Feb. 27, 1962 A. HUET 3,022,811

MACHINE FOR THE MANUFACTURE OF TUBE NECKS ON HEADERS

Filed March 16, 1959

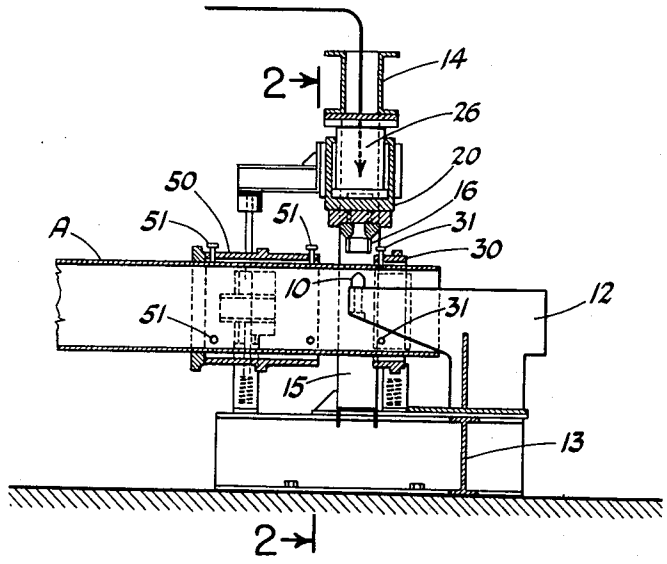


FIG. 1

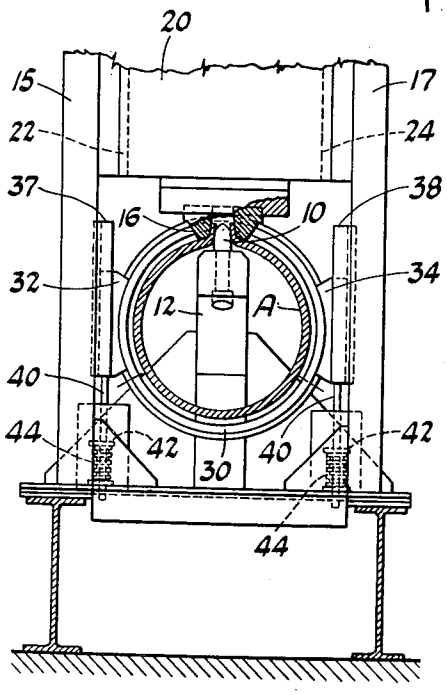


FIG. 3

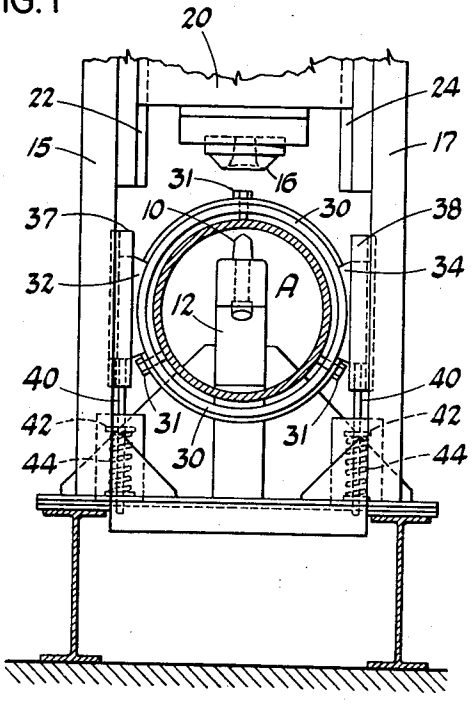


FIG. 2

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United States Patent Office 3,022,811 Patented Feb. 27, 1962

3,022,811

MACHINE FOR THE MANUFACTURE OF TUBE NECKS ON HEADERS

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Filed Mar. 16, 1959, Ser. No. 799,606
3 Claims. (Cl. 153—2)

The present invention relates to metal working and particularly to an improvement in apparatus for forming tubular necks on headers utilized for fluid distribution.

One form of known machine for the manufacture of tube necks on headers has a punch disposed inside the header to be actuated by a hydraulic jack or piston bearing against the inside wall of the header so that the punch traverses the opposite wall to form a tube neck. The punch cooperates with die applied against the outside of the header all around the point where the tube neck is to be formed so as to shape it. In the case where a series of tube necks are executed along one generatrix of the header surface, the punch and its operating jack are shifted along at the inside of the header over the whole length of this generatrix of the surface.

If it is desired to obtain a ring of tube necks spaced circumferentially around the header in a plane perpendicular, or even at an angle, to the longitudinal axis of the header, it is necessary to rotate the header around its axis in order to successively execute all tube necks. As the jack has to rest on and bear against the inside wall of the header opposite the point where the tube neck is to be formed, it is important that the wall on which the jack bears is relative cool in order to resist the pressure. If it is then desired to form tube necks which are to be at 180° from those which have already been formed, it is necessary to wait until the header is sufficiently cooled off at the point of support, which delays the operation. On the other hand, the inside wall of the header has been perforated at points where tube necks have already been formed and can no longer be utilized to supply the jack with a sufficiently geometrical stable supporting surface.

In order to overcome these difficulties, applicant has conceived an apparatus which according to the invention is especially intended to ensure the execution of a ring of tube necks on a header. A fundamental characteristic of this apparatus lies in that, instead of being arranged as in the machine briefly described above, the wall piercing punch remains fixed and immobile within the header while the outer die which is applied against the outside of the header is now the active member and, by coming down on the punch, presses the wall of the header against this fixed punch. This arrangement affords, as may be seen, the advantage of not requiring the use of a jack working against the inside wall of the header opposite a neck location in order to ensure the formation of a tube neck.

Furthermore, the apparatus is arranged to enable displacement of the header during fabrication of a tube neck by allowing the header to move down onto the punch. Means are also provided to permit the rotation of the header around its longitudinal axis so as to successively obtain a ring of tube necks in a plane perpendicular to, or at an angle to, the axis of the header.

The following description when read in conjunction with the accompanying drawings showing an illustrative embodiment of the invention will afford an understanding of the manner in which the invention can be executed.

FIGURE 1 is a longitudinal vertical cross-section of the apparatus and shows the extremity of a header inserted in the apparatus for formation of tube necks according to the invention.

FIGURE 2 is a cross-section on a larger scale on the line 2—2 of FIG. 1.

FIGURE 3 is a view similar to FIG. 2 showing the apparatus and header after formation of a tube neck.

The neck forming apparatus embodying the invention consists mainly of a fixed punch **10** supported in a removable manner in a support **12** having the shape of an anvil, the support **12** being an integral part of a base **13** solidly anchored to the ground. Positioned above and aligned with the axis of punch **10** there is a cross bar **14** providing a support for a neck shaping die **16**. The cross bar **14** is sustained by two vertical guide-ways **15, 17** mounted on base **13**. A die-holder support **20** slides in vertical grooved tracks **22, 24** forming a part of guide-ways **15, 17**. On the cross-bar **14** a hydraulic jack **26** is mounted to operate the sliding support **20** which carries the outer matrix or die **16**.

At the right side of guide-ways **15, 17** (FIG. 1) a ring **30** is provided for the purpose of supporting the extremity of a header A on which necks are to be formed, the ring **30** having three set screws **31** which adjust the position of header A within the ring. Ring **30** is mounted to rotate around its axis within brackets **32, 34** guided in vertical grooveways **37, 38** on the uprights **15, 17**. The slides **33, 35** are mounted on rods **40** having collars **42** engaged by springs **44** which have the effect of maintaining ring **30**, and consequently header A, in a normal position above the punch **10** as shown on FIG. 2.

Additional means are provided to support header A while permitting its rotation around its axis. These means consist mainly of a sleeve **50** (FIG. 1) having set screw **51** engaging header A. The rotation of sleeve **50** within suitable supporting brackets permits header A to turn around its axis. This rotation can be effected by any suitable means, which are not shown; for instance, through operation by roller bearings or rollers, thrust blocks allowing to immobilize header A in any angular position desired at the point where it is intended to obtain the tube neck.

The apparatus operates as follows;

The end of header A on which a ring of tube necks is to be formed is slipped over the support **12** for punch **10** as shown on FIG. 1. The anvil shape or cantilevering of this support permits slipping the header over punch **10** sufficiently far to ensure that the ring of tube necks when formed will be located at a sufficient distance from the end of header A. The header having been immobilized in the angular position corresponding to that desired for the tube neck, screws **31** are tightened in such manner as to secure the extremity of the header within the ring **30**. The wall of the header having been heated at the point where the tube neck is to be obtained, and where a preliminary hole may have been made, die **16** is brought down in a first operation into contact with the outside wall of header A. Then the die **16** coming down through full action of jack **26** moves the end portion of header A by a translation movement further downwards as the ring **30** carried in brackets **32, 34** on slides **37, 38** is depressed against the resistance of springs **44**. This has the effect of forcing the header wall onto the punch in such manner that it is pierced and establishes on the header wall by means of punch **10** and die **16** the tube neck intended to be obtained, as shown on FIG. 3.

In this position the extremity of the header which has been treated is depressed by a movement which appreciably should be one of translation where the other extremity of the header is supported by a ring and slide arrangement similar to arrangement **32, 37, 40**, or the header may be sufficiently long to let its other end to simply rest on a support of any kind around which the header executes a large radius rotation.

Once a tube neck is formed, die **16** is raised by jack **26** in order to be returned to its elevated position and springs **44** raising ring **30** bring header A back into the

position shown in FIG. 2, while disengaging it from the punch 10. Header A is then turned around its axis in the desired angle for the formation of the next tube neck.

I claim:

1. Apparatus for forming tubular necks on a hollow cylindrical work-piece by means of a punch and die comprising: a fixed punch disposed in upright relation above the base; means supporting the punch so arranged that one end portion of the work-piece may be slipped over the punch; a matrix die for cooperating with the punch to form and shape a tubular neck on the work-piece; means for supporting the die above the work-piece and punch; reciprocable means for moving the die downwardly on said support to engage it with the outer wall of the work-piece and force the latter onto the punch to form a tubular neck; a ring support for receiving the said end portion of the work-piece; means for securing the work-piece to said ring; and means located in a position axially of the work-piece beyond the punch and die for mounting said ring for vertical reciprocation with respect to said punch.

2. Apparatus for forming tubular necks on a hollow cylindrical work-piece by means of a punch and die comprising: a base; an upright secured to the base; a support extending freely over the base from said upright; a punch disposed in upright relation mounted adjacent the distal end of said support so that one end portion of the tubular work piece may be slipped over the punch; a matrix die for cooperating with the punch to form and shape a tubular neck on the work-piece; means for supporting the die above the work-piece and punch; reciprocable means for moving the die downwardly on said supporting means to engage it with the outer wall of the work-piece and force the latter onto the punch to form a tubular neck; a ring support receiving the said end portion of the work-piece; means for securing the work-piece to said ring; means located in a position

axially of the work-piece beyond the punch and die for mounting said ring for vertical reciprocation with respect to said punch; and means associated with said ring and its reciprocable mounting means to permit the rotation of said ring to enable turning of said work-piece so as to selectively disposed circumferentially spaced portions of its wall between said die and punch for the formation of successive necks thereby.

3. Apparatus for forming tubular necks on a hollow cylindrical work-piece by means of a punch and die comprising: a base; an upright secured to the base; a support extending freely over the base from said upright; a punch disposed in upright relation mounted adjacent the distal end of said support so that one end portion of the tubular work-piece may be slipped over the punch; a matrix die for cooperating with the punch to form and shape a tubular neck on the work-piece; means for supporting the die above the work-piece and punch; reciprocable means for moving the die downwardly to engage it with the outer wall of the work-piece and force the latter onto the punch to form a tubular neck; a ring support receiving the said end portion of the work-piece; means located in a position axially of the work-piece beyond the punch and die for mounting said ring; means for securing the work-piece to said ring; and means associated with said ring and its mounting means to permit the rotation of said work-piece so as to selectively dispose circumferentially spaced portions of its wall between said die and punch for the formation of successive necks thereby.

References Cited in the file of this patent

UNITED STATES PATENTS

550,750	Forg	Dec. 3, 1895
1,489,716	Rupe	Apr. 8, 1924
1,574,900	Kellogg	Mar. 2, 1926
2,804,790	Refere	Sept. 3, 1957