March 3, 1964 J. GAGG 3,123,268

MECHANISM FOR JOINING WEBS OF MATERIAL

Filed Dec. 11, 1961 3 Sheets-Sheet 1

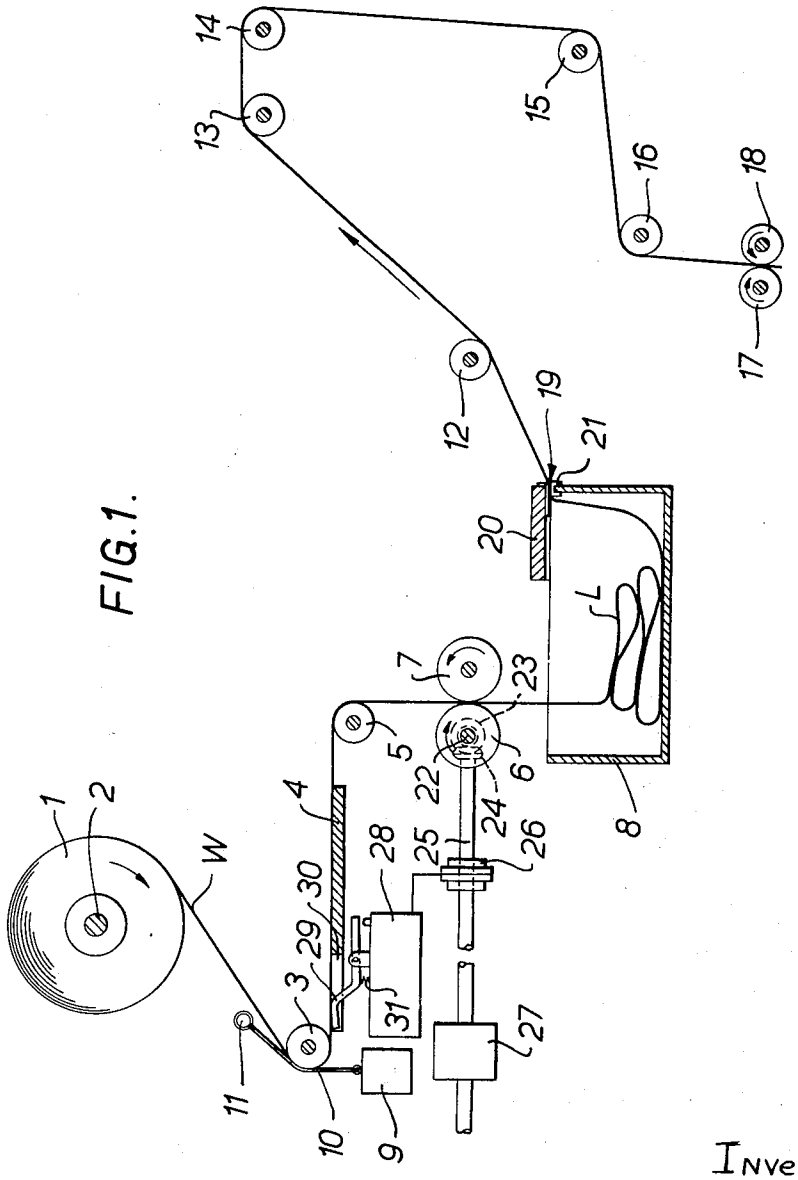


FIG. 1.

INVENTOR
James Gagg

March 3, 1964 J. GAGG 3,123,268

MECHANISM FOR JOINING WEBS OF MATERIAL

Filed Dec. 11, 1961 3 Sheets-Sheet 2

FIG. 2.

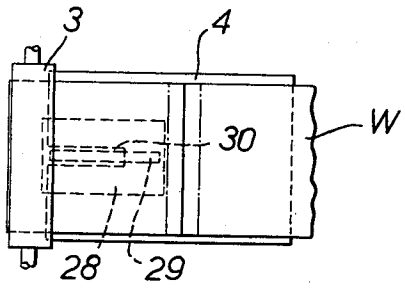
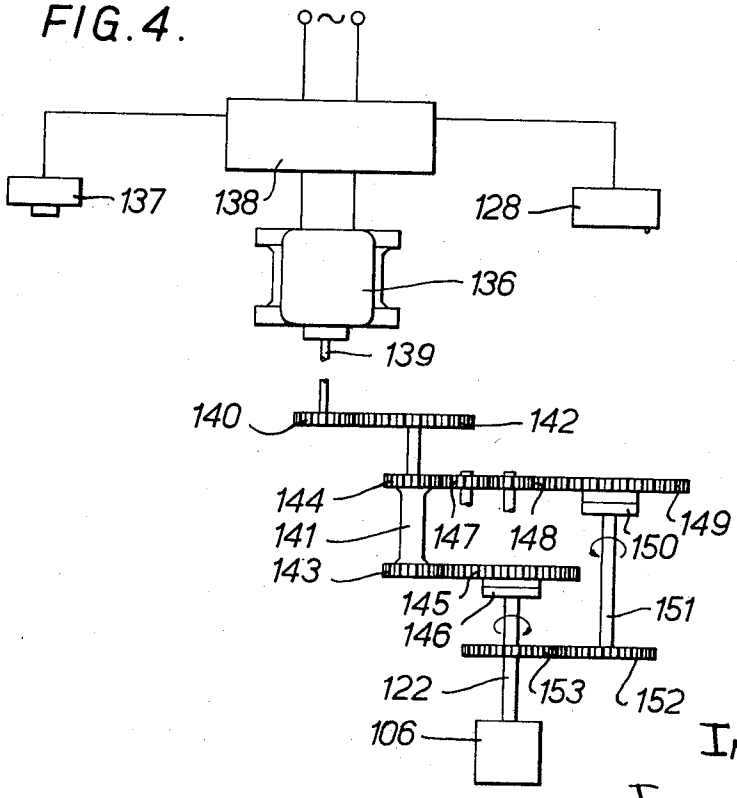


FIG. 4.



INVENTOR

James Gagg

By Watson, Cole, Grindle + Watson

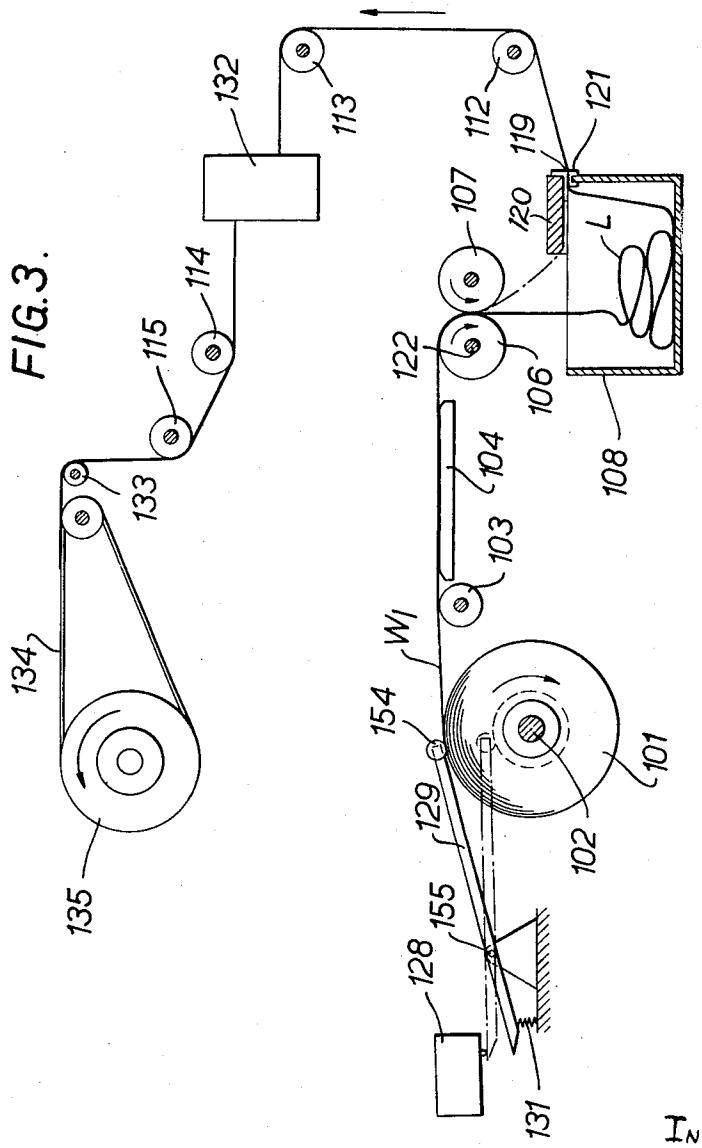
ATTORNEYS

March 3, 1964 J. GAGG 3,123,268

MECHANISM FOR JOINING WEBS OF MATERIAL

Filed Dec. 11, 1961 3 Sheets-Sheet 3

FIG. 3.



INVENTOR
James Gagg

By
WATSON, COLE, GRINDLE + WATSON

ATTORNEYS

United States Patent Office 3,123,268 Patented Mar. 3, 1964

3,123,268

MECHANISM FOR JOINING WEBS OF MATERIAL

James Gagg, London, England, assignor to Molins Machine Company Limited, London, England, a British company

Filed Dec. 11, 1961, Ser. No. 158,193
Claims priority, application Great Britain Dec. 15, 1960
2 Claims. (Cl. 226—111)

This invention concerns improvements in or relating to mechanism for joining the end of a web of material to the beginning of another web of similar material without having to stop the operation of the machine of which the mechanism is part.

Mechanism for joining or splicing the end of an exhausted web of material such as paper, board, cellophane, foil or other similar flexible materials for use in wrapping or packaging articles for merchandising, to the beginning of a fresh reel of the same material, without having to stop the attached machine is well known. Usually such mechanisms form attachments of considerable size or form separate machines and therefore suffer from the disadvantage of requiring additional floor space which may frequently not be available. The present invention supplies a much simplified form of web splicing apparatus which is of such compact size as to be capable generally of being accommodated on existing machines without requiring additional floor space and is applicable to machines in which the web is of comparatively narrow width.

According to the present invention there is provided in a machine utilising a comparatively narrow web of material, apparatus for joining the end of a running web to the end of a further web while the machine is operating, the apparatus being included within the confines of the machine and comprising a stationary container, web feeding means, means to cause the web feeding means to feed more of the running web into the stationary container than is required by the machine so as to store therein a reserve of material, means to cause the web feeding means to discontinue feeding, and means to join together the ends of the running web and the further web while the web feeding means discontinues feeding. The web feeding means may comprise draw rolls arranged to feed the running web positively into the stationary container at the same speed as that at which the web is drawn into the machine, and to feed the web at a faster speed when it is desired to build up a reserve in the stationary container, and may comprise means to draw the running web through the stationray container and through a pair of rollers located between the container and a reel of the running web, the said rollers being arranged to freewheel when the running web is so drawn.

A pair of rollers may be arranged to feed the running web at a faster speed than the speed at which the web is drawn into the machine when it is desired to build up a reserve and at a slower speed when it is desired to exhaust the reserve.

Means may be provided to tension the running web between the stationary container and the machine.

Mechanism for joining or splicing webs of material according to the invention will now be described by way of example with particular reference to the accompanying drawings of which:

FIGURE 1 is a diagrammatic arrangement in section of one form of web joining mechanism,

FIGURE 2 is a plan of part of FIGURE 1,

FIGURE 3 is a diagrammatic arrangement in section of a further form of web joining mechanism,

FIGURE 4 is a diagrammatic plan of mechanism for driving part of FIGURE 3.

In FIGURES 1 and 2 a reel of material 1 is carried on

a free running spindle 2, being located against sideways movement by means of flanges which are not shown. The web W from the reel 1 is fed in the direction shown by the arrow under an idler pulley 3 and over a splicing plate 4 to a further idler pulley 5. From 5 the web W is nipped between two draw rolls of which 6 is driven and 7 is free to rotate on its own shaft. Tension in the web W between the idler pulley 3 and the draw rolls 6 and 7 is maintained by a tension weight 9 attached to one end of a flexible tension strip 10, the other end of which is fixed to an anchor 11. The anchor 11 is so positioned in relation to the idler pulley 3 that the flexible tension strip 10 holds the web against the idler and thereby keeps the web in a state of constant tension for a constant rotational speed of the draw roll 6.

From the draw rolls 6 and 7 the web is led into a reservoir 8 and thence via idler pulleys 12, 13, 14, 15 and 16 to draw rolls 17 and 18. Tension is maintained between the reservoir 8 and the draw rolls 17 and 18 by means of a gate 19 on the reservoir. The gate 19 comprises a cover plate 20 and an upper edge 21 of the reservoir, separated from each other by a small clearance. The underside of the cover plate 20 and the top side of the edge 21 are both covered with a soft material, such as felt or wool or velvet, which closes the clearance and places the web between the reservoir and the draw rolls 17 and 18 in a state of constant tension. The web which is fed from 17 and 18 can be used for any desired purpose which since it is not part of this apparatus, will not be described.

The driven draw roll 6 is keyed to a shaft 22 at one end of which a bevel gear 23 is driven by a further bevel 24 at the end of a driving shaft 25. The driving shaft 25 is in two parts which are connected by a clutch 26, the input end of the shaft being driven through a variable speed box 27. A slot 30 is cut in the splicing plate 4 through which projects an arm 29 of a micro-switch 28, the arm 29 being held in contact with the web W passing over the plate 4 by means of a spring 31. The micro-switch 28 is connected to and operates the clutch 26.

The operation of the web splicing apparatus will now be described. Before starting up the machine of which this apparatus forms a part, a fresh reel of material is placed on and fixed to the spindle 2 by means of a flange which is not shown. The web W is threaded under the idler 3, over the splicing plate 4, into the gate 19, over the remaining idlers and through the nip of the draw rolls 17 and 18. The tension weight 9 is placed in position with the result that due to the tension put into the web between the idler 3 and the draw rolls 6 and 7 the arm 29 is forced down against the action of the spring 31 thus opening the micro-switch 28. As soon as the micro-switch opens, the clutch 26 closes thereby connecting up the two halves of the driving shaft 25. The variable speed box 27 is adjusted so that the peripheral speed of the draw roll 6 will be greater than the peripheral speed of the draw rolls 17 and 18. The machine is now ready to be started up.

When the machine starts to run the draw rolls 6 and 7 will feed the web into the reservoir at a faster rate than the draw rolls 17 and 18 can pull the web out through the gate 19. Thus a reserve of the web will start to build up in loops L within the reservoir. This reserve will be allowed to build up until there is sufficient material within the reservoir to be drawn out by the draw rolls 17 and 18 whilst the reel 1 is stopped, a new reel placed in position and the web joined or spliced, as will be described. As soon as sufficient web reserve is housed in the reservoir, which may occur just before the reel is exhausted, the output speed from the variable speed box may be re-

duced so that the peripheral speed of the draw rolls 6 and 7 is equal to that of the draw rolls 17 and 18. This will then ensure that as much web is removed from the reservoir as is fed into it, with the reserve quantity remaining constant.

The reel 1 is allowed to continue running until all the material has been used. As soon as the end of the web has passed from between the flexible tension strip and the idler 3, tension will be released and the arm 29 will lift, thus opening the clutch 26 and stopping the rotation of the draw rolls 6 and 7. The response time of the electrical circuit and the inertia of the mechanism is such that the end of the web is stopped before it has reached the right hand edge of the splicing plate as seen in FIGURE 1. As soon as the end of the web is stationary the core of the reel 1 is removed from the spindle 2, a new reel is replaced and the new web threaded between the flexible tension strip 10 and the idler 3. The new web is then abutted against the old web and a strip of adhesive material is fixed to the two ends to form a joint. During the time taken to form the joint the draw rolls 17 and 18 have been using up the reserve housed in the reservoir. Consequently the speed of the variable speed box is adjusted so that once again the draw rolls 6 and 7 feed more material into the reservoir than the draw rolls 17 and 18 pull from it. The cycle of operations then continue as described above.

An alternative arrangement is shown in FIGURES 3 and 4, which represent the addition of web-splicing apparatus to a continuous rod cigarette making machine. A reel of cigarette paper 101 is carried on a spindle 102, being held thereon by means of a flange which is not shown. The web W is fed over an idler pulley 103, a splicing plate 104, through draw rolls 106 and 107 and from thence to a reservoir 108. From the reservoir the paper web W passes through a gate 119 over idler pulleys 112 and 113 to a printer 132 and from thence over further idlers 114 and 115 to a paper roll 133. From the paper roll 133 the web joins a garniture tape 134 driven at constant speed by a tape drum 135. The tape 134 grips the web which is thus pulled at constant speed through the printer and over the idler pulleys from the gate 119 of the reservoir.

The drive of the draw roll 106 is shown in FIGURE 4 where 136 is a reversible electric motor, the direction of rotation of which can be changed by push button 137 operating through a control panel 138. The push button 137 can also stop the motor 136. Keyed to motor shaft 139 is a gear 140 driving a shaft 141 through a gear 142. Fixed to the shaft 141 are gears 143 and 144. The gear 143 drives the draw roll shaft 122 through a gear 145 and a Spragg clutch 146 which is arranged to transmit the drive only when the gear 145 is driven in a clockwise direction as indicated by the arrow around the shaft 122. When the direction of rotation of the motor 136 is reversed the gear 145 rotates in a counter clockwise direction and thus no drive is transmitted to the shaft 122. In this case, i.e. when the motor direction is reversed the drive is transmitted via the gear 144, gears 147 and 148, to gear 149 which is fixed to the input side of a Spragg clutch 150. Both the gear 149 and the Spragg clutch 150 are keyed to a shaft 151 and the clutch is arranged to drive the shaft 151 when the gear 149 is rotating in an anticlockwise direction as indicated by the arrow around the shaft 151. Keyed to the shaft 151 is a gear 152 which engages and drives a further gear 153 keyed to the draw roll shaft 122. Thus when the motor 136 drives in one direction the drive is transmitted through the gears 140, 142, 143 and 145 to the draw roll shaft 122 and when driven in the opposite direction, the drive is transmitted through the gears 140, 142, 144, 147, 148, 149, 152 and 153 to the draw roll shaft 122. The alternative drives are made possible by arranging that the two Spragg clutches transmit a drive of opposite rotational sign. Thus the clutch 146 only transmits power

when the gear 145 is driven in a clockwise direction as indicated by the arrow around the shaft 122. If the shaft 122 is driven in a clockwise direction or if the gear 145 is driven in an anticlockwise direction then no power is transmitted by the clutch 146. The other Spragg clutch 150 is arranged to transmit the drive only when the gear 149 is driven in an anticlockwise direction, i.e. as indicated by the arrow around the shaft 151. Thus whatever the direction of rotation of the shaft 139 of the motor there is one and one only path available for the transmission of power to the draw roll 106. The gear trains are also arranged so that the speed of the draw roll 106 when driven through the clutch 146 is higher than it is when driven through the clutch 150 whilst by including an additional three members in the gear chain driving through the clutch 150 the direction of rotation of the draw roll 106 is the same for both paths.

The operaiton of the web splicing apparatus shown in FIGURES 3 and 4 differs from that shown in FIGURES 1 and 2 in that for normal feeding of the paper web there is no reserve in the reservoir 108 and the run of the web is as shown in FIGURE 3 by means of the hatched line. During such periods of web feeding the motor 136 is stopped by means of the push button 137. The draw rolls then free-wheel and are driven by the passage of the web between them, the web being pulled by the garniture tape 134. When the reel 101 reaches a predetermined diameter a roller 154 held against the reel periphery by the action of a spring 131 and carried on an arm 129 which pivots at 155 causes the free end of the arm 129 to actuate a micro-switch 128 which in turn starts up the motor 136 through the control panel 138. The direction of the rotation of the motor when started in this way is such as to drive through the clutch 149 whilst when the motor is running at full speed the peripheral speed of the draw roll 106 is slightly greater than its free wheeling speed when the web is pulled through by the action of the gariture tape 134.

As soon as the draw roll 106 is being driven at a slightly greater peripheral speed, in this case 10%, than speed at which the web is removed from the gate 119, then a reserve start to build up in loops L within the reservoir. The increased speed and the diameter of the reel 1 at which the micro-switch is actuated are so designed that there will be approximately 20 seconds reserve in the reservoir when the paper from the reel 1 comes to an end. Just before the paper comes to an end the motor 136 is stopped by the push button 137 when the machine operator threads on a new reel and splices its end to the end of the previous reel, the web of which has been broken with the end to be joined left free on the splicing plate 140. The splice or joint is made exactly as previously described.

To get moving the web from the new reel the motor 136 is statred by the push button 137. The direction of rotation of the motor is now such as to drive the draw roll 106 through the clutch 150. This will ensure that the draw roll 106 is run at a slightly lower peripheral speed, in this case 5%, than the speed at which the web is removed from the gate 119, when the reserve loops L, if any reserve remains, will be used up. As soon as all the reserve is used up the web will again take up the course shown by the hatched line in FIGURE 3. Since the speed of the web being pulled by the garniture tape is greater than the peripheral speed of the draw roll 106, the draw roll will free wheel as it is now again driven by the paper web. The motor 136 can be stopped and the cycle of operations repeated as soon as it becomes necessary to join up the web of a new reel.

What I claim as my invention and desire to secure by Letters Patent is:

1. In a continuous rod cigarette-making machine, a pair of draw rolls for a drawing web from a reel of cigarette paper and feeding it into a stationary container in which a reserve of said web is accumulated, stored and

used while its trailing end is joined to the free end of a new web, web feeding means driven at a fixed speed for feeding said web continuously from said container to the cigarette-forming portion of said machine, means to drive said pair both faster and slower than said web feeding means and means to cause said pair of draw rolls to freewheel when the linear speed of said web is greater than their peripheral speed.

2. Apparatus as claimed in claim 1, wherein said container comprises means to tension said web before it reaches said web feeding means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,415,312	Castricum	May 9, 1922
2,491,228	Swift	Dec. 13, 1949
2,529,161	Kelling et al.	Nov. 7, 1950
3,060,945	Spenle	Oct. 30, 1962

FOREIGN PATENTS

225,413	Australia	Nov. 10, 1959
828,031	France	Feb. 2, 1938