

7. In a tube trimming machine, a mandrel, means to rotate the mandrel, a trimming tool, means to swing the tool toward and from the mandrel, means to rotate the tool to trim off a scrap piece from the tube, tube-holding means to receive, embrace and support the end part of a tube carried by and of greater diameter than the diameter of the mandrel, said means holding the end part of the tube concentrically of the mandrel while the tool presses another part of the tube temporarily against the mandrel and thereby arranges said another part of the tube eccentrically of the mandrel and rotates the tube, means to reciprocate the tube-holding means toward and from the mandrel, and means surrounding the mandrel to deliver a hollow conical blast around the mandrel and thereby to dismount the scrap piece and the tube.

8. The machine of claim 7, and means associated with the tube-holding means to punch a central hole in the end wall of the tube while the tube is held by the tube-holding means.

9. The machine of claim 8, the tube-holding means including a sleeve and a spring-pressed perforated button slidably axially in the sleeve.

10. The machine of claim 7, and means for delivering a blast through the tube-holding means to assist in mounting a partly mounted tube on the mandrel.

11. The machine of claim 10, and means associated with the tube-holding means to pierce the end wall of the tube.

12. The machine of claim 7, the mandrel having a longitudinal hole therein communicating with a transverse hole therethrough and a punch carried by and rotatable with the tube-holding means and depositing a punching from the tube into the longitudinal hole in the mandrel.

13. The machine of claim 12 and means for delivering a blast through the tube-holding means and the punch when the dismounting blast is inoperative.

14. In a tube trimming machine, a revoluble mandrel to enter and to rotate a tube, means to rotate the mandrel, a die having a hole therethrough and carried by the mandrel for rotation therewith, a sleeve reciprocating toward and from the mandrel and receiving therein the end portion of the mandrel and the closed end portion of a tube mounted on the mandrel when the sleeve is nearest the mandrel, means reciprocating the sleeve toward and from the mandrel, a perforated member slidable and rotatably mounted within the sleeve and arranged to engage the closed end portion of the tube and to rotate therewith, a spring within the sleeve urging the member out of the sleeve, coacting stop shoulders on the sleeve and member to limit the outward movement of the member, a piercing punch in the sleeve adapted to pass through the member and into the hole of the die when said closed portion and said member slide into the sleeve, and a revoluble mounting for the sleeve and the punch.

15. The machine of claim 14 and means for directing a blast through the sleeve and the member toward the mandrel.

16. The machine of claim 14, the sleeve being in coaxial alignment with the mandrel and of greater inner diameter than the outer diameter of the mandrel and thereby holding the end portion of the tube concentrically with the mandrel, a trimming tool, means for oscillating the tool toward and from the mandrel, means to rotate the tool, a trimming shoulder on the mandrel coplanar with the tool and cooperating therewith to trim the other end portion of the tube and to press upon that part of the tube being trimmed to hold said part against the mandrel temporarily and in eccentric relation to the mandrel.

17. In a tube trimming machine, a revoluble mandrel having a trimming shoulder thereon and adapted to support a tube having a closed end and an open end, means to rotate the mandrel, a pipe arranged in longitudinal spaced relation to the mandrel and in axial alignment therewith, means for directing a blast through the pipe toward the mandrel and upon the closed end of a tube partly mounted on the mandrel to complete the mounting of the tube, revoluble means cooperating with the shoulder to trim a ring of scrap off the open end of the tube and to leave the scrap ring on the mandrel, means to move the revoluble means toward and from the mandrel, means to rotate the revoluble means, a second pipe in the form of a ring around the inner end portion of the mandrel, the pipe ring having perforations in the wall thereof and being closed at the end thereof whereby a blast into the ring emerges through the perforations in annular form around the mandrel and moves longitudinally around the outside of the mandrel and against the surfaces of the scrap ring and the tube to blow said scrap ring and tube off the mandrel.

18. In a tube trimming machine, a revoluble trimming tool, a cylindrical mandrel adapted to enter a tube and having a part cooperating with the tool to trim one end of a tube, the mandrel having a longitudinal opening therethrough and a transverse opening communicating with the longitudinal opening, means for oscillating the tool toward and from the mandrel, means in longitudinal spaced relation to the mandrel for directing an air blast in one direction toward the mandrel, means for directing a second air blast in the opposite direction to encompass the outside of the mandrel and also to pass through said openings, a pointed reciprocating piercing punch arranged coaxially of the mandrel and cooperating therewith to pierce the closed end of a tube during the rotation of the tube by the mandrel and to deposit the scrap produced by the punch in said longitudinal opening, yieldable means adjacent the punch to exert pressure on said closed end during the operation of said tool and punch, a housing for the punch and for said yieldable means confining said first-mentioned air blast to said one direction, and means for reciprocating the housing toward and from the mandrel.

19. In a tube trimming machine, a revoluble mandrel having a longitudinal opening therethrough and a transverse opening communicating with the longitudinal opening, punch-holding means reciprocating toward and from the mandrel for completing the mounting of a cylindrical tube having a closed end on the mandrel and for holding the tube on and causing the tube to rotate with the mandrel, said means comprising a sleeve, a spring-pressed member having a longitudinal hole therethrough slidable in the sleeve and adapted to press upon the end of the tube and a piercing punch rotatably mounted within the sleeve, a die adjacent the transverse opening

within the mandrel and cooperating with the punch to pierce the end of the tube, means for directing a blast through the sleeve and said member toward the mandrel, means for reciprocating the punch-holding means and the punch toward and from the mandrel, a revoluble mounting for the punch, sleeve and member, and means directing a second blast through the mandrel to eject the punching produced by the punch through the transverse opening.

20. In a tube trimming machine, a revoluble mandrel adapted to have a tube having a closed flat end mounted thereon and rotated thereby, the mandrel having a part thereof reduced in diameter to receive the trimming tool hereinafter mentioned, a sleeve reciprocatory toward and from the mandrel, a spring-pressed member slidable within the sleeve and having a central opening therein, said member pressing upon and rotating with the closed end of the tube, a punch rotatably mounted within the sleeve and adapted

to pass through the opening of the member when the member is retracted, means to reciprocate the sleeve member and punch as a unit toward and from the mandrel, a die within the mandrel coacting with the punch, a trimming tool coacting with and oscillatory toward and from the mandrel to operate upon the tube substantially simultaneously with the operation of the punch and means to oscillate the tool toward and from the mandrel.

HAROLD F. TEMPLE.

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