United States Patent

Hedrich et al.

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[54] FLATTENING AND TAKE-AWAY DEVICE FOR BLOWN TUBING

[72] Inventors: **Winfried Hedrich**, Natrup-Hagen; **Hartmut Upmeier**, Tecklenburg, both of Germany

[73] Assignee: **Windmoller & Holscher**, Westphalia, Germany

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** ..... **93/1 R**, 18/45, 226/197

[51] **Int. Cl.** **B31d**

[58] **Field of Search** 93/1; 18/45; 226/197, 199

[56] **References Cited**

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Primary Examiner—Bernard Stickney

Attorney—Fleit, Gipple & Jacobson

[57] **ABSTRACT**

The device serves for flattening and taking away blown tubing, which has been made from plastics material with the aid of a stationary blow head for tubing. The flattening plates and the take-away rolls perform a rotational oscillation about the axis of the incoming tubing. The take-away rolls are succeeded by a pair of deflecting rolls, which have axes of rotation that are parallel to the axis of rotation of the take-away device. The flattened tubing is fed from the take-away rolls to the pair of deflecting rolls around a deflecting rod, which rotates with the take-away rolls about the axis of rotation of the take-away device and which extends at an angle of 45° to the axis of the tubing. Stationary guide elements for the tubing succeed the pair of deflecting rolls. The deflecting rod is disposed directly over the take-away rolls. The pair of deflecting rolls are mounted on the oscillating take-away device and disposed laterally beside the deflecting rod.

4 Claims, 4 Drawing Figures

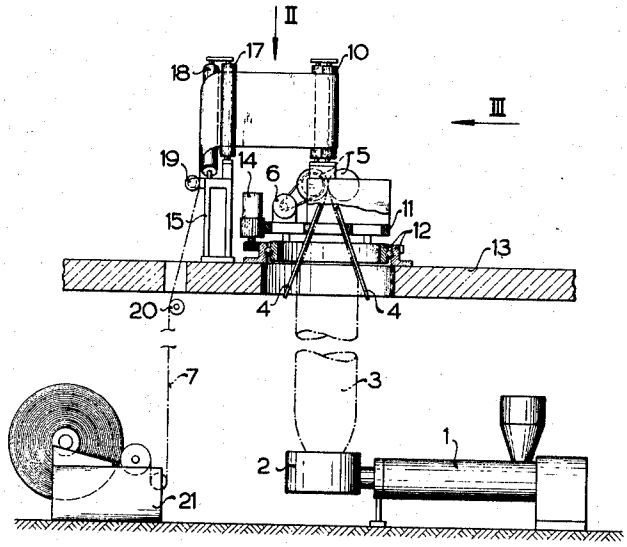


FIG.1

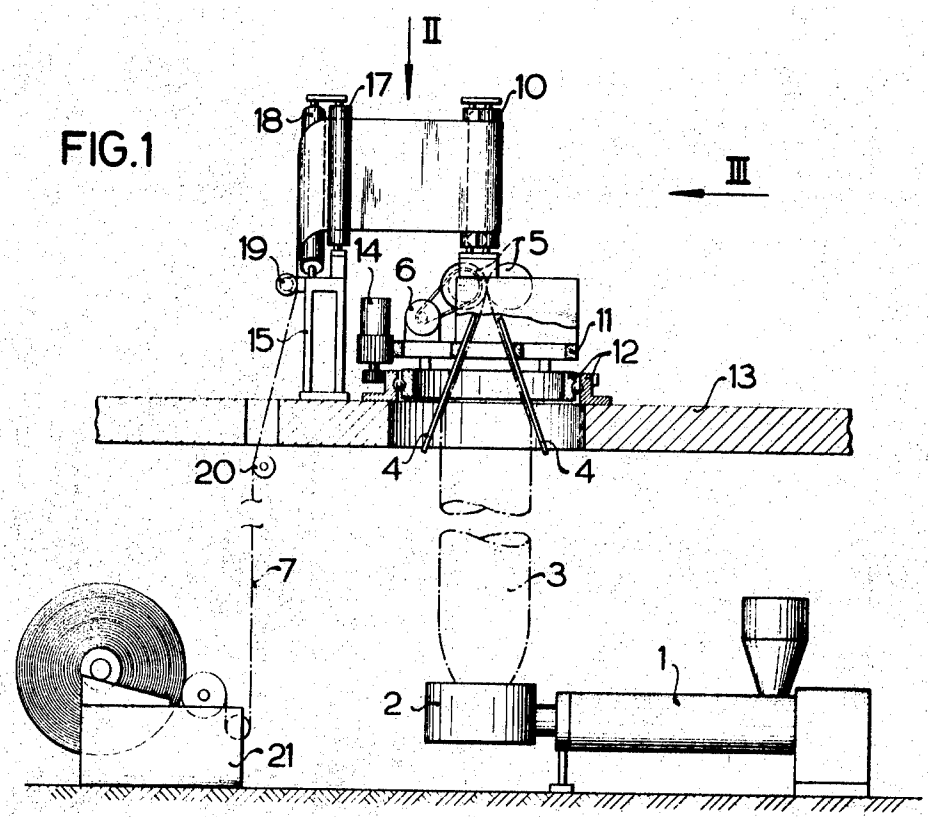


FIG.2

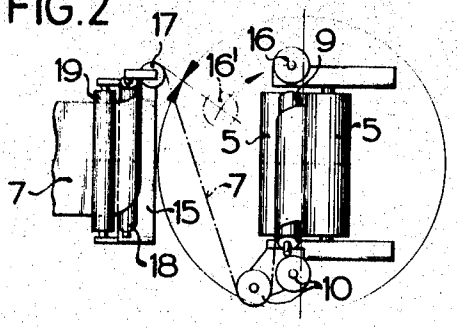


FIG.3

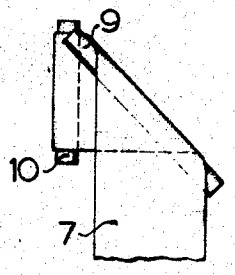
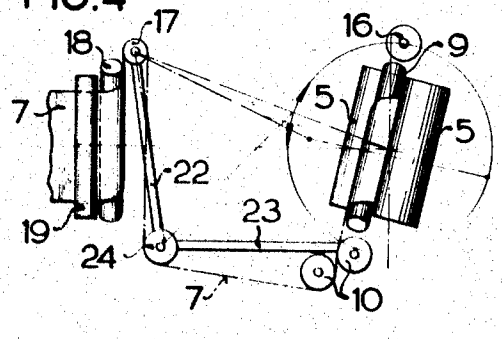


FIG.4



INVENTORS
Hartmut UPMEIER
Winfried HEDRICH
By
Fleit, Gipple & Jacobson
their ATTORNEYS

FLATTENING AND TAKE-AWAY DEVICE FOR BLOWN TUBING

This invention relates to a flattening and take-away device for blown tubing, which has been made from plastics material with the aid of a stationary blow head for tubing, in which device the flattening plates and the take-away rolls perform a rotational oscillation about the axis of the incoming tubing, the take-away rolls are succeeded by two juxtaposed deflecting rolls, which have stationary axes and define a nip extending in the direction of the axis of rotation of the take-away device, and the flattened tubing is fed to said deflecting rolls from said take-away rolls via a deflecting rod, which rotates with the take-away rolls about the axis of rotation of the take-away device and extends laterally from the axis of rotation at an angle of 45° to the axis of the tubing, and via deflecting rolls which respectively precede and succeed the deflecting rod, the first of said deflecting rolls being parallel to the take-away rolls and the second being parallel to the stationary central deflecting rolls. As a result of the use of such flattening and take-away device, which has been disclosed in a prior application assigned to the same assignee, the inevitable flow defects caused in the blow head and the feed passages are uniformly distributed throughout the tubing when the same has been flattened and wound up so that the tubing forms a cylindrical roll having no annular beads, which must be expected if the flow defects are not distributed. Where the flattening and take-away device according to said prior application is used, the screw extruder, inclusive of the blow head thereof, and the coiler or the machine for further processing may be stationary, normal screw extruders having normal blow heads can be reliably connected without need for rotary couplings, which are liable to be deranged, and no difficulty is involved in the mounting and operation of the coiler.

The present invention relates to an improvement in the device disclosed in said prior application. According to the present invention, the deflecting rod is disposed directly over the take-away rolls and the take-away rolls are mounted on the oscillating take-away device laterally beside the deflecting rod. Hence, there are no stationary deflecting rolls which define a nip extending in the direction of the axis of rotation of the take-away device but the tubing is fed directly to the stationary guide elements which are disposed laterally beside the take-away device. Because the deflecting rod is disposed directly over the take-away rolls, the additional deflecting rolls respectively preceding and succeeding the deflecting rod may be eliminated. The arrangement according to the invention has primarily the result that the angular range of the rotation of the oscillating take-away device can be increased to approximately 360° without a large additional expenditure.

In a further embodiment of the invention, the device may comprise, in addition to the pair of deflecting rolls disposed laterally of the deflecting rod on one side thereof, a withholding roll, which is mounted on the oscillating take-away device and disposed on the other side thereof and contacts the tubing to hold the same sufficiently spaced from the deflecting rod when the take-away device is in an end position in which its direction of rotation is reversed.

The tubing may be fed from the pair of deflecting rolls directly to the stationary guide elements, and a succeeding coiler for the tubing may be driven by a slip coupling so that the changes in the velocity of the tubing which are due to the changes in the length of the path of travel of the tubing, which latter changes are due to the rotational movement of the take-away device, are compensated by the slip allowed for in the means for driving the coiler for the tubing. If the take-away device is succeeded by a processing machine rather than a coiler for tubing, a storage element, preferably a dancer roll, may be disposed between the stationary guide elements for the tubing and the processing machine or a coiler driven at a constant velocity and said storage element may compensate the changes in the velocity of the tubing.

According to another feature of the invention, an additional deflecting roll may be provided between the pair of deflecting rolls and the stationary guide elements for the tubing, and said additional deflecting rolls may be mounted on the common hinge between two levers, which are pivotally interconnected at one end of each lever, whereas the other end of one of the levers is pivoted to the oscillating take-away device adjacent to the pair of deflecting rolls and the other end of the other of the levers is pivoted to the stationary guide elements for the tubing. The last-mentioned embodiment is particularly desirable where the tubing is very wide and heavy so that difficulties, particularly a sagging of the tubing, may arise when the distance between the pair of deflecting rolls and the stationary guide elements for the tubing is a maximum. Besides, the above-described compensation of the changes in the velocity of the tubing is not required in this embodiment because the deflecting roll mounted on the levers always ensures a constant length of the path of travel between the pair of deflecting rolls and the stationary guide elements for the tubing.

The invention will be described more fully hereinafter with reference to the drawing, which shows two embodiments by way of example.

FIG. 1 is a view showing a screw extruder for producing blown tubing, a device according to the invention for flattening and taking-away the blown tubing, and a coiler for tubing, which succeeds the device.

FIG. 2 is a top plan view taken in the direction of the arrow II in FIG. 1 on the flattening and take-away device shown in FIG. 1.

FIG. 3 is a side elevation taken in the direction of the arrow III of FIG. 1 and showing a portion of the device according to the invention.

FIG. 4 shows another embodiment of the deflecting device.

As is apparent from FIG. 1, a screw extruder 1, which is diagrammatically shown, and a blow head 2 for tubing, are operated to produce a tubing 3. The latter is flattened by flattening plates 4 and taken away by a pair of take-away rolls 5, which are driven in known manner by a gearmotor 6. The flattened tubing 7 is laterally deflected through 90° by a non-rotating deflecting rod 9, which extends at an angle of 45° to the axis of the tubing, and is then moved in an on-edge orientation via a pair of deflecting rolls 10 to the deflecting roll 17 and from the latter in a tangential direction to another deflecting rod 18, having an inclination of 45°, and a deflecting roll 19. The rolls 17 and 19 and the rod 18 are all secured to the stationary post 15. The tubing is again deflected through 90° by the deflecting roll 19 and is fed via one or more guide rollers 20 in a direction which is opposite to its original direction of travel to a coiler 21 for tubing.

The take-away rolls 5, the deflecting rod 9 and the pair of deflecting rolls 10 are secured to a rotatably mounted frame 11, which is mounted, e.g., by means of a ball bearing 12 on an intermediate ceiling 13 of the workshop and is rotationally oscillated by a gearmotor 14. For the sake of clearness, the means for supplying the driving power and any means for supplying compressed air, as well as the means for reversing the direction of rotation, are not shown. The means for supplying the driving power and compressed air may consist of known means, including trailing cables and tubes or slip rings, and rotary lead-ins. The direction of rotation may be reversed in known manner by limit switches.

A withholding roll 16 is mounted on the rotary frame 11 on that side of the deflecting rod 9 which is opposite to the pair of deflecting rolls 10 and prevents a contact between the tubing and the deflecting rod when the take-away device is in an end position, in which the direction of rotation is reversed. The withholding roll 16 is shown at 16' in this position.

For the sake of clearness, the swivel bearing 12 and the gearmotors 6 and 14 are omitted in FIG. 2. The flattened tubing 7 is indicated in dash-dot lines in the position which it assumes when the take-away device is in the intermediate position shown in FIG. 2. The deflection of the tubing by the non-rotating deflecting rod 9, which extends at an angle of 45° to the axis of the tubing, is particularly apparent from FIG. 3.

Where the present invention is used, the angle through which the take-away device can be rotated may be increased

to about 360° because the deflecting rod **9** is disposed centrally over the pair of take-away rolls **5** and the pair of deflecting rolls **10** and the withholding roll **16** are mounted laterally of the deflecting rod on the oscillating frame **11**. As a result, the rotation can be performed without a restriction by a stationary path of travel of the tubing but the tubing is oscillated during the rotation so that the tubing is not disposed within the range of movement of the take-away device throughout the rotational movement through about 360°. Because the distance from the pair of deflecting rolls **10** to the stationary guide elements **17**, **18**, and **19** for the tubing varies constantly during the rotation of the take-away device, the length of the path of travel of the tubing **7** will be changed too. This fact results in irregularities in the velocity at which the tubing is fed to the coiler **21** via the guide elements **17**, **18** and **19** for the tubing. These deviations comprise alternating accelerations and retardations relative to the velocity of the take-away rolls **5**. These deviations are very small because the turntable **11** rotates at a very slow speed. If the turntable performs one revolution in 20 minutes and the diameter of the orbit is 1,000 millimeters,

$v_u = 3.14\ Dn = 3.14 \times 0.05 = 0.157$ meters per minute

and the velocity deviation f is

$$f = (v_u \times 100 / v_{take\text{-}away}) = (\%)$$

The velocity deviations for some take-away velocities are as follows:

$V_{take\text{-}away}$ m/min	Deviation
10	± 1.56%
15	±1.04%
20	±0.78%
25	±0.62%

These deviations are compensated by the means for driving the coiler; these means preferably include a slip coupling, or the compensation may be accomplished, e.g., by a dancer roll or the like.

With very wide tubing, the heavy weight thereof may give rise to difficulties in the handling of the tubing, namely, a sagging of the tubing, when the distance between the pair of deflecting rolls **10** and the deflecting roll **17** is a maximum. To avoid this, the take-away device may be provided with a guide means, which comprises two levers **22**, **23** and a deflecting roll **24**. The latter is mounted at the common hinge connecting the two levers **22**, **23**. The other end of one of said levers is pivoted to the oscillating take-away device adjacent to the pair of deflecting rolls **10** and the other end of the other lever is mounted on the stationary deflecting roll **17**. These guide means for the tubing afford the additional advantage that the tubing will travel between the take-away rolls **5** and the coiler **21** without changes in velocity because the path of travel always has the same length.

What is claimed is:

1. A flattening and take-away apparatus for blown tubing of plastic material comprising a stationary blow head, a rotatable frame arranged downstream of said blow head, means to reversibly rotate said frame about an axis thereof, means secured to said frame for flattening said tubing, take-away rolls for said flattened tubing secured to said frame downstream of said flattening means, a deflecting rod secured to said frame immediately downstream of said take-away rolls at an angle of 45° to the axis of said flattened tubing, a pair of deflecting rolls secured to said frame adjacent to and laterally of said deflecting rod, said pair of deflecting rolls having axes of rotation parallel to the axis of rotation of said frame, and a plurality of stationary guide means for the flattened tubing located downstream of said frame.

2. Apparatus according to claim **1**, further comprising a withholding roll rotatably mounted on said frame and disposed adjacent to and laterally of said deflecting rod at the other side thereof from said pair of deflecting rolls.

3. Apparatus according to claim **1** further comprising a windup assemblage and a slip coupling in operative relationship for driving said windup assemblage, wherein the tubing is guided from said pair of deflecting rolls directly to said stationary guide means for the tubing.

4. Apparatus according to claim **1**, further comprising two levers pivotally interconnected at one of their ends, the other end of one of said levers being pivoted to said frame adjacent to said pair of deflecting rolls, the other end of the other one of said levers being pivoted to said stationary guide means, and an additional deflecting roll mounted to said interconnected ends of said levers parallel to said pair of deflecting rolls.

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