

[54] **FILM REGISTRATION APPARATUS**
 [75] Inventor: **William F. Prena**, Melrose Park, Ill.
 [73] Assignee: **John Morrell & Co.**, Chicago, Ill.
 [22] Filed: **Mar. 17, 1971**
 [21] Appl. No.: **125,135**

[52] U.S. Cl. **53/51**, 156/495, 226/27
 [51] Int. Cl. **B65b 41/18**
 [58] Field of Search 53/51, 3; 226/2,
 226/27, 32, 33, 49, 143; 264/40, 288;
 156/160, 229, 494, 495; 26/54, 63

[56] **References Cited**

UNITED STATES PATENTS

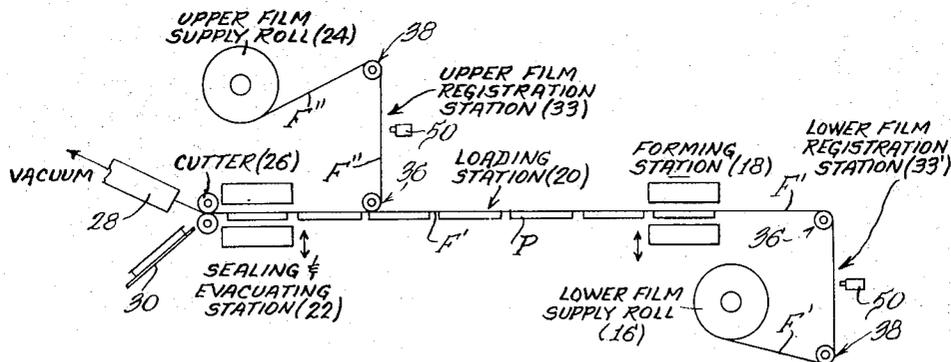
2,375,451	5/1945	Waters.....	53/51 X
3,126,431	3/1964	Harder et al.....	53/51 X
3,294,301	12/1966	Richter	226/27
3,555,768	1/1971	Miller	53/51 X

Primary Examiner—Robert L. Spruill
 Attorney—Hofgren, Wegner, Allen, Stellman & McCord

[57] **ABSTRACT**
 An apparatus and method for registering and applying

a web of film or sheet material bearing repeat indicia to respective uniformly-spaced receiving elements arranged serially and mounted for simultaneous movement in a given path. The receiving elements are moved in a cyclical intermittent indexing motion, with the elements remaining stationary in a rest period between indexing movements. A set of power driven draw rollers feed the web of material to the receiving elements at a constant rate while the receiving elements are being indexed. A brake is applied to the draw rollers so that they grip the web during said rest period. The web passes through a set of stretch rollers which free-wheel while the web is fed to the receiving elements. At least one of the stretch rollers is actuated in a reverse direction to stretch the web while the web is gripped by the draw rollers during the rest period of the receiving elements. A control means, including sensing means responsive to repeat indicia on a part of the web between the draw rollers and the stretch rollers, activates the one stretch roller on detecting certain of the indicia. The control means includes a time delay to activate the one stretch roller a predetermined time after detecting one of the indicia, and the stretch roller is deactivated when said one of the indicia again is detected by the sensing means as the web bearing the indicia is stretched in the reverse direction.

11 Claims, 7 Drawing Figures



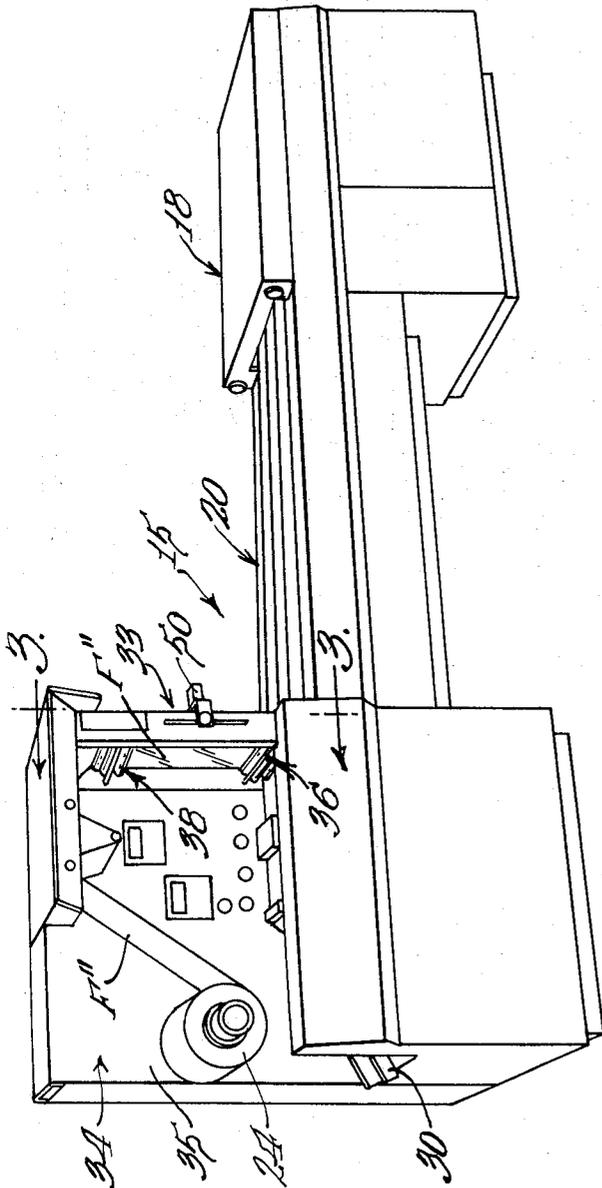


FIG. 1.

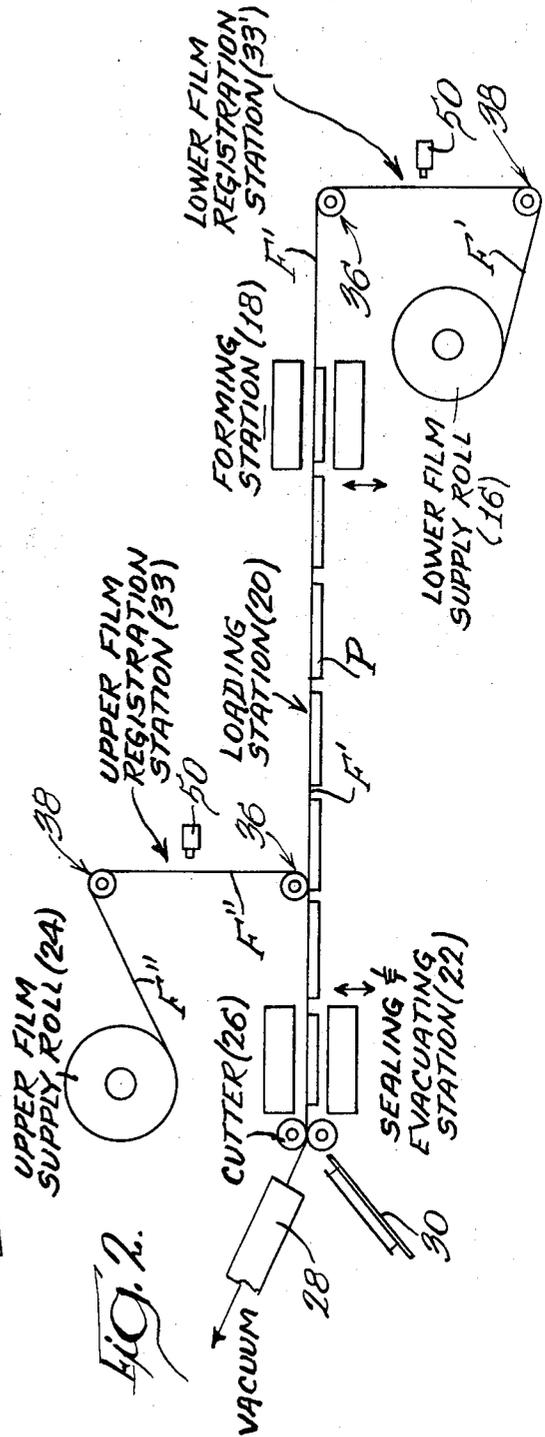
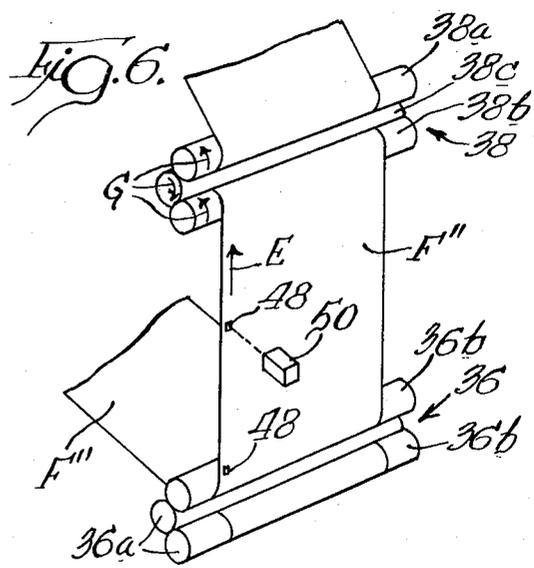
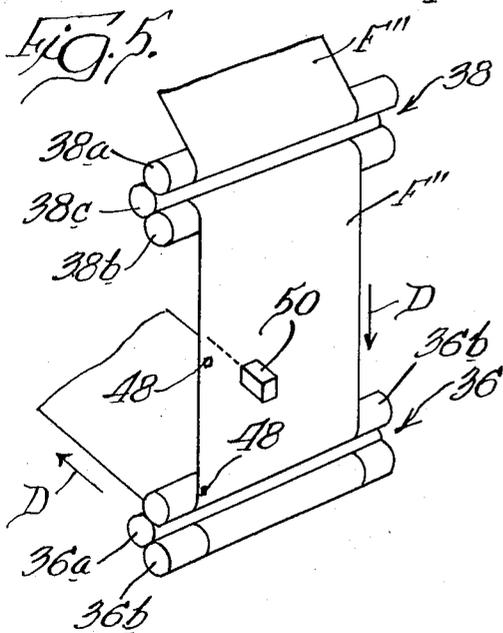
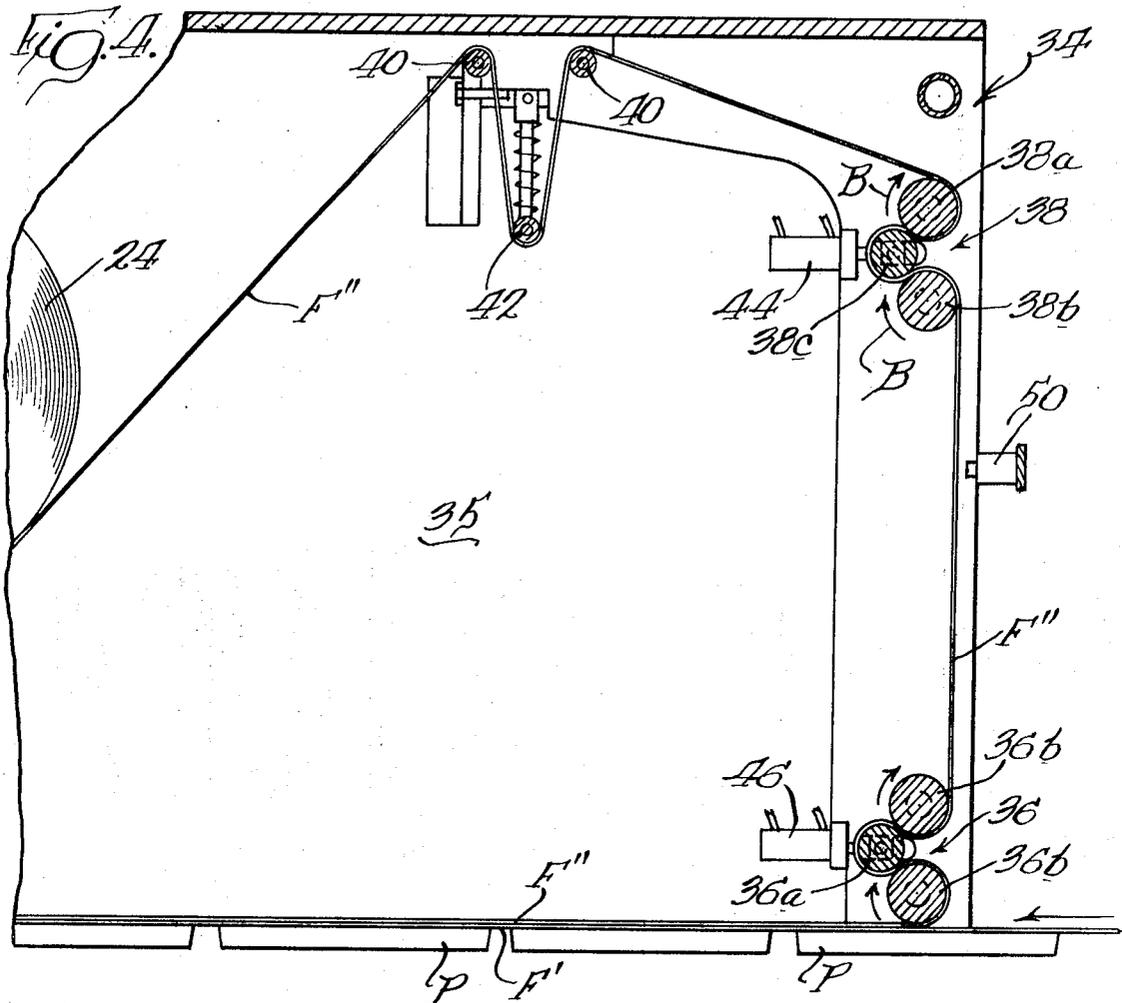


FIG. 2.

Inventor:
 William F. Prena
 By Hofgren, Wegner,
 Allen, Stellman & McCord
 Attys



FILM REGISTRATION APPARATUS

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to registration of indicia and, more particularly, relates to a method and apparatus for applying a continuous web of material to a corresponding series of receiving elements in such a manner that printed indicia on the web is maintained in registry with the respective receiving elements. The exemplary apparatus (in conjunction with which the invention herein is described) relates to producing containers from flexible plastic material bearing indicia such as an identification of the packaged product. More particularly, the invention is described herein in conjunction with an apparatus which has receiving elements comprising package pockets or package forming dies mounted for movement sequentially past a series of packaging stations. These pockets or dies are arranged to receive a web or film of flexible sheet material drawn from a supply roll and adapted to be formed into packages containing products such as luncheon meat or the like. Most often it is desirable to apply printed indicia to the packages. This normally is accomplished by pre-printing the roll stock with a repetitive series of evenly spaced displays containing the desired information and arranging the displays so that they are placed in registry with a corresponding pocket or die as the packages are being formed. It will be appreciated, however, that the spacing of the displays or indicia on the roll stock cannot be maintained at exactly the spacing of the package forming dies, due to manufacturing tolerances, humidity and temperature effects, etc. Thus, there is a problem in obtaining the desired registration between the indicia and the package forming dies. Even minute differences between the indicia spacing and the forming die spacing tend to accumulate, resulting in substantial displacement of the indicia from the desired position on the packages.

In some packaging machines, this problem has been resolved by printing the indicia with a longitudinal spacing slightly less than the spacing between the package forming dies, and the film is controllably stretched as it is being applied to the forming die so that the indicia is maintained substantially in registry with the dies. This procedure normally is followed in packaging machines wherein the packaging material is supplied to the package forming dies through draw rollers driven in timed relationship to the advance of the package pockets or forming dies. An electrically operated clutch, interposed between the machine drive and the draw rollers is actuated by an electric eye responsive to the indicia and timed to act in synchronism with the advance of the dies. When the draw rollers have advanced the indicia to the desired position relative to the dies, the clutch disconnects the rollers from their drive and a brake is applied, halting feeding of packaging material for a predetermined period sufficient to effect the desired stretch.

One of the problems presented by machines of this type is that excessive stress may be developed in the packaging material where it is attached to the package pockets or dies, thus tending to pull the film away from the dies and cause undesirable wrinkling or even tearing of the packaging material. This problem becomes particularly acute in packaging machines where the dies are moved intermittently because the sudden application of force to highly stressed packaging material

each time the dies are advanced can result in fracture of the packaging material between the feed rollers and the dies to which the material is secured. Furthermore, many preferred packaging materials require relatively high stress to produce the amount of stretch needed to register indicia printed thereon. Such machines require an unduly large amount of power in its drive means to accommodate the high stress forces produced by the needed stretch while at the same time performing the necessary advancing and/or packaging functions.

Other machines have been utilized to overcome such difficulties by an arrangement wherein the packaging material is controllably stretched independently of the container forming dies to an extent providing a permanent set elongation of the material. Thereafter, the material is applied to the dies under a tension substantially less than that required to produce the permanent set. The most common type of such machines utilizes a differential speed between a pair of spaced sets of draw rollers, the forward set of rollers rotating at a faster speed than the rearward set of rollers to effect a stretching of the web of packaging material between the rollers. The principal problem with such machines is the complexity and difficulty of determining, maintaining and adjusting the precise differential speed between the two sets of rollers to effect the desired amount of stretch in the web of packaging material.

The principal object of the present invention, therefore, is to provide an improved and simplified apparatus and method for registering indicia on a printed web with corresponding receiving elements.

A further object of the invention is to provide a new and improved apparatus and method for registering indicia on a printed web of packaging material by controllably stretching the web independently of the package forming dies to provide a permanent set elongation of the material before feeding the web to the dies under a tension substantially less than that required to stretch the film to produce a permanent set.

In the preferred embodiment of the invention, an apparatus is provided for applying a web of material bearing repeat indicia to respective uniformly spaced receiving elements arranged serially and mounted for simultaneous movement in a given path. Drive means moves the receiving elements in a cyclical intermittent indexing motion, with the elements remaining stationary in a rest period between indexing movements. Power operated draw rollers constantly grip the web and feed the web to the receiving elements at a constant rate while the elements are being indexed, the draw rollers being non-rotatable during the stationary period of the elements. Before reaching the draw rollers, the web is threaded through a set of stretch rollers, at least one of which is power operated. Clutch means is provided for the power operated stretch roller to activate the stretch roller in a reverse direction during at least a portion of the stationary period of the receiving elements and the idle period of the draw rollers, to pre-stretch the web independently of the packaging dies. The clutch is deactivated during the indexing motion of the receiving elements whereby the stretch rollers free-wheel as the web is fed to the receiving elements under reduced tension just sufficient to maintain the desired amount of stretch to form the packages.

Others objects, features and advantages of the invention will be come apparent from the following detailed

description taken in connection with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a packaging machine embodying the concepts of the present invention;

FIG. 2 is a schematic elevational view illustrating the machine part or station arrangement of the packaging machine shown in FIG. 1;

FIG. 3 is an elevational view of the upper film registration station taken generally in the direction of arrow 3—3 in FIG. 1;

FIG. 4 is a vertical section taken generally along the line 4—4 of FIG. 3;

FIG. 5 is a schematic perspective view of the stretch and draw rollers with the web of packaging material threaded therethrough, just prior to stretching the web;

FIG. 6 is a view similar to that of FIG. 5 during the stretching of the web; and

FIG. 7 is a schematic view of the control structure for the stretch rollers.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings in greater detail, and first to FIGS. 1 and 2, a packaging machine, generally designated 15 in FIG. 1, is shown and is designed to package food products or other commodities in packages formed from a web of flexible sheet material or film which is capable of being heat sealed about the product. Referring to FIG. 2, one continuous web of packaging material or film F' is stripped off a lower supply roll 16 of heat-sealable flexible material and is carried successively to a forming station 18 where individual pockets P or clusters thereof are formed in the film for receiving a product to be packaged, then to a loading station 20 where the product is loaded or positioned in the pockets P, normally by hand, and then to a sealing and evacuating station 22. A second continuous web or layer of film F'' is carried from an upper film supply roll 24 of heat-sealable flexible material to a point between the loading station 20 and the sealing and evacuation station 22, to overlie the lower film sheet F' and the pockets P formed therein, with the product loaded in the pockets. The juxtaposed lengths of film then are carried to the sealing and evacuating station 22 where the sheets are heat sealed together about the periphery of the pockets P and air is evacuated from within the pockets to provide moisture and air impervious packages. The sealed pockets then are carried to a cutter 26 where the film between the individual pockets is cut. The waste film is carried from the cutting station by a vacuum nozzle 28, and the severed film and sealed packages are carried therefrom as by a conveyor 30.

When either the upper or lower sheets of film F'' and F', respectively, are printed with indicia along the lengths thereof for each package, film registration means or stations 33 for the upper sheet of film F'' and 33' for the lower sheet of film F' are provided to index the film so that the indicia thereon is properly aligned for each ultimately sealed and loaded package.

The present invention deals primarily with the method and apparatus at the film registration stations 33, 33' for applying the continuous web of packaging material to the receiving elements or pockets P in such a manner that printed indicia on the web is maintained in registry with the respective receiving elements.

A control box, generally designated 34, (FIG. 1) having a front wall 35 (FIG. 3) is disposed behind the sealing and evacuating station 22 and the upper film registration station 33, and houses control means including appropriate conventional mechanical and electric cams, appropriate conventional solenoid-operated air and vacuum valves, appropriate pneumatic and electrical circuitry to control the timing and operation of the various items or structural elements described above and described hereinafter.

Referring to FIGS. 3 through 7, the apparatus at the upper film registration station 33 will be described. As stated above, this registration station controls the indexing for the upper web of packaging material or film F''. It should be pointed out that the structure and operation of the lower film registration station 33' for the lower layer of film F' is substantially the same as is described hereinbelow.

As stated above, the receiving elements or pockets P are arranged serially and mounted for simultaneous movement in a given path from the loading station 20 to the sealing and evacuating station 22. The drive means for the apparatus moves the receiving elements in a cyclical intermittent indexing motion, with the elements remaining stationary in a rest period between indexing movements while other operations are performed, such as sealing and evacuating the packages. The film registration apparatus of the present invention includes means in the form of a set of power operated draw rollers 36 which constantly grip the film of packaging material F' and feed the film to the pockets P at a constant rate while the pockets are being indexed from the loading station 20 to the sealing and evacuating station 22. The draw rollers 36 are sequentially operatively associated with the drive means for the packaging machine so that as the pockets P are indexed past the draw rollers 36, the draw rollers are rotated to feed the film F'' to juxtaposition over the pockets P for movement to the sealing and evacuating station 22. When the indexing motion is stopped and the pockets are in the stationary or rest period, the draw rollers 36 remain non-rotatably idle while still gripping the film F'' which is threaded therebetween, as best seen in FIGS. 4, 5 and 6.

Disposed above the set of draw rollers 36 is a set of stretch rollers 38 through which the film F'' is threaded, as best seen in FIG. 4. Two of the stretch rollers 38a and 38b are clutch driven by a clutch 39 (FIG. 7) and are activated and deactivated by a control means to be described in greater detail hereinafter. The stretch rollers are deactivated during the indexing cycle of the packaging machine so that they free-wheel in the direction of arrows B (FIG. 4) as the film F'' is fed to the receiving elements or pockets P by the draw rollers 36. As will be described in greater detail hereinafter, during a portion of the rest period for the receiving elements or pockets P and the idle period for the draw rollers 36, the clutched rollers 38a, 38b of the set of stretch rollers 38 will be activated so that they rotate in a direction opposite that of arrows B to stretch the film upwardly in the direction of arrow E (FIG. 6) while the film remains gripped by the draw rollers 36.

Between the supply roll 24 and the set of stretch rollers 38, the film F'' is threaded about a pair of stationary rollers 40 and about a spring biased idler roller 42 which is disposed between the stationary rollers 40.

The center roller 38c of the set of stretch rollers 38 and the center roller 36a of the set of draw rollers 36 are biased against the other two rollers in their respective sets, to grip the film F', by means of air cylinders 44 and 46, respectively. The rollers 38c and 36a are mounted by means of floating connections so that when the air cylinders 44 and 46 are deenergized, the rollers 38c, 36a may be moved to the left, as viewed in FIG. 4, to facilitate threading the film F' between the rollers from the supply roll 24 thereof for feeding to the sealing and evacuating station 22.

Referring to FIGS. 3, 5 and 6, the film F' carries printed indicia, illustrated herein as small marks 48 placed at uniformly spaced positions along the film. Of course, the printed material on the film normally would be considerably more extensive, as at 49 in FIG. 3. The disclosure in this regard has been simplified merely for purposes of clarity. It will be understood that the spacing between the marks 48 on the film F' as it leaves the supply roll 24 is slightly less than the spacing between the receiving elements or pockets P. Thus, it is necessary that the film be stressed in order to obtain proper registry between the printing on the film and the receiving elements or pockets. This stretching of the film is effected in the novel manner now to be described.

A sensing means in the form of a photocell 50 is provided and is responsive to the indicia 48 on the film F'. The photocell is disposed between the draw rollers 36 and the stretch rollers 38. The photocell is operatively associated by control means in the control box 34 to the clutch 39 for the stretch rollers 38a and 38b so that the stretch rollers are activated and deactivated by means of the response of the photocell 50 detecting the indicia marks 48 on the web of film F'. Referring to FIGS. 5 and 7, as the film is fed by the draw rollers 36 in the direction of arrows D, the indicia marks 48 will pass in front of the photocell 50 and when one of the marks (the upper mark shown in FIG. 5) passes in front of the photocell, the photocell sensing unit causes a signal to be sent to the control means and starts the running of a conventional time delay means which either may be electrical or mechanical, such as a cam and gear arrangement. The time delay is such that the clutched stretch rollers 38a, 38b will not be activated to rotate in a reverse direction (opposite that of arrows B in FIG. 4) until the indexing movement of the apparatus has stopped and the draw rollers 36 are idle, gripping the film therebetween. At the end of the given time delay, the stretch rollers 38 will be activated so that they rotate in the direction of arrows G (FIG. 6) to stretch the film in a reverse direction, while being gripped by the draw rollers 36, until the indicia mark 48 which started the cycle for the time delay—stretch roller operation again passes in front of the photocell 50 and is detected thereby. When the indicia mark again is detected, the clutch means for the stretch rollers 38a, 38b are disengaged and the stretch rollers are deactivated. The film between the draw rollers 36 and stretch rollers 38 thus will have been pre-stretched to produce a permanent set in the film. The term "permanent set" is used here to mean a set which lasts without significant creep-back of the film at least for the period of time required to complete the necessary packaging operations such as the sealing and evacuating of the packages.

After the clutched stretch rollers 38a, 38b have been deactivated, the packaging machine will be indexed for

another complete cycle whereby the film will be drawn in the direction of arrows D (FIG. 5) until the next indicia mark 48 passes in front of the photocell 50 to initiate the cycle for the stretch rollers 38, beginning with the time delay, whereupon the stretch rollers again will be activated during the idle or rest period of the machine (where other functions such as sealing and evacuating of the packages are performed) and the film is gripped by the draw rollers 36.

Referring to FIG. 3, gears 52 are fixed to the inside of the shafts for the stretch rollers 38a, 38b, the gears being in mesh with a gear 54 on the end of a drive shaft 56 which extends through the front wall 35 of the control box 34, into the control box for connection through a drive chain 58 to the clutch 39 of the control means for the apparatus. Similarly, gears 60 on the inner end of the draw rollers 36b are in mesh with a gear 62 fixed to a drive shaft 64 which is driven by a drive chain 66 during the indexing movement of the packaging machine.

The parts of the control circuit referred to above are schematically shown in FIG. 7. The photocell 50 is connected by line 71 to a conventional type of bi-stable switch 72 for obtaining immediate switching between a pair of lines 73 and 74. An example of the well-known bi-stable switch is a flip-flop component which is an electronic bi-stable multi-vibrator. The line 73 has the time delay means 75 previously referred to with an output line 76 to a clutch control 77. The line 74 also connects to the clutch control 77. In operation, as previously stated, a mark passes in front of photocell 50 and operates switch 72 to make a connection to line 73 and the time delay means 75. Subsequently, a signal to clutch control 77 causes engagement of the clutch 39. When the same mark again returns to the photocell, the switch 72 shifts to make a connection to line 74. The signal is then received by the clutch control to disengage the clutch 39.

It can be seen that by stretching the film during the rest period or "down time" of the cyclical sequence of operation of the machine, the power source need only be sufficient to stretch the film. In other words, power is not needed to stretch the film in addition to that power necessary for feeding the film and other operations of the machine.

The foregoing detailed description has been given for clearness of understanding only and no unnecessary limitations should be understood therefrom as some modifications will be obvious to those skilled in the art.

I claim:

1. In a device for applying a film or web of material bearing repeat indicia to respective uniformly-spaced receiving elements arranged serially and mounted for simultaneous movement in a given path, and wherein drive means moves said receiving elements in a cyclical intermittent indexing motion with the elements remaining stationary during a rest period between indexing movements, a film registration apparatus, comprising: means to feed said web forwardly to said receiving elements at a constant rate while said elements are being indexed and to hold said web stationary while the elements are stationary during said rest period; and an improvement therein including means in advance of said feed means to stretch said web in a reverse direction while the web is held stationary by said feed means.

2. The device of claim 1 wherein said means for stretching the web comprises a set of rollers between

7

which said web is threaded, at least one of said rollers being selectively power-operated for rotation in a reverse direction, and including clutch means for said power-operated roller to activate the roller in said reverse direction during at least a portion of the stationary period of said receiving elements while the web is held stationary by said draw rollers.

3. The device of claim 2 wherein said clutch means is deactivated during the indexing motion of said receiving elements whereby the rollers may free-wheel while the web is being fed to the receiving elements.

4. The device of claim 2 including control means which includes sensing means responsive to repeat indicia on a part of said web between said feed means and said rollers, said control means being operative to activate said clutch means on detecting certain of said indicia.

5. The device of claim 4 wherein said control means is operative to deactivate said clutch means on detecting certain of said indicia.

6. The device of claim 5 wherein said control means includes time delay means to activate said clutch means to commence stretching the film a predetermined time

8

after detecting one of said indicia.

7. The device of claim 6 wherein said clutch is deactivated when said one of said indicia again is detected by said sensing means as the web bearing the indicia is stretched in said reverse direction.

8. The device of claim 1 including control means which includes sensing means responsive to repeat indicia on a part of said web between said feed means and said stretch means, said control means being operative to activate said stretch means on detecting certain of said indicia.

9. The device of claim 8 wherein said control means is operative to deactivate said stretch means on detecting certain of said indicia.

10. The device of claim 9 wherein said control means includes time delay means to activate said stretch means to stretch the film a predetermined time after detecting one of said indicia.

11. The device of claim 10 wherein said stretch means is deactivated when said one of said indicia again is detected by the sensing means as the web bearing the indicia is stretched in said reverse direction.

* * * * *

25

30

35

40

45

50

55

60

65