Nov. 2, 1926. 1,605,535

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METHOD AND APPARATUS FOR MAKING TUBES AND SIMILAR ARTICLES

Filed Nov. 24, 1923 2 Sheets-Sheet 1

Fig. 1

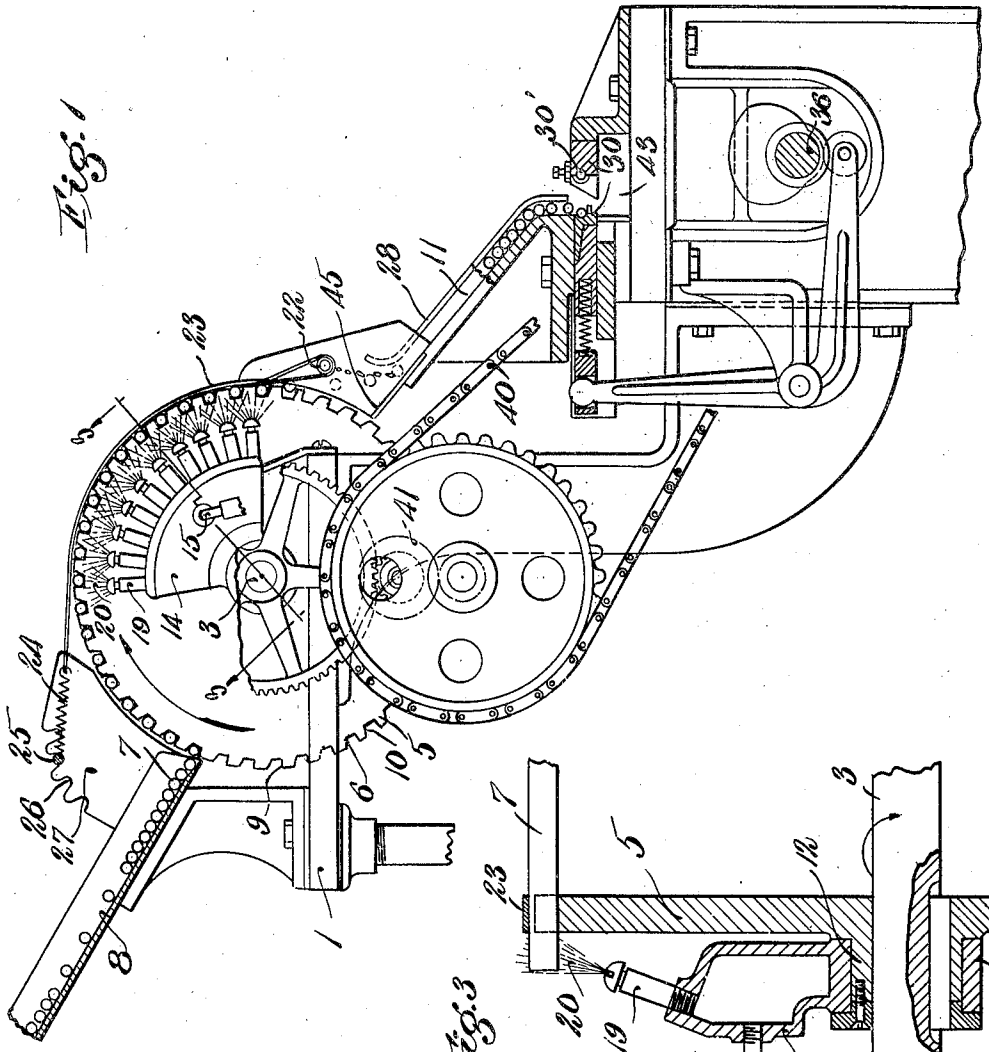


Fig. 3

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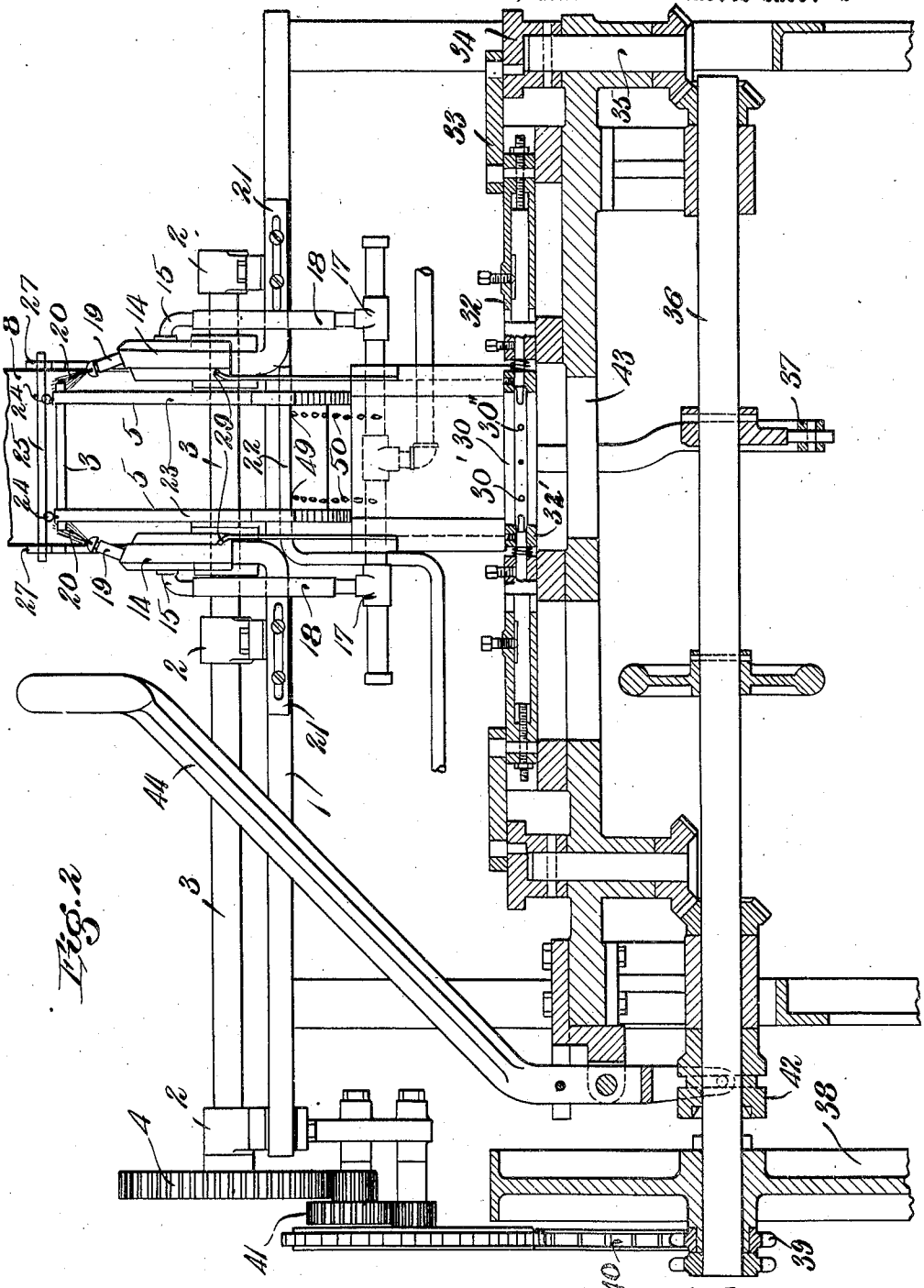


Fig. 2.

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Patented Nov. 2, 1926. 1,605,535

UNITED STATES PATENT OFFICE.

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METHOD AND APPARATUS FOR MAKING TUBES AND SIMILAR ARTICLES.

Application filed November 24, 1923. Serial No. 676,762.

The invention has to do particularly with the annealing and shaping of radiator tubes and other tubular articles; and has for its objects automatically to perform these operations in immediate succession, with rapidity, with minimum heating to those portions of the tubes which are not to be shaped, and with minimum danger of cracking the tubes or producing incipient ruptures.

By way of illustration, a concrete embodiment of the invention is shown in the accompanying drawings in which:—

Figure 1 is a side view, partly in elevation and partly in section of a complete annealing and shaping machine embodying my invention;

Fig. 2 is a front view of the annealing portion of the machine with the shaping mechanism shown in section; and

Fig. 3 is a fragmentary sectional view as on the line 3—3 of Fig. 1.

The embodiment illustrated in the drawings, includes a suitable hopper or feed supply for the work blanks, a carrier transferring individual units from the hopper, means for heating a selected portion or portions of the individual units a prescribed amount, means for subsequently cooling said units, and forming mechanism to receive and shape the blanks immediately upon the completion of the annealing operation.

The numeral 1 designates the frame of my improved machine having the bearings 2 in which is journaled the shaft 3 having on one end the drive gear 4 and having intermediately secured thereon the spaced disks or carrier members 5. These carrier members are provided with aligned sets of notches 6 to receive the tubes or other articles 7 which are to be annealed and are relatively so disposed that the end or ends which are to be particularly annealed project outwardly from the carriers or holders which serve at the one time to hold and present the end or terminal portion for annealing and to relatively shield or protect the body portion of the member 7 against the annealing heat.

The tubes to be annealed are preferably held as in the inclined magazine or hopper 8 from which they will feed by gravity into the notches 6 of the carrier. The notches have a straight side as at 9 and an inclined tooth portion as at 10 onto which the tubes 7 will readily roll from the hopper, but which incline upwardly away from the tubes when in discharge position. This allows the tubes to drop out freely and there is no tendency on the part of the carrier to draw the members back away from the second hopper slide 11 which receives the tubes from the carrier.

The disks or carrier members 5 are preferably formed with hub portions 12 suitably keyed to the shaft 3 to rotate therewith. Rotatably mounted on these hub portions are the sleeves 13 of the fuel chambers 14. These chambers are provided with inlets 15 for gas or other suitable combustible mixture connected with the supply pipe 17 as by the hose or other flexible conduits 18 and have a number of projecting burners 19. These burners are located immediately adjacent the carrier disks 5 and direct their flames 20 against the projecting end or ends of the members 7. Adjustable brackets 21 on the frame 1 engage and steady the chambers 14 on the hubs 12 so that the flames from the several burners will be best directed against the projecting ends.

To properly retain the members 7 in position on the carriers during this heating operation, I secure to the water pipe 22 or other suitable support on the frame 1 flexible metallic bands 23. These bands have at their ends the springs 24 provided with keepers 25 for selective engagement in the notches 26 of the plates 27 on the frame 1, this adjustment serving to vary the pressure of the bands 23 against the articles 7. The diameter of the articles 7 is preferably such as to extend just above the periphery of the notched carriers 5 into sliding engagement with the clamping bands 23. The bands at their lower ends incline outward away from the carriers so that articles 7 will be released to drop out of the carriers into the upper end of the receiving trough or hopper member 11. This second hopper has the top guide 28 to retain the members 7 in a single layer or row and has the lateral guide portions 29 to contact with the ends of the tubes or members 7 and to line them up in the hopper 11 for discharge into the shaping mechanism.

The pipe member 22 in addition to serving as a point of attachment for the bands 23 is drilled or perforated as at the points 49 to discharge a spray of water 50 into the upper end of the hopper 11, the spray com-

ing out in such manner as to first strike the body of the tubes near their heated end portions as they drop out of the carrier. There is a sufficient volume of water supplied to produce a film in the bottom of the hopper 11 properly chilling the members 7. This operation makes use of the well known principle that copper or similar material is annealed by heating and then suddenly cooling the work. By causing the spray to strike just the warm central body portion and extend thence outward to the heated ends in place of striking directly against the heated ends, tendency toward distortion of the tubes is avoided.

The shaping mechanism comprises dies 30 having opposed semi-cylindrical recesses 30′ provided with interior protuberances 30″ for indenting the periphery of the tubes, the dies separating to receive a tube as shown in Fig. 1 and then moving together The end forming dies comprise plungers 32 movable into the ends of the tubes to expand the ends into hexagonal or other polygonal shape, the plungers carrying spring-pressed formers 32′ which have complemental polygonal walls confining the expanded ends. These plungers 32 are operated by the links 33 and eccentrics 34 driven through the shafts 35 and suitable gearing from the main drive shaft 36 which also has connections 37 for controlling the dies 30.

Loosely mounted on the shaft 36 is the belt wheel 38 having a sprocket 39 connected by the drive chain 40 and gearing 41 with the drive gear 4 of the shaft 3, the wheel 38 being adapted for operative connection with the shaft 36 by the manually operable clutch 42. This shaping mechanism is described and claimd per se in Patent No. 1,514,589, issued November 4, 1924, filed May 5, 1920, and further description is unnecessary herein.

In operation, a plurality of tubes are placed in the hopper 8 from which individual tubes are carried upward and around by the carriers 5 beneath the bands 23 past the several heating burners 19, after which in their heated condition they are discharged from the carrier into the second hopper 11, being cooled during the discharge and while within the hopper 11 by spray of water to anneal them for the succeeding operation. The dies 30 are disposed immediately adjacent the lower end of the hopper 11 and as reciprocated by the connections 37 grasp the lowermost tube 7 and bring it into alignment with the plungers 32 for shaping, after which the shaped tube drops down through the discharge trap 43.

In the event of sticking or other difficulty in connection with the formation of the parts 7 the operator may grasp the clutch shifter 44 disconnecting the shaft 36 from the drive 38 to stop the shaping mechanism. It is essential however that the annealing portion of the mechanism continue to operate since if this were stopped without the heating burners being first shut off the heat would tend to melt the ends of the members 7, thus not only destroying said members but also involving liability of serious damage to the machine. To take care of this and provide egress for the members 7 in excess of the quantity which can be held within the hopper or magazine 11, the upper end of its base adjacent the conveyor is cut away as at 45 so that when the members 7 begin to pile up the extra ones may drop through into a suitable container. In this manner continuous performance of the annealing operation in a combined annealing and shaping machine is insured irrespective of any necessary independent starting or stopping of the shaping portion of the machine.

I claim:

1. The method of making tubular articles which comprises feeding tube sections along a predetermined path, alternately heating and cooling portions of the sections in transit along said path, and at an advanced position along said path shaping said portions of the sections when cooled.

2. The method of making radiator tubes for honey-comb assemblage which comprises feeding tube sections along a predetermined path with the tube sections extending transversely of the path, heating the ends of the sections in transit along said path, and with the sections still extending as aforesaid subsequently expanding said ends into polygonal shape adapted to said assemblage.

3. The method of making radiator tubes for honey-comb assemblage which comprises feeding tube sections along a predetermined path with the tube sections extending transversely of the path, heating the ends of the sections in transit along said path, then cooling the sections, and with the sections still extending as aforesaid subsequently expanding said ends into polygonal shape adapted to said assemblage.

4. Apparatus for making tubular articles which comprises a carrier having transverse recesses to receive tube sections with at least one end of the sections projecting therefrom, a heater arranged to heat the projecting ends of the section while in the carrier, a shaper associated with the carrier for subsequently shaping said ends, and means for automatically transferring the sections from the carrier to the shaper.

5. A machine of the character described including a carrier and a shaper associated therewith, said carrier having recesses for receiving elongate units in parallel relation thereupon, means for feeding the units to the carrier, means adjacent the carrier for heating a localized area of each of the units,

and means for receiving and guiding the units in parallel position to the shaper for shaping the previously heated areas of the units.

6. A machine of the character described including a carrier having means for engaging the work intermediate its ends, means adjacent the carrier for heating a projecting end portion of the work, means to receive the heated work as discharged from the carrier and means for directing a cooling spray on the discharged work.

7. A machine of the character described including a rotary conveyor having a plurality of blank receiving recesses in its periphery, means for supplying blanks to said recesses, a tension band overlying a portion of the periphery of the conveyor for retaining the blanks in the recesses, a heater unit disposed adjacent the conveyor for heating the blanks, and a spraying device adjacent the conveyor for spraying the articles.

8. A machine of the character described including a rotary conveyor having a plurality of blank receiving recesses in its periphery, means for retaining the blanks in the recesses, a heater unit disposed adjacent the conveyor for heating the blanks, a spraying device adjacent the conveyor for spraying the articles, and a receiving hopper disposed adjacent the conveyor having a portion projecting into the path of the articles as discharged therefrom, said receiving hopper having a cutaway portion for discharge of excess work blanks.

9. The process of preparing work blanks for shaping consisting in protecting the body portion of said blanks, subjecting the exposed terminal portion to a heating action and subsequently subjecting the blank to a chilling action by directing a spray toward the previously protected body portion thereof.

Signed by me at Lowell, Massachusetts, this 21st day of November, 1923.

GEO. A. FOISY.