Oct. 23, 1951 E. LEHMANN 2,572,164

COLLAPSIBLE TUBE HANDLING APPARATUS

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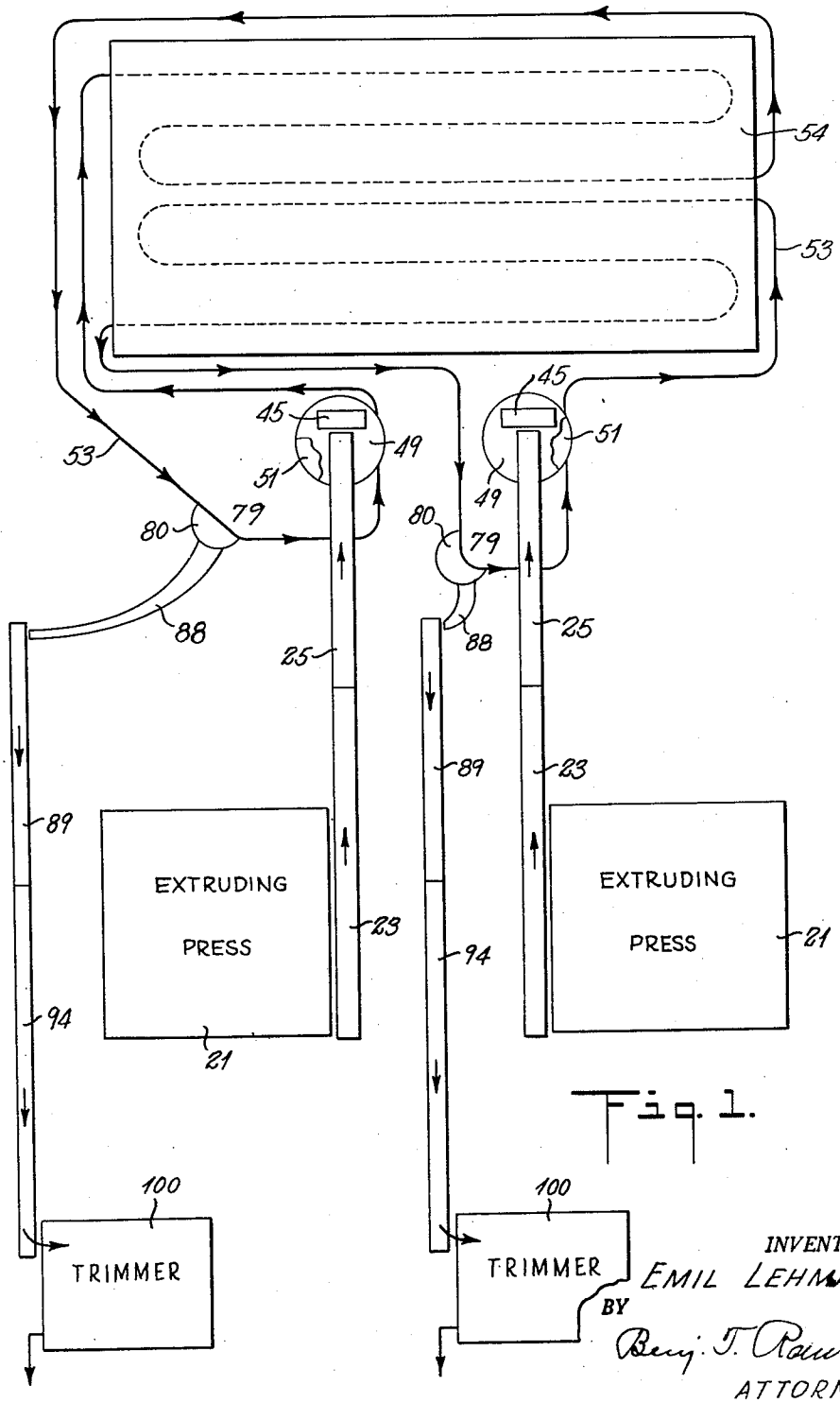

Fig. 1.

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COLLAPSIBLE TUBE HANDLING APPARATUS

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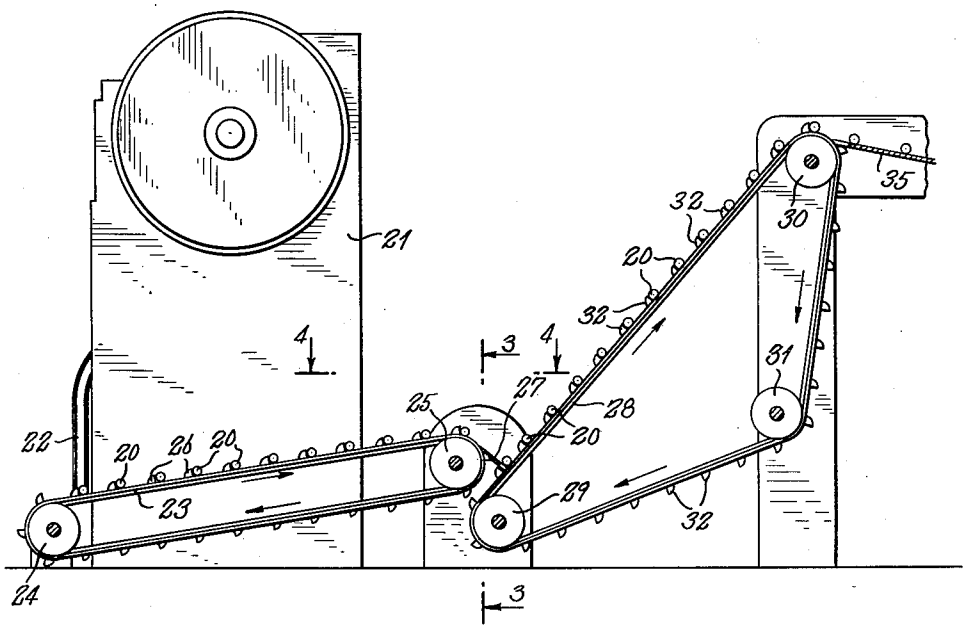

Fig. 2.

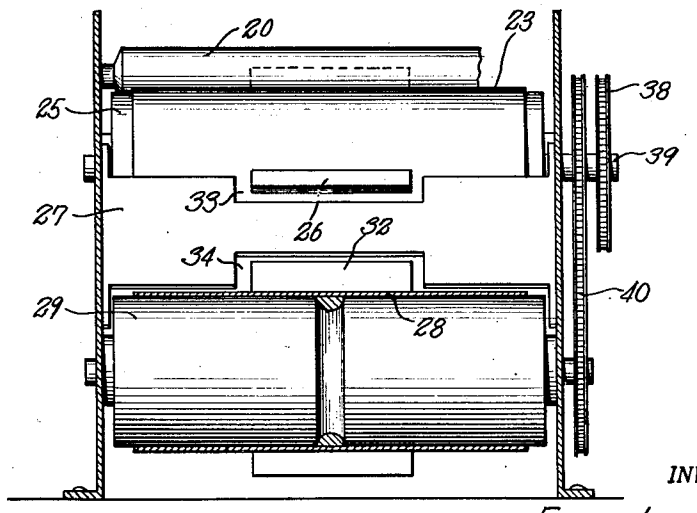

Fig. 3.

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COLLAPSIBLE TUBE HANDLING APPARATUS

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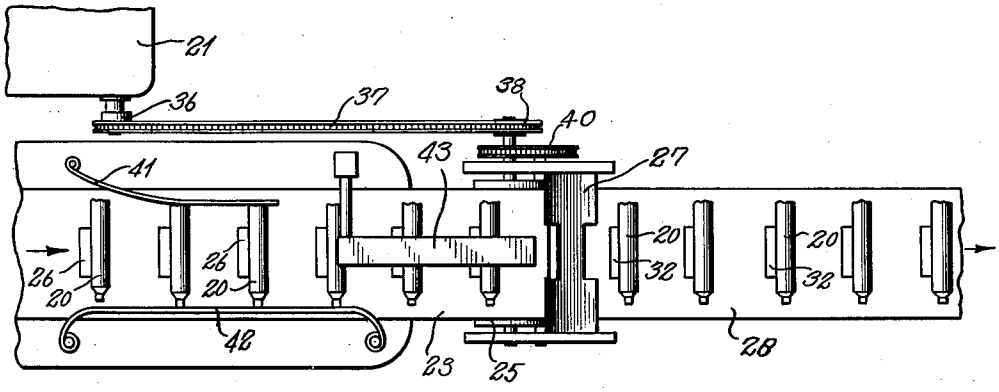

Fig. 4.

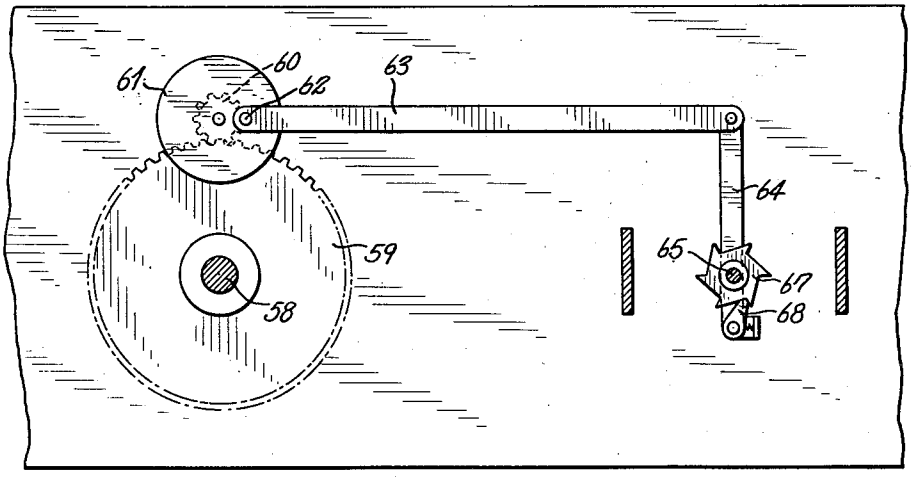

Fig. 5.

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COLLAPSIBLE TUBE HANDLING APPARATUS

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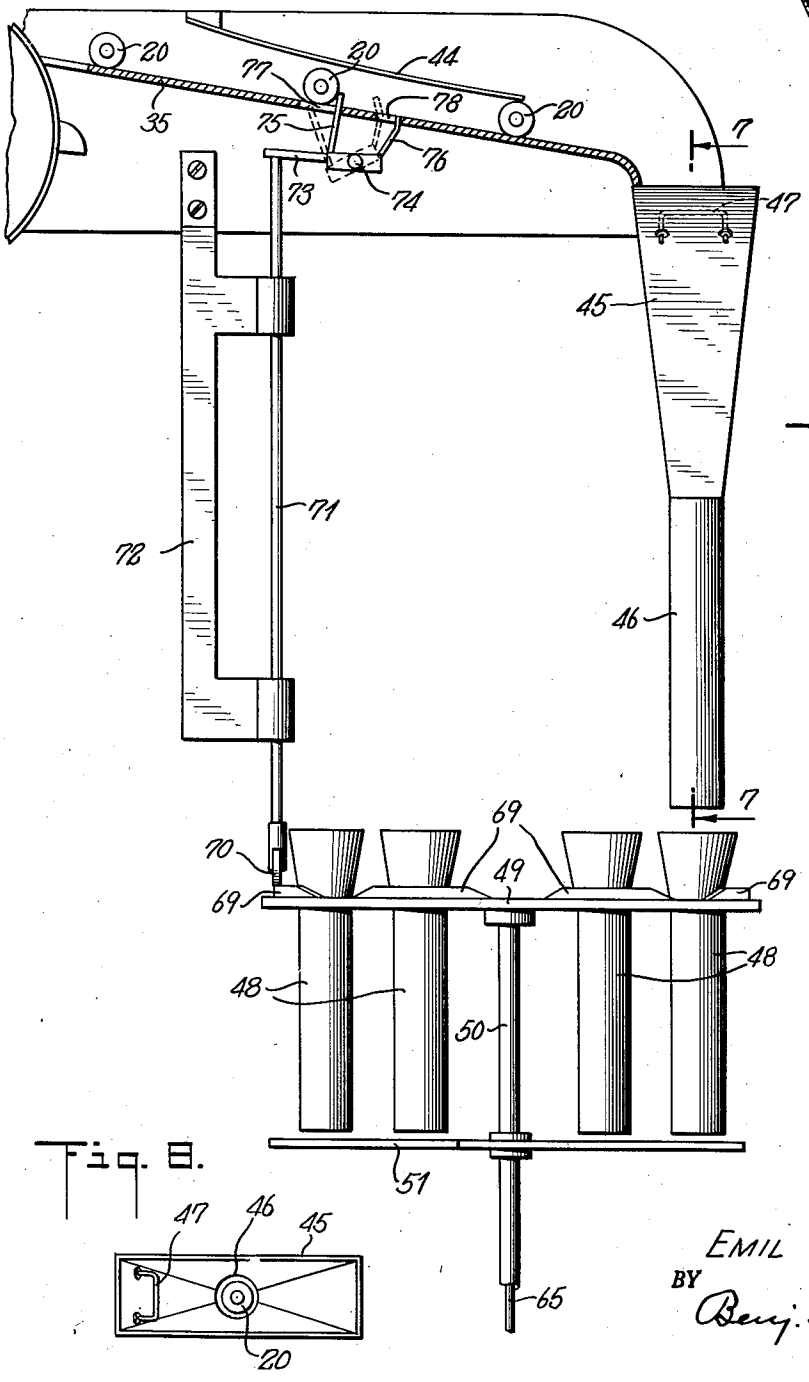
Fig. 6.



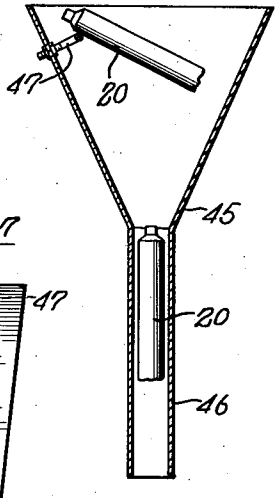


Fig. 7.

Fig. 8.

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COLLAPSIBLE TUBE HANDLING APPARATUS

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Fig. 9.

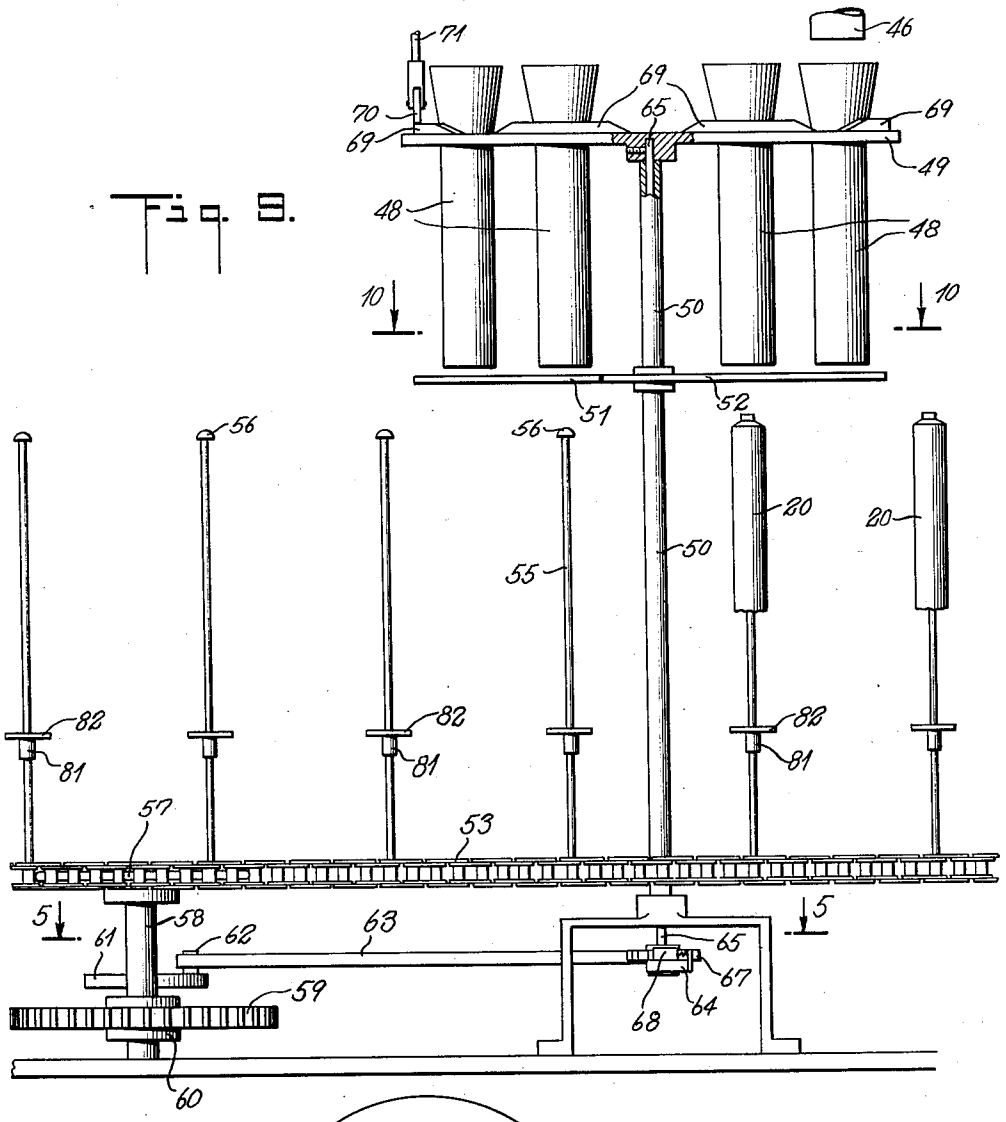

Fig. 10.

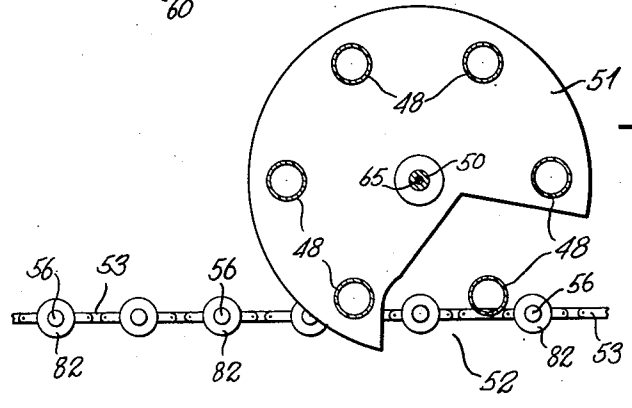

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Fig. 11.

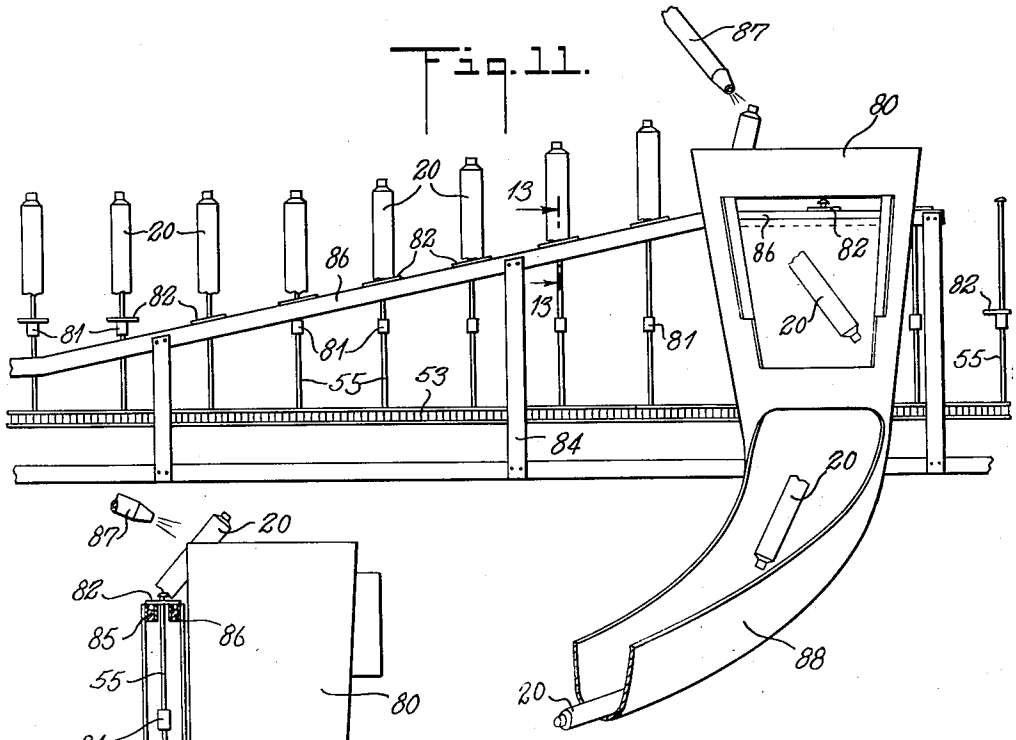

Fig. 12.

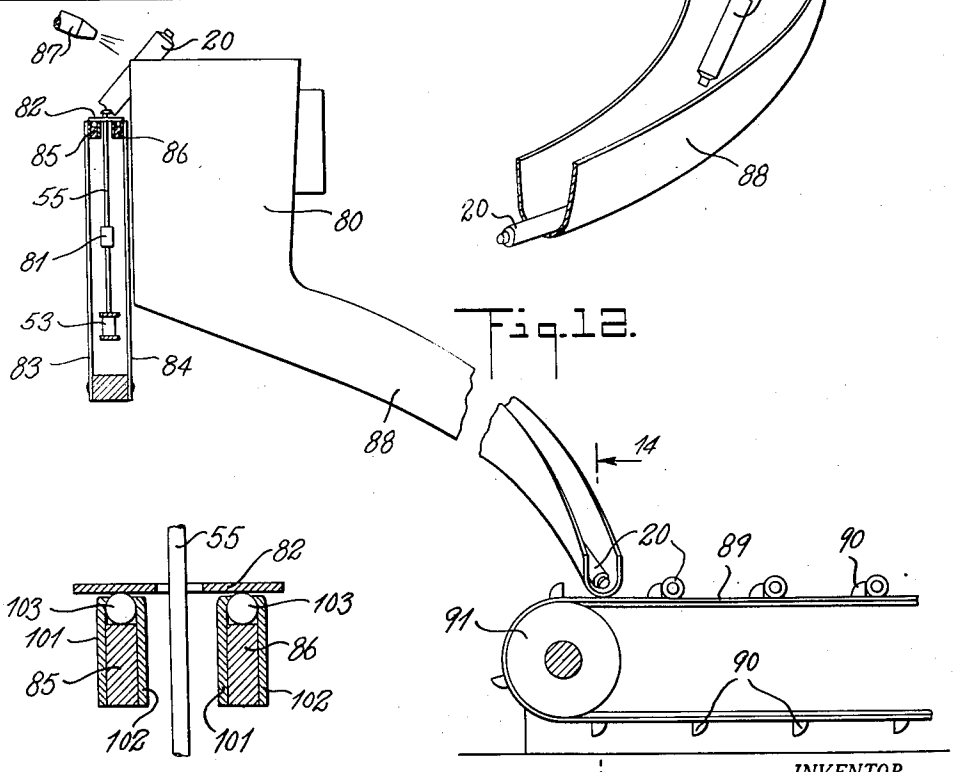

Fig. 13.

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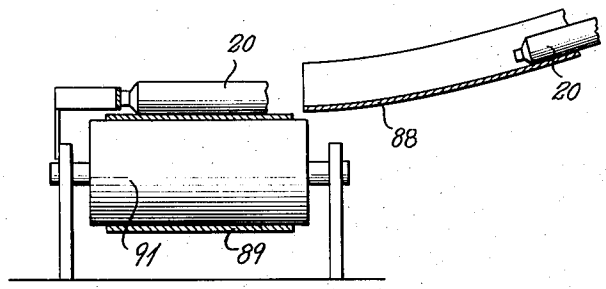

Fig. 14.

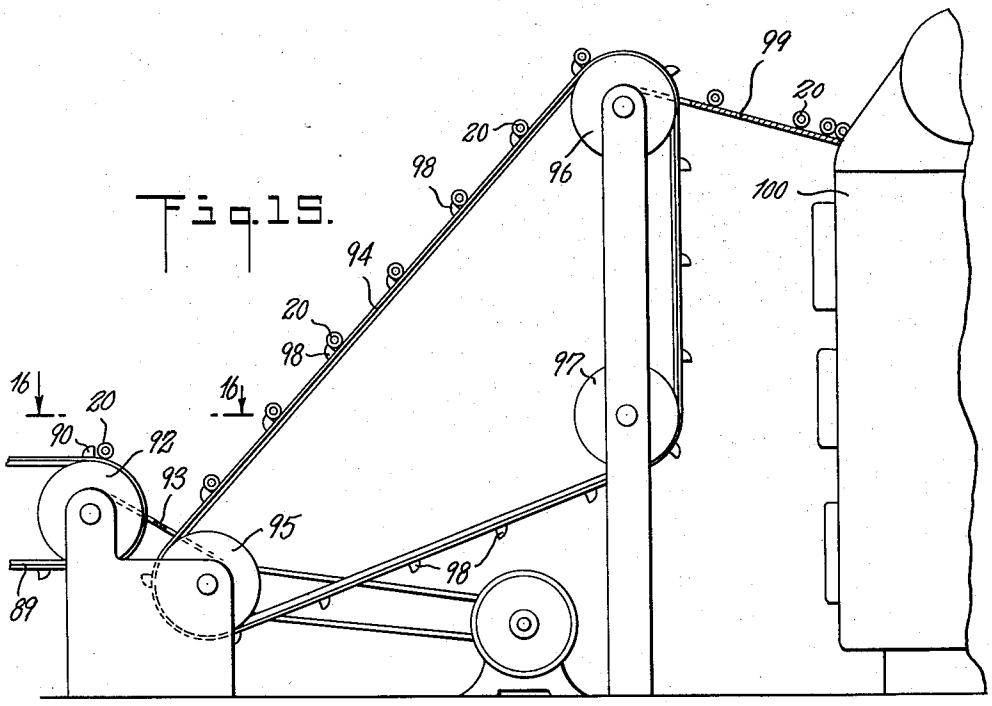

Fig. 15.

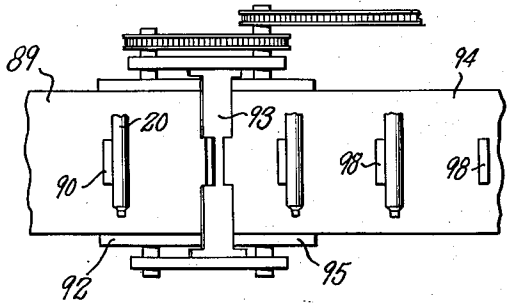

Fig. 16.

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Patented Oct. 23, 1951

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UNITED STATES PATENT OFFICE

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COLLAPSIBLE TUBE HANDLING APPARATUS

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Application June 28, 1947, Serial No. 757,815

9 Claims. (Cl. 198—26)

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My present invention relates to apparatus for handling collapsible tubes and more particularly in annealing tubes such as those made of aluminum.

When aluminum is extruded into collapsible tubes it becomes hard and stiff and therefore requires subsequent softening or annealing to give it the properties required in a collapsible tube. The walls of the extruded tubes are, however, thin and correspondingly fragile and are not suited to withstand stresses applied either radially or longitudinally.

In my present invention the tubes to be annealed are placed on upright pins or rods mounted at spaced intervals on an endless chain which passes below an annealing furnace having slots through which the passing rods project. The tubes suspended individually on the upper ends of the rods are thereby carried to and through the furnace.

As the tubes are extruded they are fed by the extruding means through a chute which brings them to a horizontal position and must be turned to a vertical position to be placed on the chain rods.

For this purpose the tubes are carried by an endless belt from the chute to a funnel, the upper end of which is elongated horizontally to receive a tube in its horizontal position and which contains a tripping bar positioned transversely below the tube near its shoulder end so that the lower open end turns downwardly to upright position as the tube falls through the chute. Each tube is then received in one of a series of receivers mounted on a turn table which is moved in timed synchronism with the chain to bring each tube immediately over a supporting rod and to drop it onto the rod. This places the tube in position to enter the annealing oven.

After the tubes have passed through the annealing oven it is necessary to return them to their horizontal position. For this purpose each supporting rod is provided with a supporting collar on which loosely rests a perforated disk or washer. After emerging from the annealing oven or furnace the upright rods or posts of the chain pass between a pair of inclines so positioned that as the chain progresses the perforated disk or washer rests on the incline and is elevated upwardly relatively to the chain and the tube until the lower end of the tube is near the upper end of its respective rod. At this point a jet or blast of air directed at the tube blows it sidewise and inverts it downwardly to fall into a funnel and guide chute which brings it to a horizontal

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position and passes it on a conveyor for transfer onto a trimming machine.

Various features of the invention are illustrated by way of example in the accompanying drawings in which—

Fig. 1 is a diagrammatic plan view of the apparatus showing the relative positions of the extruding press, annealing oven and trimming machine;

Fig. 2 is a side view of a conveyor mechanism leading from the extruding machine;

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

Fig. 4 is a plan view of a part of the conveyor mechanism on the line 4—4 of Fig. 2;

Fig. 5 is a plan view of a ratchet device for driving the turn table intermittently;

Fig. 6 is an elevation view of the apparatus for turning the tube and delivering it to the turn table;

Fig. 7 is a view of the mechanism on the line 7—7 of Fig. 6;

Fig. 8 is a plan view of the funnel of Figs. 6 and 7;

Fig. 9 is a side view of the turn table and a portion of the conveyor chain and of the drive for the turn table;

Fig. 10 is a sectional view of the turn table taken on line 10—10 of Fig. 9;

Fig. 11 is an elevation of the incline and mechanism for removing the tubes from the conveyor chain after annealing;

Fig. 12 is an elevation taken at right angles to that of Fig. 11;

Fig. 13 is a vertical section taken on the line 13—13 of Fig. 11;

Fig. 14 is a vertical section taken on the line 14—14 of Fig. 12;

Fig. 15 is a side elevation, and Fig. 16 is a plan of a part of a conveyor mechanism leading to the trimming machine.

In the embodiment shown in the accompanying drawing, tubes 20 formed in an extruding press, shown at 21, slide in succession neck foremost down a chute 22, the lower end of which is substantially horizontal and in line with the upper surface of an endless belt 23 passing about pulleys 24 and 25 and provided with crosswise cleats 26.

The belt 23 is timed relative to the extruding machine 21 so that a tube will slide down the chute 22 and onto the belt 23 between a pair of successive cleats and will, therefore, rest on the cleats.

Immediately below the upper end of the belt 23

as it passes about the pulley 25 is an inclined plate 27, Figs. 2 and 3, the upper end of which intersects or is tangent to the periphery of the belt 23 so as to receive the tubes 20 as they pass over the pulley 25.

At the lower end of the plate 27 is a second conveyor belt 28 supported about three spaced pulleys 29, 30 and 31 and provided with crosswise cleats 32. The plate 27 has suitable cut outs 33 and 34 at its upper and lower ends respectively to permit the passage of cleats 26 and 32.

The conveyor belt 28 carries the tubes upwardly and over the upper pulley 30 to a receiving plate 35. The belts are driven from a sprocket 36 on the extruding machine 21 and a chain 37 trained over a sprocket 38 fixed on a shaft 39 on which the pulley 25 is mounted. The pulley 29 is driven from the shaft 39 by means of a sprocket and chain drive 40 as shown in Figs. 3 and 4.

The drive is so proportioned that the cleats of the belts will move at the same time intervals depositing a tube from each cleat of the belt 23 onto a cleat of the belt 28. The tubes are accordingly placed in timed succession for deposit on the plate 35. The tubes are positioned on the belts with their tops or necks aligned by means of a spring 41 which presses them lightly against a horizontal guide 42 immediately above or near one edge of the conveyor belt 23.

The tubes may also be lightly pressed onto the belt 23 by means of a horizontal spring 43 extending immediately above the belt. The tubes are, therefore, delivered onto the plate 27 and to plate 35 in correctly aligned position. As each tube is deposited on the plate 35 it rolls downwardly under a light guide leaf 44 so spaced as to prevent any piling up of the tubes.

At the lower end of the plate 35 the tube rolls into the upper end of an elongated funnel 45 having a downwardly extending spout or chute 46 of cylindrical cross section. As the tube enters the upwardly elongated or flaring end of the funnel 45 it is supported near its shoulder end by a trip bar 47 which holds this end from falling while permitting the lower end to turn downwardly, as indicated in Fig. 7, until the tube has attained approximately upright position, thereupon the tube falls downwardly through the chute 46 into one of a series of cylindrical receivers 48 mounted on a turn table 49 about a central hollow stationary shaft 50 of the turn table. The lower ends of the tubes rest on a stationary plate 51 supported by the shaft 50 below the lower open end of the receivers 48.

The turn table 49 is intermittently rotated so as to bring one of the receivers 48 immediately below the funnel chute 46 at the time a tube 20 is dropped therethrough so that the tube will come directly into the receiver and will rest with its lower open end on the fixed plate 51. As the turn table 49 rotates about the center of the shaft 50 each receiver 48 is in turn brought over a cut out portion 52, Fig. 10, of the plate and drops downwardly.

An endless chain 53 for conveying the tubes into and through and out of an annealing furnace 54, Fig. 1, (two such chains being shown by way of example, only one of which is described), is arranged to pass beneath the cut out part 52 of the plate 51.

The chain 53 is provided with upwardly projecting posts or rods 55 at uniformly spaced distances and the speed of the chain is so timed relative to the speed of rotation of the turn table 49 that the posts come in succession beneath the space 52 at the same time interval that a new receiver 48 comes into position to discharge its tube. A tube, therefore, falls downwardly over the upward part of the post 55 until its shoulder rests upon and is supported by the upper end of the rod, which is preferably provided with a widened part or head 56.

The chain 53 is trained about supporting sprockets such as the sprocket 57, Fig. 9, supported on a vertical shaft 58 on which is fixed a driving gear 59 which is driven at a speed in proportion to that of the extruding machine so that a post 55 will advance one space by the time a tube is extruded and discharged to the conveyor mechanism.

The gear 59 is preferably continuously driven and gives a continuous linear speed to the chain 53. An intermittent or step by step rotation is transmitted from the gear to the turn table 49 by means of a spur gear 60, Figs. 5 and 9, meshing with the gear 59 and carrying a crank disk 61.

Attached to a pin 62 on the crank disk 61 is a link 63 joined at its opposite end to a crank arm 64 and rocking freely on a shaft 65 which extends upwardly to and is pinned to the turn table 49.

Fixed on and rotatable with the shaft 65 is a ratchet wheel 67, Figs. 5 and 9, which is engaged by a pawl 68 mounted on the rod 64, with each rotation of the disk 61, therefore, the ratchet wheel 67 may be advanced one notch and the turn table 49 rotated a distance equal to that between the successive receivers 48, thus bringing a new receiver above a new post at the proper timed sequence.

To admit the tubes 20 to the funnel 45 at the same rate of speed at which they are supplied from the latter to the receivers and thus to avoid jamming, a stop and release mechanism is provided on the supply table 35 and is operated from the turn table 49. For this purpose a number of cams 69 are mounted on the upper surface of the turn table 49, there being one for each receiver.

A roller 70 supported on the lower end of a cam rod 71 which is slidably mounted in a bracket 72 depending from the table 35 is arranged to ride on the successive cams and to lift the rod 71 for each cam surface 69.

The upper end of the rod 71 bears against an arm of a tilting lever 73 rocking on a horizontal shaft or trunnion 74. The lever 73 also has a pair of arms 75 and 76 on opposite sides of the trunnion 74 which extend through slots 77 and 78 respectively and which are alternately swung to and from the position shown in full and broken lines.

When the lever 73 is in the position shown in full lines the tube 20 rolling down the inclined plate 35 will be stopped by the arm 75. As the lever 73 rocks to the broken line position the arm 75 passing downwardly in the slot releases the tube which then rolls until it is stopped by the arm 76 which is now in its uppermost position. As the lever 73 rocks back to its full line position the arm 76 is lowered out of the path of the tube and the arm 75 swings forwardly to give the tube a slight impulse downwardly. At each rocking of the lever 73, therefore, a tube is released to roll into the funnel 45 and thence to be deposited on one of the posts 55 to be carried into the annealing furnace.

After the tubes have passed through the an-

nealing furnace they are carried by the chain to the position indicated at 79, Fig. 1.

To transfer the tubes from the chain to the trimming machine in proper position to be trimmed and processed by the latter, they are lifted free of the chain and turned and fed top downwardly into a funnel 80, Figs. 11 and 12. To lift the tubes 20 from their respective posts 55 each post is provided with a fixed collar 81 somewhat below the lower end of the tube and with an annular plate or washer 82 which is slidable vertically on the post.

As the chain approaches the funnel 80 it passes between spaced supports 83 and 84 which at their upper ends carry upwardly inclined rails 85 and 86 which extend upwardly from a level below that of the collar 81 to a level near the upper edge of the funnel 80 and are spaced sufficiently close to engage the washers 82 which therefore ride upwardly on the rail as shown in Fig. 11 to a position near the upper ends of the posts 55.

As these washers ride upwardly on the posts they engage and lift the tube 20 to the position shown in Fig. 12. As the tubes reach the upper level of the rails 85 and 86 their upper ends pass in front of a blast of air directed from a nozzle 87 which topples the tubes head foremost into the funnel 80 from which they drop through an inclined chute 88 terminating in approximately horizontal position above a conveyor belt 89 so as to deposit the tubes transversely of the belt so that they may be engaged by one of a succession of transverse cleats 90.

The belt 89 passes about an idler drum 91, Fig. 12, and a driven drum 92, Fig. 15, and in passing over the drum 92 deposits a tube on an inclined plate 93 (similar to plate 27 of Fig. 3) which in turn delivers the tubes to an upwardly inclined belt 94 trained about a driven pulley 95 and two idler pullevs 96 and 97. The belt is provided with transverse cleats 98 which support and carry the tubes upwardly and over the pulley 96. As the tubes pass over the pulley 96 they are delivered onto an inclined delivery plate 99 which in turn delivers them to the trimmer 100.

In order to facilitate the sliding of the washers 82 on the rails 85 and 86 the upper ends of the latter are provided with side plates 101 and 102 to form an upwardly opening channel in which are spaced ball bearings 103 on which the successive washers 82 ride smoothly. In this way the tubes are lifted with a minimum vibration to a height that they may be blown sidewise and slid foremost into the funnel 80.

Through the above invention the tubes as they are extruded from the extruding machine are automatically placed on the chain in position to pass through the annealing furnace and as they emerge from the annealing furnace are removed from the chain and placed in position for action by the trimming machine.

Through this apparatus there is no necessity for touching the tubes which are hot when they are delivered by the extruding machine, due to the mechanical working they have undergone, and also when delivered from the annealing furnace.

Also the invention avoids the necessity to grip the tubes or apply any pressure to them that might distort their thin walls.

Having described my invention, what I claim is:

1. Apparatus for placing collapsible tubes on upright transfer pins which comprises, an inclined table over which tubes may roll in succession, a funnel having an elongated end extending transversely of said table at the lower end thereof and having a tripping bar in the upper part of said funnel to engage the upper end of each tube and to permit the lower end to fall downwardly to bring said tube to upright position, a turn table below said funnel having receivers positioned to align successively with the delivery end of said funnel as said turn table is rotated, a stationary plate below said receivers having a cut away portion, a chain having upwardly extending pins in spaced intervals positioned to pass in succession below the cut away portion of said plate.

2. The apparatus of claim 1 which also comprises a timing means between said chain and said turn table to bring said receivers and said pins synchronously to said cut away portion of said plate.

3. The apparatus of claim 2 which also comprises a feeding means to permit said tubes to roll singly over said table to said funnel in timed sequence synchronized with said turn table.

4. The apparatus of claim 2 which also comprises a continuous drive for said chain and a ratchet and pawl driven from said chain drive to actuate said turn table intermittently.

5. The apparatus of claim 2 which also comprises a rocker having arms that move alternately in spaced positions into and out of the path of tubes rolling down said table and cams mounted on said turn table to rock said rocker synchronously with the movement of said receivers.

6. Apparatus for mounting collapsible tubes in upright position on a conveyor which comprises, a funnel having a transverse trip bar at its upper end, means for supplying collapsible tubes in horizontal position to said funnel in position to engage said tubes near one end to permit said tubes to turn downwardly to upright position through a funnel, a receiver for said tubes below said funnel and a conveyor mechanism below said receiver and means for releasing said tubes from said receiver to said conveyor in timed synchronism with the movement of said conveyor.

7. Apparatus for feeding tubes to a conveyor mechanism which comprises, a conveyor having spaced elements to receive said tubes, a continuous drive for said conveyor, a receiver to receive and hold said tubes in upright position, means to deliver tubes intermittently and in timed sequence from said receiver to the receiving elements of said conveyor, a funnel above and delivering to said receiver, mean for supplying tubes in horizontal position in timed sequence to said funnel, said funnel having a trip element to engage said tubes near one end to cause said tubes to turn downwardly to upright position to said funnel.

8. Apparatus for feeding and conveying collapsible tubes which comprises, an inclined table over which said tubes may roll horizontally in succession, means for supplying tubes to said table, a rocker having a pair of arms positioned to project alternately and in spaced position on said table to permit a tube to pass with each rocking of said rocker, a funnel positioned to receive tubes from said inclined table and having a trip element to engage said tube near one end to permit said tube to fall to upright position in said funnel, a conveyor below said funnel and having tube receiving and carrying elements at spaced intervals and receivers movable in succession to a position below said funnel to receive tubes in

upright position and to a position above the tube receiving elements of said conveyor.

9. The apparatus of claim 8 having a drive for said conveyor and means driven from said drive to move said receivers intermittently in timed sequence from said funnel to position to deliver tubes to said conveyor elements.

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