March 25, 1941. L. V. SEAMAN 2,236,160

TUBE PUNCHING MACHINE

Filed Sept. 5, 1939

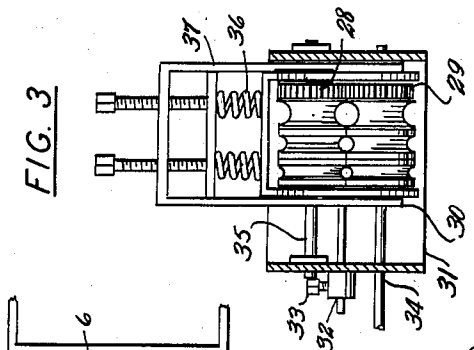


FIG. 3

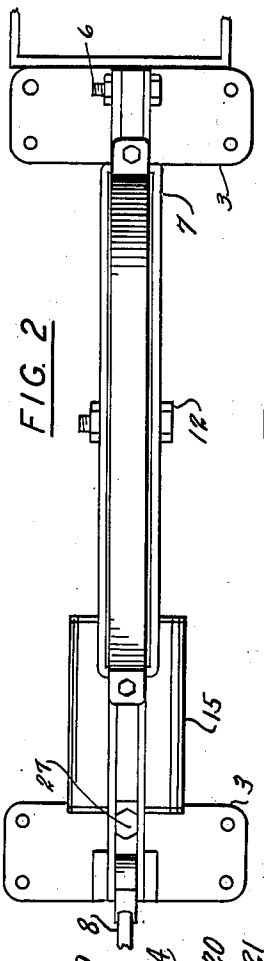


FIG. 2

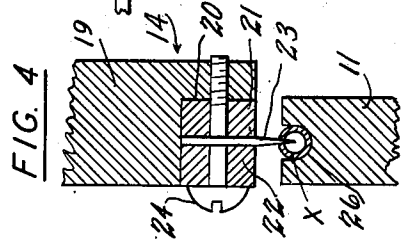


FIG. 4

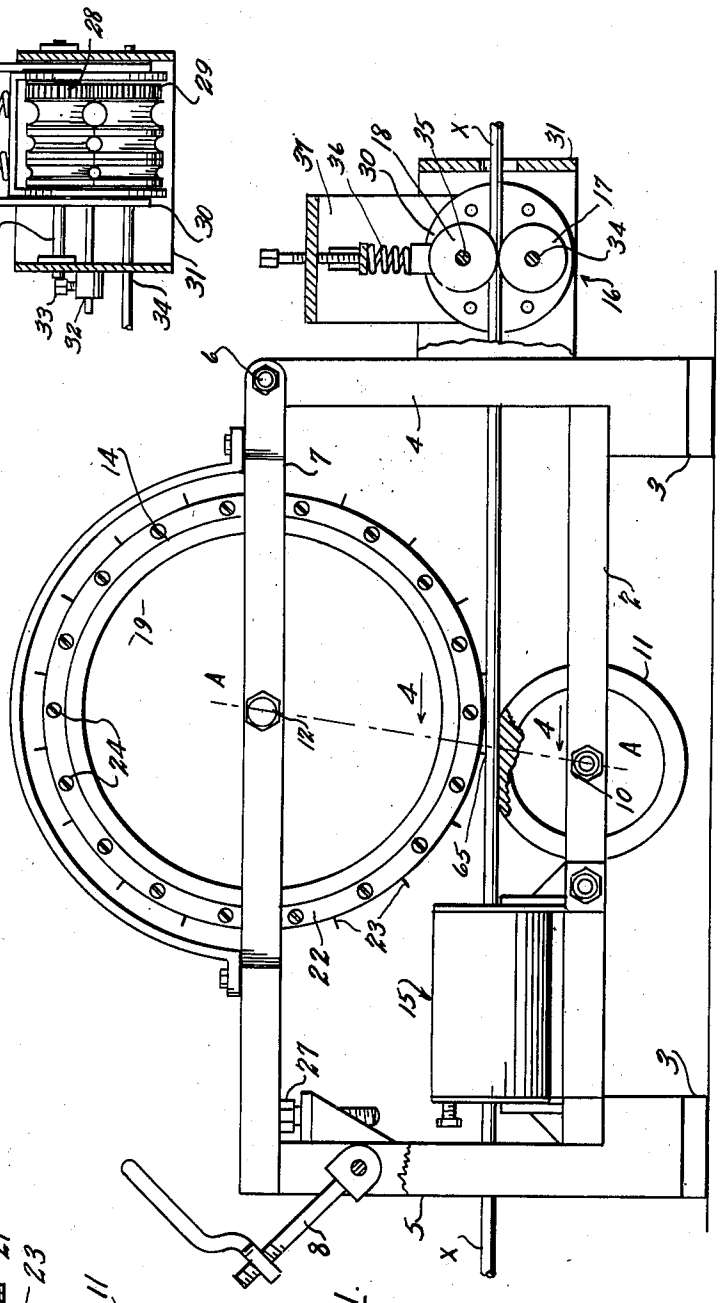


FIG. 1.

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TUBE PUNCHING MACHINE

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4 Claims. (Cl. 164—99)

This invention relates to machines for automatically punching or perforating metal tubing with a large number of equally spaced and aligned holes.

In the construction of evaporative cooler pads, and otherwise, in the arts, it is desirable to obtain straight lengths of metal tubing wherein a large number of uniformly spaced, sized and aligned holes have been punched. This metal tubing is for the most part made of copper and is supplied commercially in rolls. In removing the tubing from these rolls it inevitably becomes kinked and otherwise deformed. I have found that in order to successfully uniformly punch this tubing, it is essential to remove all bends, kinks and deformations before presenting the tubing to the punching mechanism.

I have further found that in order to obtain uniform and satisfactory results, it is necessary to draw or feed tubing through these devices, that is, first through a tube straightener and second, through a punching mechanism by mechanical means.

Therefore, the objects of my invention are—

First, to provide a machine adapted to continuously draw lengths of tubing, of comparatively soft metal, through devices whereby it is straightened and uniformly punched with holes of a desired size;

Second. to provide such a machine wherein various lengths of tubing may be punched and wherein the size of the holes punched may be easily varied;

Third, to provide such a machine wherein tubing is fed through the machine by mechanical means;

Fourth, to provide a machine of the type described wherein the mechanism may be easily and quickly adapted to different sizes of tubing; and

Fifth, to provide mechanism in conjunction with the punching mechanism for efficiently straightening the tube prior to punching.

I attain these objects by means of the devices and mechanisms illustrated in the accompanying drawing, in which

Figure 1 is a side elevation of the entire machine;

Figure 2 is a plan view of the main body thereof;

Figure 3 is a right hand end elevation of the mechanical feeding mechanism;

Figure 4 is a fragmentary section drawn on an enlarged scale of portions of the punching wheel and guide roller taken substantially on line 4—4, Figure 1;

The machine consists essentially of a base 2, including supporting feet 3, and having two upright standards 4 and 5 extending upward at each end. At the upper end of standard 4 a laterally positioned bolt 6 forms a hinge bearing for a movable punching wheel supporting frame 7. The opposite or left hand end of this support is firmly clamped into a U-shaped fork at the top of standard 5. The pivotal clamp bolt 8 is used to hold the left hand end of supporting frame 7 in place. A laterally positioned cross bolt 12 extending through the frame 7 forms a bearing for a punching wheel 14. A cross bearing bolt 10 supports a grooved roller 11 within the base 2. This may be termed a guide roller. Positioned on the longitudinal base members of the frame, near the left end is a tube guide 15, which, if desired, may be in the form of a tube straightener, and attached to the outside of the right hand standard 4 is power drive tube puller 16. It is to be understood that the tubing X to be punched is introduced at the left hand end of the device and forced left to right through the tube guide 15. From thence it is supported in the notch in the guide roller 11. Thence the tubing goes between frictional gripping rollers 17 and 18 of the power drive tube puller.

The punching wheel is composed primarily of a steel or cast iron wheel body 19, having an annular notch 20 cut in one side of its rim. (See Figure 4.) Two rings 21 and 22, fit into this notch. These rings are made of comparatively harder steel. They are adapted to grip radially extending punch pins 23, between their inner adjacent faces. These pins are positioned at predetermined equi-spaced intervals around the periphery of these rings. Radial drill holes are made at proper intervals between the adjacent faces of these rings so that each has a semi-cylindrical recess acting as a chuck face to aid in retaining the punch pins. Both rings are held together and they, in turn, in place against the flange made by notch 20, by transversely extending machine screws 24. The guide roller 11 is provided with an annular groove 26 having a U-shaped section as shown in Figure 4. The bottom of this roller is formed to fit the tube X to be punched. The sides of this U-groove are just the width of the diameter of the tube so as to permit no side play of the tube within the groove.

The depth of the punch is governed by the axial distance between wheel 14 and roller 11. This is made adjustable by a screw 27 attached

to standard 5. The top of this screw contacts the bottom of the support frame 7 when the clamp 8 is set. By raising the head of the screw the axial distance between these wheels is increased, and vice versa.

In order to accommodate various sizes of tubing, guide roller 11 is made easily interchangeable by removal of bearing bolt 10. Rollers having different sized grooves may be provided for each size tubing.

Rollers 17 and 18 of the tube puller are also provided with several registering annular grooves to accommodate various sizes of tubing. These rollers turn in opposite directions by means of the gears 28 and 29. Both rollers and gears are supported in a laterally movable frame 30, which, in turn, is supported in the housing box 31. Lateral position is maintained by a shaft 32 and set screw 33 threaded into a boss on the box 31. The shaft 34 supporting the lower rollers 17 and gear 29 is fixed, while shaft 35, supporting the upper rollers and gear 28 is vertically movable and resiliently held downward by springs 36 operative in cage 37.

In use, tubing is inserted into guide 15 which has an axial hole to receive and guide the tubing from left to right, as described, it is further inserted into the device until it rests in the groove 26 in roller 11 with the right hand end extending beyond into the tube puller 16, and within the proper sized grooves between gripping rollers 17 and 18. Thereupon, the frame 7, supporting the punching wheel 14 is brought into position and adjusted by screw 27 to obtain the depth of perforation desired. Frame 7 is then clamped and locked in place with lock bolt 8. Power may now be applied to shaft 34, to turn it in a clockwise direction as viewed in Figure 1, and this draws the tubing through the punching mechanism.

Punches 23 are preferably made of very hard steel, such as used in making phonograph needles. These are conically pointed and therefore, the depth of punch governs the size of hole punched. Steel rings 21 and 22 are needed to maintain these pins in position. The axis of guide roller 11 is positioned slightly ahead of the axis of the punching wheel 14. This is done so that the punching point, marked 65, will contact the top of the tube slightly in advance of the median line A—A, drawn between the axis of said roller and said punch wheel. Therefore, as the tube is pulled through on the guide roller, each punch point reaches the maximum depth of punch when its axis coincides with said median line. This arrangement prevents side strain on the punching points as they approach the punching position and prevent breakage.

Having now fully described my invention and explained its use, I realize that to those familiar with the art, various modifications and changes will suggest themselves, all of which, however, may well remain within the spirit of the invention, and, therefore, I wish to be limited only by the following claims.

I claim:

1. A tube punching machine, including in combination a base frame member including a laterally supported guide roller having an annular groove adapted to receive and maintain in and definitely aline in a diametrical position tubing to be punched as rolled therethrough, a punching wheel, having a plurality of peripherally alined punch pins radially extending from its rim supported on a frame adjusted relative to said base frame so that the peripheral relation of said wheel to said roller may be adjusted, said wheel and roller being positioned to turn in the same plane with said punch pins alined with the bottom of the groove in said roller, means for guiding tubing to be punched into the groove in said roller, and mechanism for forcing said tubing between said wheel and guide roller so that said punch pins successively punch said tubing as it rolls between them, the axis of said roller being positioned slightly in advance of that of said wheel toward the direction of movement of said tubing so that said punch pins will successively be alined with the center of the axes of said punch wheel and guide roller at the position of maximum depth of punch.

2. A tube punching machine including a frame having a horizontal base member, a guide roller removably mounted thereon on a transverse bearing having an anular groove on its outer rim adapted to receive and position tubing to be punched, standards extending upward from said base member having means of support for a punching wheel supporting frame, a punching wheel supporting frame hingedly supported on one of said standards and adapted to be clamped and supported on the other standard, means for clamping said punching wheel supporting frame in position on said second standard at a plurality of predetermined distances from said base member, a punching wheel having a plurality of radially extending conically pointed punch pins extending from its periphery mounted on said punching wheel supporting frame on a transverse bearing, said punching wheel being positioned and said punch pins being positioned thereon so that said pins are in a plane coinciding with a plane extending through the center of the groove on said guide roller, in combination with means for guiding tubing to be punched into the groove on said roller and mechanism for drawing said tubing through the groove in said roller while contacting the punch pins on said punching wheel.

3. A tube punching machine including a frame having a horizontal base member, a guide roller removably mounted thereon on a transverse bearing having an annular groove on its outer rim adapted to receive and position tubing to be punched, standards extending upward from said base members having means of support for a punching wheel supporting frame, a punching wheel supporting frame hingedly supported on one of said standards and adapted to be clamped and supported on the other standard, means for clamping said punching wheel supporting frame in position on said standard, a punching wheel having an annular notch cut in its rim with a flange remaining, a pair of rings of hardened steel fitted into said notch, radially extending oppositely positioned grooves cut in the adjacent faces of said rings adapted to receive radially extending punch pins, and means for forcing said rings together to clampably retain punch pins in said grooves and a plurality of conically pointed punch pins positioned in said radial grooves between said rings, said punching wheel being positioned and said punch pins being annularly aligned thereon so as to be aligned with the center of the groove of said guide roller, means coopertive with the conical points of said punch pins to vary the size of holes to be punched, including means intermediate said base member supporting said guide roller and said punch pin supporting

frame for varying the distance between these frame members whereby the distance between the axes of said guide roller and said punching wheel may be varied to effect the depth of punch of each of said conically tipped punch pins, the axis of said guide roller being positioned slightly ahead of that of said punching wheel relative to the direction of movement of tubing therebetween, in combination with means for drawing straightened lengths of tubing to be punched through the groove of said guide roller while contacting the tips of said punch pins on said punching wheel.

4. A tube punching machine including, in combination, the base frame member, a tube guide roller having an annular groove adapted to receive and aline tubing therein, an upper frame member, a punching wheel supported in said upper frame having a plurality of radially extending conically shaped punching pins, said roller and wheel being supported in said frame portions so that the punching pins in said wheel are in the same diametrical plane as the center of the groove in said roller, and said punching wheel being supported so that the periphery of said conical punching pins may be adjusted in said plane relative to the bottom of the groove in said roller.

LEO V. SEAMAN.