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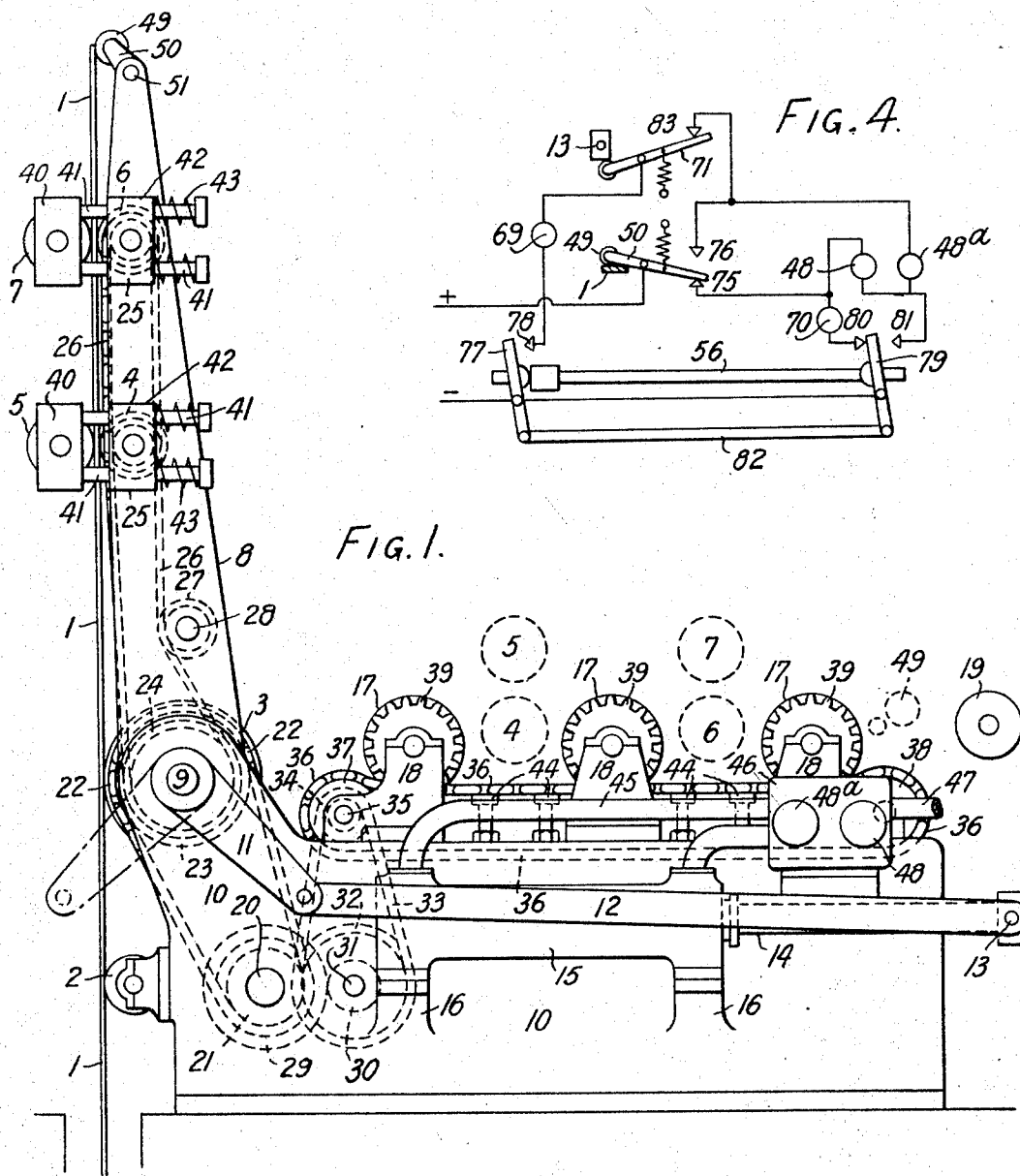
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APPARATUS FOR REMOVING LENGTHS FROM A MOVING STRIP OF GLASS

Filed May 27, 1936

2 Sheets-Sheet 1



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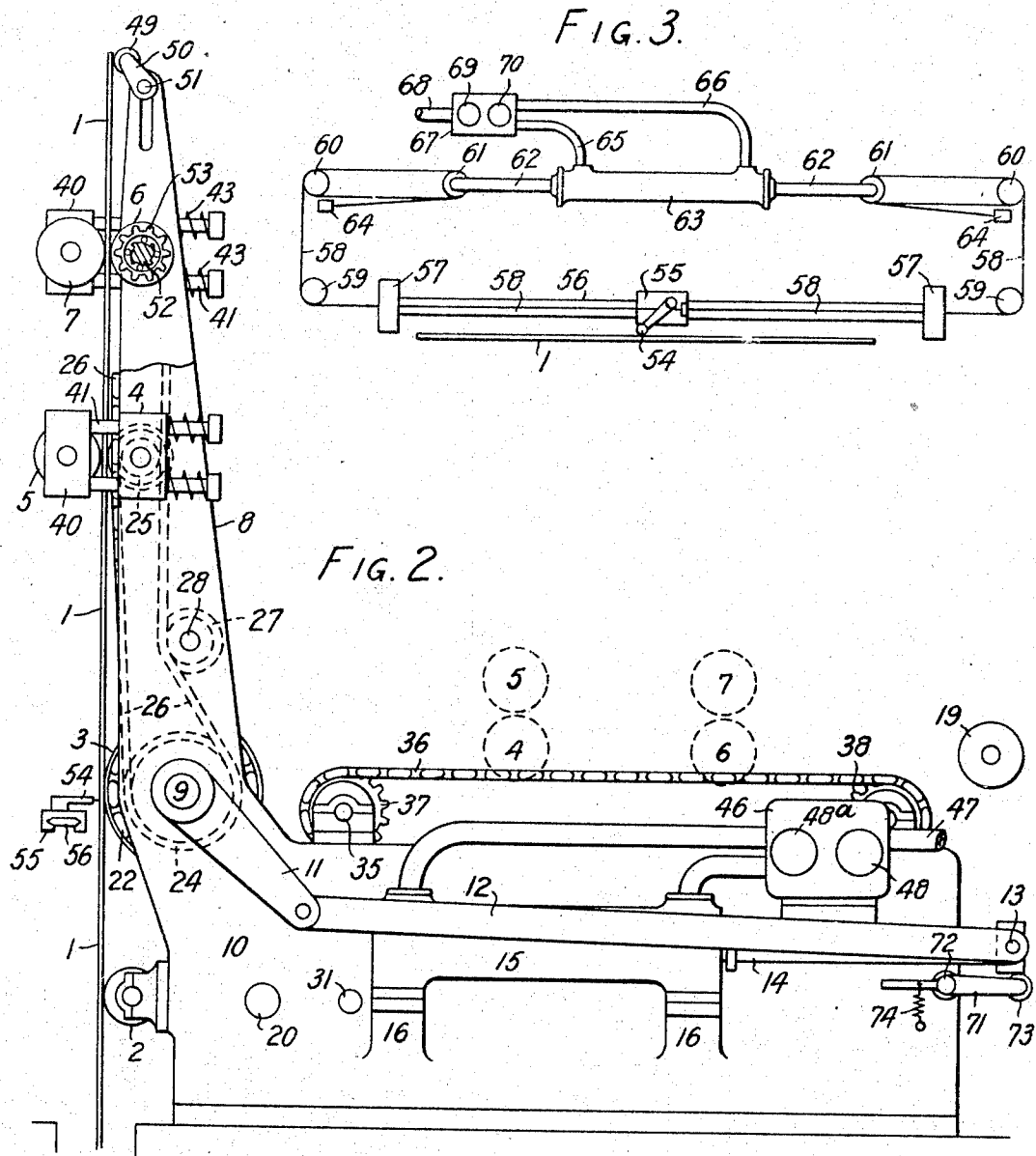
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UNITED STATES PATENT OFFICE

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APPARATUS FOR REMOVING LENGTHS
FROM A MOVING-STRIP OF GLASSJoseph Gaskell, St. Helens, England, assignor to
Pittsburgh Plate Glass Company, Pittsburgh,
Pa.Application May 27, 1936, Serial No. 82,070
In Great Britain June 1, 1935

7 Claims. (Cl. 49—48)

This invention relates to vertically drawn glass strip and has for its object an improved apparatus whereby lengths are removed from the drawn strip.

5 According to the invention, a pivoted frame, when in an upright position, is adapted by gripping rollers to receive the rising strip of glass. The strip is then scored or is cracked electrically. The frame is then rotated (thereby snapping off 10 the length of strip if this has been scored) into a running off position, clear of the rising strip. The cut off length is then run off clear of the frame, at a speed higher than the drawing speed, and the frame is returned to its upright position 15 when the cut length is clear of it. Preferably, a switch on the frame operated by the rising of the strip to a predetermined height, sets in operation the means for rotating the frame into the running off position and the same switch, on its return movement, when the cut-off length is 20 clear of the frame, sets in operation the means for returning the frame to its upright position. The cut-off length may be run off at high speed by its being brought to lie on a plurality of high 25 speed rollers when the frame is moved to the running off position; the grip of the frame rollers being released to free the cut-off length. Alternatively, the driven roller of each pair of gripping rollers may be driven through a free-wheel 30 clutch and means provided whereby the rollers are driven at the high speed when the frame is brought into the running off position.

When the strip is cut by scoring and snapping, the operation of removing lengths may be made 35 fully automatic by electrical switchgear whereby the scoring device is set in operation by the rising of the strip to a predetermined height and its movement, on reaching the end of its traverse sets in operation the means for rotating the frame 40 into the running off position; the movement of the cut-off length in running off may set in operation the means for returning the frame to its upright position, and the movement of the frame, in so returning, may set in operation the return 45 of the scoring device to its normal position.

In the accompanying drawings:—

Figures 1 and 2 are side elevations of two alternative forms of the apparatus;

Figure 3 is a diagrammatic plan view of a scoring device, and

Figure 4 is a diagram of electrical connections for fully automatic operation.

Referring to Figure 1, the strip of glass 1, issuing from the annealing tower, passes the idle

by the two pairs of rollers 4, 5 and 6, 7. The glass strip is scored along a line opposite the roller 2. The rollers 4—7 are carried on a frame having side plates 8 which are carried on the shaft 9 journaled in the main frame 10. The 5 shaft 9 carries, on the near side of the frame 10, the arm 11, to which is pivoted the connecting rod 12, which is pivoted at 13 to the piston rod 14 of a hydraulic cylinder 15, resting on brackets 16 on the frame 10. If fluid be admitted to the 10 right hand end of the cylinder 15, the piston rod 14 is moved to the left and the arm 11 is moved into the position shown in dotted lines. Thereby, the frame 8 is moved into a horizontal position, in which the rollers 4—7 occupy the position 15 shown in dotted lines. In this position the rollers 4 and 6 have their upper surfaces just below the plane of the upper surfaces of three rollers 17 carried on the main frame 10 by brackets 18. The roller 19 is the first roller of a conveyor, 20 adapted to receive and convey away the cut length of glass strip.

The rollers 3, 4 and 6, and the rollers 17 are driven as follows:—The main driving shaft 20 25 carries a chain wheel 21 on the inside of the frame 10 and a chain 22 on the wheel 21 passes round a chain wheel 23 fixed to the roller 3, which is free to turn on the shaft 9. Also fixed to the roller 3 is a second chain wheel 24, and chain wheels 25 are fixed to the rollers 4 and 6. A 30 chain 26 passes from the chain wheel 24 and engages the chain wheels 25, passing round the idle chain wheel 27 on the pin 28. The speed of the chain 26 is such as to turn the rollers 3, 4 and 6 at the speed of draw of the glass strip 1. A gear 35 wheel 29 carried on the shaft 20 drives a pinion 30 on the pin 31. The pinion 30 carries a chain wheel 32 which drives, by a chain 33, a chain wheel 34 on the pin 35 fixed to the bracket 18. The chain wheel 34 is attached to a second chain 40 wheel 37 and a chain 36 passes round the wheel 37 and an idle chain wheel 38 at the right hand end of the apparatus. The chain 36 engages chain wheels 39 on the ends of the rollers 17, turning these clockwise at a speed considerably 45 higher than the speed of the rollers 4 and 6.

The rollers 5 and 7 are carried in bearing blocks 40 fixed to rods 41, which pass through the bearing blocks 42 of the rollers 4 and 6, and are provided with springs 43 which press the rollers 50 5 and 7 against the rollers 4 and 6 respectively, to grip the glass strip 1. Bolts 44 are fixed to brackets on the upper part of the main frame 10 and are so placed that, when the frame 8 is

ends of the rods 41 strike the bolts 44 and the rods 41 are moved against the pressure of the springs 43 to raise the rollers 5 and 7 clear of the glass strip.

5 The hydraulic cylinder 15 has pipes 45 from its two ends leading to a valve box 46, to which fluid under pressure is brought by the pipe 47. The valves of the box 46 are operated by two solenoids 48 and 48^a. A roller 49, on an arm 50, adapted to turn on a bar 51 fixed to the frame 8, is so placed as to be struck by the upper edge of the glass strip 1, the arm 50 being thereby turned clockwise. The arm 50 is adapted to close one or other of two electrical contacts (not shown) in 10 the circuits of the solenoids 48 and 48^a respectively. One of the contacts is closed by spring pressure when the roller 49 is free of the glass strip, and operates the solenoid 48^a which admits fluid into the left hand end of the cylinder 15 to move the frame into the position shown. When 20 the glass strip causes the arm to turn towards the position shown, the first contact is opened and, in the position shown, the second contact is just being made. This latter contact causes the solenoid 48 to operate and admit fluid to the right hand end of the cylinder 15. The arm 50 may be made adjustable in position on the frame to adjust the length to be cut off.

In operation, the glass strip is scored along a 30 line opposite the idle roller 2. The score is made at such a time that, when the strip has risen to the height shown, the scored line is opposite the point of contact of the roller 3. At this moment, the cylinder 15 is operated to turn the frame 8 into the horizontal running off position. In doing 35 so, the glass strip 1 is snapped along the line of the score and, by the pivoting movement of the frame 8 about a centre out of the plane of the strip, the two cut edges of the glass strip are separated immediately after snapping. The cut 40 off length of strip is brought down to rest on the rollers 17, the rollers 5 and 7 being moved clear of the strip as explained above. The cut off length is then run off rapidly to the right, by 45 the rapid rotation of the rollers 17, on to the conveyor rollers 19. As soon as the back end of the cut off length has passed beyond the roller 49, the arm 50 turns to close the contact which causes fluid to be admitted to the left 50 hand end of the cylinder 15, and so causes the frame 8 to be returned to the position shown, ready to receive another length of glass strip.

If the lay-out of the plant permits it, the running off of the cut-off length may be effected 55 by gravity, the frame then being rotated through more than a right angle, so as to bring the cut-off length on to a plurality of idle rollers on an inclined plane.

In the alternative form of apparatus shown in 60 Figure 2, the construction differs from that shown in Figure 1, only in the means for running off the cut-off length. The rollers 4 and 6 of the frame 8 are driven, as before, by the chain 26, and chain wheels 25. The wheels 25, 65 however, drive the rollers through free-wheel clutches, of which that driving the roller 6 is shown at 52 by the front member of the frame 8 being broken away and the chain wheel 25 removed. The chain wheel 25 is attached to 70 the inner member of the clutch 52, while the outer member is a chain wheel 53 attached to the roller 4. When the frame 8 is brought into the horizontal position, the chain wheels 53 are adapted to engage a chain 36, driven at high 75 speed similarly to the chain 36 of the construc-

tion of Figure 1. By reason of the free-wheel clutches 52, the rollers 4 and 6 are driven at high speed by the chain 36, and thereby the cut-off length of strip is rapidly ejected from the frame on to the conveyor rollers 19. This construction obviates the need for releasing the grip on the strip between the pairs of rollers 4, 5 and 6, 7, by means of the rods 41 and bolts 44 of the construction of Figure 1.

Alternatively, the free-wheel clutches may be 10 at an earlier element in the drive to the rollers 4 and 6, as for instance, between the chain wheels 23 and 24, and then the chain 26 may be adapted to engage high speed driving means when the frame is rotated into the running off position. 15

The above described apparatus for snapping and removing cut-off lengths of strip is preferably combined by electrical switch gear with a scoring device, so that the operations of scor- 20 ing, snapping and removing cut-off lengths are carried out automatically, the start of the operations being determined by the rise of the strip to a predetermined height.

Any form of automatic scoring device may be 25 employed or an electric cracking device may be employed, in which case the above described apparatus operates only to remove the cracked-off length. By way of example, one form of scoring device will now be briefly described with 30 reference to Figure 3, in which it is illustrated diagrammatically and with reference to Figure 4 showing the electric switch circuit. Referring to Figure 3, the strip of glass 1 is scored by a cutter 54 mounted on a carriage 55 which is adapted 35 to slide on a guide 56 held in supports 57. In order to secure a horizontal cut across the upwardly moving glass sheet, it is necessary that the guide 56 should be inclined upwardly from its starting end in accordance with the speed 40 of draw, this being an expedient well known in the art. The carriage 55 is traversed by cables 58 which pass round idle pulleys 59 and double idle pulleys 60 and double pulleys 61 on the two ends, respectively, of the piston rod 62 of a 45 hydraulic cylinder 63. The cables terminate at fixed blocks 64. Pipes 65 and 66 pass from the two ends of the cylinder 63 to a valve box 67 with supply pipes 68. Solenoids 69 and 70 control the admission of fluid under pressure to the pipes 65 and 66 respectively. Operation of the solenoid 70 causes the rod 62 to move to the left and causes the carriage 55 to move to the right on its operative stroke. Operation of the solenoid 69 causes the carriage 55 to make 50 its return movement, which is rendered inoperative by means which need not be described here. The carriage 55, guide 56 and cutter 54 are shown in Figure 2 in the position they occupy relative to the removing apparatus, when fully automatic operation is employed. Further, for fully automatic operation, a switch arm 71 (Figure 2) is pivoted on the frame 10 at 72 and carries a roller 73 which is depressed against a spring 74 by the end of the piston rod 14 when this reaches 60 its right hand position, that is to say, when the frame 8 is in its vertical position.

The electrical circuits are shown in Figure 4. In this, the switch arm 50, with roller 49 struck by the ascending strip 1 is shown with two contacts 75 and 76. Also the arm 71 with roller struck by the end of the piston 14 is shown with a single contact 77, which is closed when the frame 8 is upright. The two solenoids 48 and 48^a of the cylinder 15 and the two 69 and 70

70 of the cylinder 63 are shown with their reference numbers. The cutter carriage 55 on its guide 56 is adapted to strike a contact arm 77 with contact 78, when in its normal position, that is to say, ready to make its operative movement to the right. It is also adapted to strike an arm 79 with two contacts 80 and 81 when it reaches the end of its operative stroke. The two arms 77 and 79 are connected by a link 82. The four solenoids have sufficient resistance to prevent their operation if a circuit is closed through three of them in series.

In the position shown, the parts are in their normal position, with the glass strip rising, and just causing the arm 50 to close the contact 75. Current then passes from the positive main through arm 50, contact 75, solenoid 70, contact 80, arm 79 to the negative main. The energizing of solenoid 70 causes the carriage 55 to make its operative movement to score the glass. When the carriage 55 reaches the end of its travel, it causes contact 80 to open and contacts 81 and 78 to close. Current then passes from the positive main through arm 50, contact 75, solenoid 48, contact 81, arm 79 to the negative main. The energizing of solenoid 48 causes the frame 8 to turn to the horizontal, snapping and removing the cut-off length. Also the contact 83 made by the arm 71 is opened. As soon as the glass has left the frame the arm 50 opens the contact 75 and closes the contact 76. Current then passes from the positive main, through arm 50, contact 76, solenoid 48, contact 81, arm 79 to the negative main. The energizing of solenoid 48 causes the frame 8 to return to its vertical position ready to receive a further length of strip. As soon as the frame reaches the vertical position, arm 71 closes contact 83 and current passes from the positive main, through arm 50, contact 76, also through contact 83, arm 71, solenoid 69, contact 78, arm 77 to the negative main. The energizing of solenoid 69, causes the carriage 55 to return to the position shown, opening contacts 78 and 81 and closing contacts 80. The cycle is then completed.

The circuits described are illustrations of one way of securing fully automatic operation, and other circuits may be employed to reach the same result. Further, the return of the scoring device to its normal position may be effected at any point of the cycle.

Having described my invention, I declare that what I claim and desired to secure by Letters Patent is:—

1. Apparatus for removing lengths from a continuously rising vertically drawn strip of glass comprising a pivoted frame, driven gripping rollers on the frame, adapted to receive the rising strip of glass and to drive it at the speed of draw, means for scoring the strip, means for rotating the frame from an upright receiving position to a running off position clear of the rising strip, stop means for engaging the strip opposite the line of scoring for causing it to crack off along such line when the frame is rotated from upright position, means for running the cut-off length out of the frame longitudinally thereof at a speed higher than the drawing speed and means for returning the frame to its upright position when the cut-off length is clear of it.

2. Apparatus for removing lengths from a continuously rising vertically drawn strip of glass comprising a pivoted frame, driven gripping rollers on the frame adapted to receive the rising strip of glass and to drive it at the speed of draw,

means for cutting the strip, means for rotating the frame from an upright receiving position to a running off position clear of the rising strip, means on the frame operable by the rising strip to set in operation the means for rotating the frame into the running off position, means for running the cut-off length out of the frame longitudinally thereof at a speed higher than the drawing speed, means on the frame, operable by the running off movement of the cut-off length, to set in operation means for returning the frame to its upright position.

3. Apparatus for removing lengths from a continuously rising vertically drawn strip of glass comprising a pivoted frame, driven gripping rollers on the frame adapted to receive the rising strip of glass and to drive it at the speed of draw, means for cutting the strip, means for rotating the frame from an upright receiving position to a running off position clear of the rising strip, a plurality of high speed rollers adapted to receive the cut-off length in the running off position, means operable by the movement of the frame to running off position for releasing the grip of the frame rollers and means for returning the frame to its upright position when the cut-off length is clear of it.

4. Apparatus for removing lengths from a continuously rising vertically drawn strip of glass, comprising a pivoted frame, gripping rollers on the frame adapted to receive the rising strip of glass, means for driving the rollers, free wheel clutches in the driving means, means for cutting the strip, means for rotating the frame from an upright receiving position to a running off position clear of the rising strip, driving means of higher speed than the drawing speed adapted to drive the gripping rollers in the running off position and means for returning the frame to its upright position when the cut-off length is clear of it.

5. Apparatus for removing lengths from a continuously rising vertically drawn strip of glass comprising a pivoted frame, gripping rollers on the frame adapted to receive the rising strip of glass, means for driving the rollers, free wheel clutches in the driving means, means for cutting the strip, means for rotating the frame from an upright receiving position to a running off position clear of the rising strip, means on the frame operable by the rising strip to set in operation the means for rotating the frame into the running off position, driving means of higher speed than the drawing speed adapted to drive the gripping rollers in the running off position, and means on the frame, operable by the running off movement of the cut-off length, to set in operation means for returning the frame to its upright position.

6. Apparatus for removing lengths from a continuously rising vertically drawn strip of glass, comprising a pivoted frame, driven gripping rollers on the frame adapted to receive the rising strip of glass, a scoring device, means operable by the rising of the strip to a predetermined height to set the scoring device in operation, means for rotating the frame from an upright receiving position to a running off position clear of the rising strip, means operable by the scoring device on reaching the end of its traverse to set in operation the said rotating means, means for running the cut-off length out of the frame at a speed higher than the drawing speed and means for returning the frame to its upright position when the cut-off length is clear of it.

7. Apparatus for removing lengths from a continuously rising vertically drawn strip of glass, comprising a pivoted frame, driven gripping rollers on the frame adapted to receive the rising strip of glass, a scoring device, means operable
5 by the rising of the strip to a predetermined height to set the scoring device in operation, means for rotating the frame from an upright receiving position to a running off position clear
10 of the rising strip, means operable by the scoring

device on reaching the end of its traverse to set in operation the said rotating means, means for running the cut-off length out of the frame at a speed higher than the drawing speed, means
5 for returning the frame to its upright position and means operable by the movement of the cut-off length in moving clear of the frame to set in operation the said returning means.

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