Dec. 20, 1949 S. E. AMOS 2,491,636

HIGH-SPEED EDGING

Filed Aug. 28, 1945 2 Sheets-Sheet 1

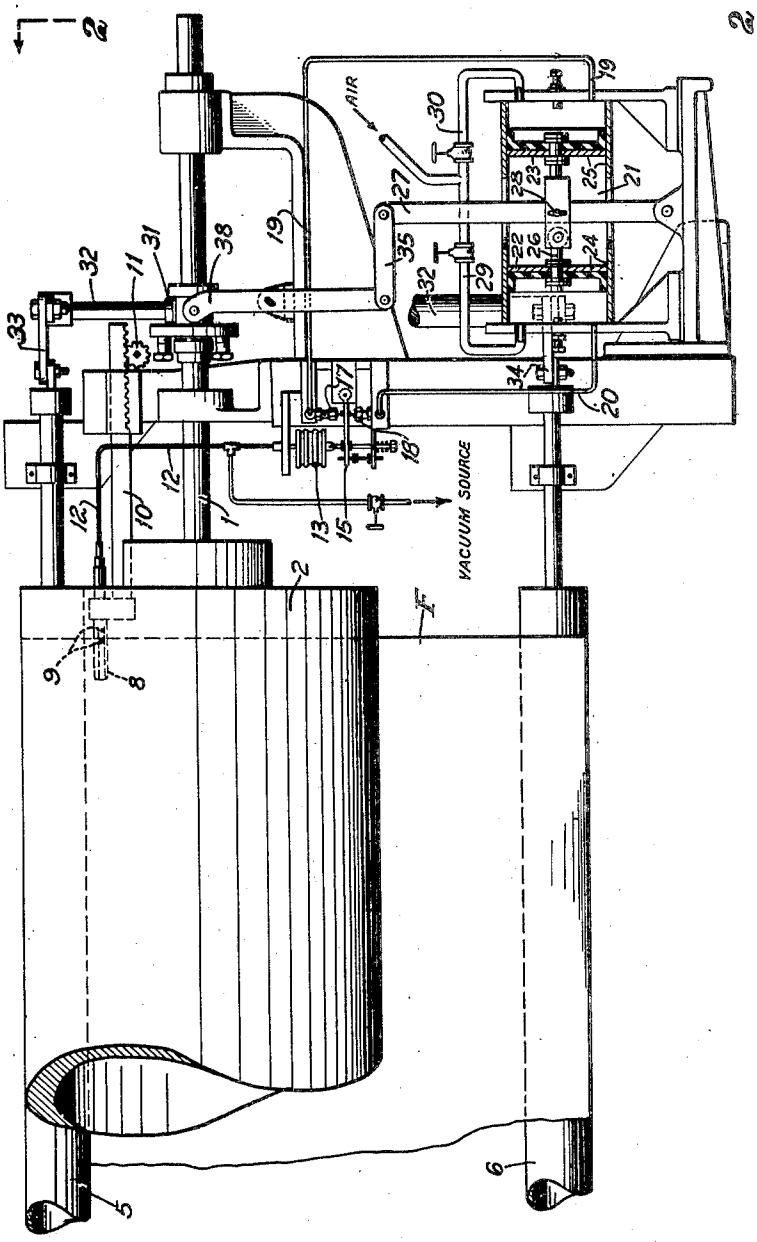

Fig. 1

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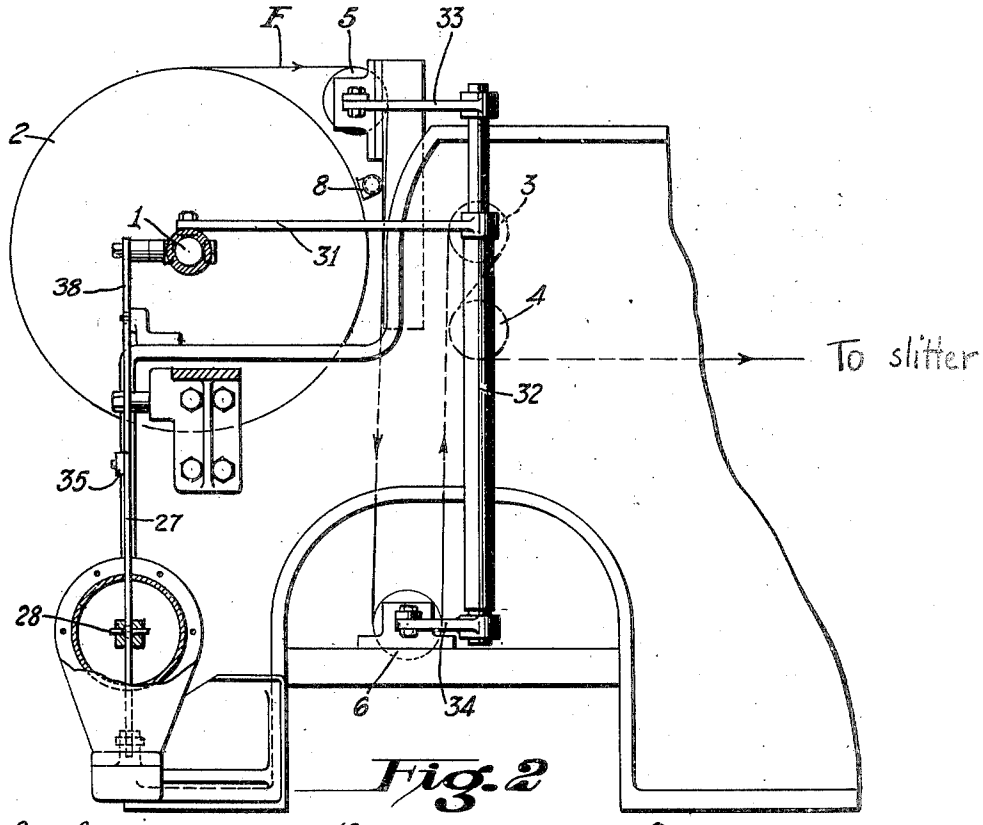

Fig. 2

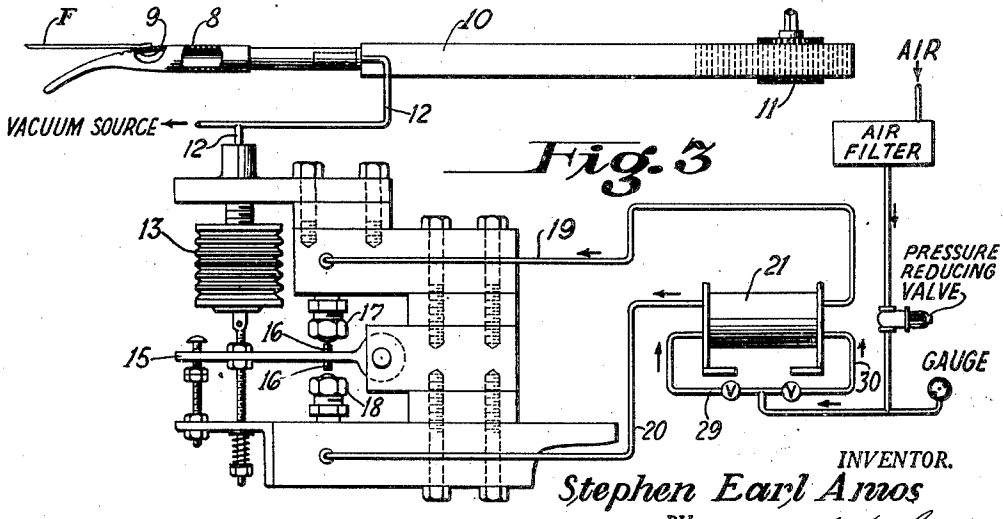

Fig. 3

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HIGH-SPEED EDGING

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2 Claims. (Cl. 242—76)

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This invention relates to improvements in apparatus for maintaining traveling pellicles in a predetermined path. More particularly, it relates to improvements in apparatus for controlling the edge travel of film as it is unwound from the supply or mill roll in a slitting machine.

Slitting machines, i. e., machines in which a relatively wide web or film is unrolled from a supply roll, passed by slitting knives to divide it into a plurality of webs or films of lesser width, which are in turn wound on separate package rolls, are widely used in the processing of paper, metal foil, transparent film, etc. It often happens that the supply roll from which the web or film is unwound is not wound with even intensity across its whole width and that the tightness of winding varies from side to side of the roll as the film is unwound. It follows from this and from other causes that in unwinding the web or film there is often a stronger pull on one edge of the film than on the other and that as a result the pellicle creeps or sways from side to side of the slitting machine so that the slitting knives cut on a somewhat irregular path to produce slit film having uneven edges, which is unsightly when wound and which tends to jam automatic wrapping machinery. Attempts have been made to maintain the edge of the film in a predetermined fixed path as it contacts the slitting knives, and virtually all expedients have operated on the principle of shifting the supply roll to bring the film back into alignment. However, because of the great mass of the supply roll the means employed to shift said roll are necessarily slow in action relative to the speed of film travel so that the correction of film travel is not sufficiently rapid to prevent some irregularity in cutting.

An object of this invention, therefore, is to provide in film winding and unwinding machines means for correcting the travel of the film during the interval of time required to realign the film supply roll. Another object is to provide apparatus for accurately controlling the edge travel of film and the like. Still another object is to provide apparatus for controlling and correcting the edge travel of film, which apparatus is substantially free of the time lag usually associated with this general type of apparatus. A further object is to devise means operative to eliminate or correct film sway in slitting machines before the film reaches the slitting knives. These and other objects will more clearly appear hereinafter.

How the foregoing objects and related ends are accomplished will be apparent from the following description in which are disclosed the principles and a preferred embodiment of the invention. The description is to be read in connection with the accompanying drawing wherein:

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Figure 1 is a side elevation, partly in section, of a portion of a slitting machine incorporating the features constituting the present invention.

Figure 2 is an end elevation, partly in section, on the line 2—2 of Figure 1.

Figure 3 is a schematic representation of the piping arrangement and associated devices for setting in motion the film shifting mechanism of this invention.

Referring to the drawings wherein like reference numerals designate like parts, and with particular reference to Figs. 1 and 2, reference numeral 1 designates a slidably mounted mandrel which serves to support the usual mill or feed roll 2 from which film F is unwound and is subsequently passed over rolls 3 and 4 and thence to slitting knives (not shown). Rolls 3 and 4, which are conventional elements of film slitting machines, are freely rotatable but have no movement along their longitudinal axis and will be referred to hereinafter as "fixed" rolls. Interposed in the path of the film between the mill roll and fixed rolls are freely rotatable film-shifting rolls 5 and 6 which are slidable endwise in cushion block or other suitable bearing structures mounted on the frame of the slitting machine. The function of these rolls is to shift the traveling film endwise to correct for film sway originating at the mill roll and to compensate for the time lag involved in shifting the heavy mill roll which is automatically shifted in response to variations in the endwise travel of the film as it leaves the mill roll. The means for detecting film sway, i. e. variance in the edge travel of the film, and the means for shifting rolls 2, 5 and 6 responsive to film sway whereby to control the travel of the film will now be described.

A nozzle or chamber 8 having a flattened downwardly curved end portion provided with an opening which in the modification illustrated consists of a plurality of holes indicated collectively by the reference numeral 9 (Fig. 1) and preferably aligned in two transverse rows is adjustably positioned as by rack 10 and pinion 11 so that in normal operation one row of holes is just covered by the traveling film F as it comes off of the mill roll. Nozzle 8 is connected through conduit 12 to a bellows 13 and the system 8—12—13 is connected to a suitable pump or equivalent device for maintaining a partial vacuum in the system. Bellows 13 is operatively connected to pivoted lever 15 upon which is

mounted pin 16 adapted to open either one or the other of normally closed check valves 17 and 18 which valves are, in turn, connected by conduits 19 and 20 to air motor 21. Air motor 21 comprises horizontally disposed and aligned pistons 22 and 23 fitted within cylinders 24 and 25 respectively and connected by rod 26 loosely coupled to pivoted lever 27 by means of pin 28. Compressed air for operating motor 21 is supplied through inlet lines 29 and 30 from a suitable source (not shown) and is exhausted from said motor through conduits 19 and 20 to check valves 17 and 18. Lever 27 is operatively connected with mandrel 1 through lever 35 and crank arm 38 and serves to shift the mandrel endwise in response to the operation of motor 21. Also connected to mandrel 1 is a relatively long lever 31 connecting mandrel 1 with vertically disposed pivot shaft 32 located in line with the first fixed rolls 3 and 4 of the slitting machine. Sliding rolls 5 and 6 are linked for endwise movement to pivot shaft 32 by arms 33 and 34 respectively, arm 33 being shorter than lever 31 and longer than arm 34.

The arrangement hereinabove described operates as follows: Film F, being unwound from the mill roll, in its normal line of travel first passes over the first shifter roll 5 and then over nozzle 8 which is prepositioned so that the edge of the film just covers and hence closes one row of holes in the nozzle. The film then passes over the second shifter roll 6, over the fixed rolls and finally to the slitter knives of the machine. The degree of vacuum in the system consisting of the nozzle, bellows and connecting pipe is so regulated by a valve that with the one line of holes in the nozzle closed by the film passing thereover the bellows maintains the pin 16 in neutral position and valves 17 and 18 remain closed so that the compressed air fed into one side of the motor 21 is in equilibrium with the compressed air fed to the other side of the motor. Thus, in the normal travel of the film the shifting mechanism is maintained in inactive state. However, immediately on the occurrence of film sway, i. e. the moment the film deviates from its normal path of travel, from whatever cause, the degree of vacuum in the nozzle-bellows system will either be increased or decreased depending on whether the deviation of film travel causes more or less of the holes to be covered by the film, and this fluctuation in the degree of vacuum will cause either contraction or expansion of the bellows which in turn will result in opening one or the other of the check valves whereby to destroy the air pressure equilibrium in the motor, and set the motor in positive operation. The motor operates to shift the mandrel, and mill roll thereon, endwise until the traveling film is again brought into proper alignment with the nozzle. At the same time, movement of the mandrel is transmitted to the pivot shaft through the connecting lever, which shaft simultaneously operates long arm 33 to shift roll 5 endwise and short arm 34 to shift roll 6 endwise a shorter distance along its axis. It will thus be apparent that that portion of the traveling film which has deviated from its path at the mill roll and would, in the usual arrangement, be fed off-track to the slitting knives is, by the mechanism of this invention, shifted back to its correct or normal path of travel in two stages of decreasing intensity so that the film passes to the fixed rolls and hence to the slitting knives in proper register. In the meantime the mill roll has been moved to a point where the traveling film is again in proper register with the holes of the nozzle and normal operation is resumed.

While the invention has been described hereinabove with specific reference to slitting machines for cellophane and the like, it is obvious that the principles thereof can be applied to any winding or unwinding mechanism where it is desired to compensate for the time lag involved in realigning the supply roll or equivalent element in the machine.

An advantage of this invention is that it permits quick and accurate control of the path of travel of the edge of a traveling film or the like, and particularly in the winding or unwinding of continuous film it serves to immediately control the travel of that portion of the traveling film which is beyond the influence of corrective measures applied at the point of deviation, and hence substantially eliminates the time lag characteristic of control mechanisms heretofore employed.

As many apparently widely different embodiments of this invention may be made without departing from the scope and spirit thereof, it is to be understood that the invention is not limited except as set forth in the appended claims.

I claim:

1. In combination, a film-supply roll mounted for axial movement, means for unwinding film from the film-supply roll, to a film slitting mechanism, two film-shifting rolls mounted for axial movement and disposed at successive points in the path of the film being unwound and between said film supply roll and slitting mechanism, pneumatic means responsive to lateral deviation of the edge of the film from a predetermined path between the shifting rolls, said pneumatic means comprising bellows, a chamber connected with the bellows and provided with holes arranged in position to be normally partly covered by the film, and a source of vacuum connected with said bellows and said chamber for maintaining a reduced pressure sufficient to maintain said bellows in a predetermined state of balance while said holes are normally partly covered; a fluid pressure operated means, two normally closed valves connected to said fluid pressure operated means for releasing pressure therein, a lever connected with the bellows and operated by the expansion or contraction of the bellows to open one or the other of said valves whereby to set said fluid pressure operated means in motion, levers operatively associated with said fluid pressure operated means for simultaneously moving the film-supply roll and the film-shifting rolls axially in accordance with the transverse deviation of the film edge, said levers being arranged to shift each succeeding film-shifting roll a lesser distance than the film-shifting roll preceding it in the path of the film whereby to properly realign the film between the film-supply roll and the slitting mechanism before it reaches the slitting mechanism.

2. In a machine comprising a film supply roll mounted for axial movement, means for unwinding film from said roll in a predetermined path to a film slitting mechanism and fluid pressure operated means responsive to lateral deviation of the film from a normal path for moving the film supply roll axially to move the film laterally to its normal path, the improvement which comprises a plurality of film-shifting rolls mounted for axial movement and disposed at successive points in the immediate path of travel of the film from the supply roll, and lever means connected with said fluid pressure operated means for simul-

taneously moving said film-shifting rolls axially as the supply roll is moved axially, said lever means being arranged to shift each succeeding film-shifting roll a lesser distance than the film-shifting roll preceding it in the path of film travel whereby to properly realign the film between the film-supply roll and the slitting mechanism before it reaches the slitting mechanism.

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