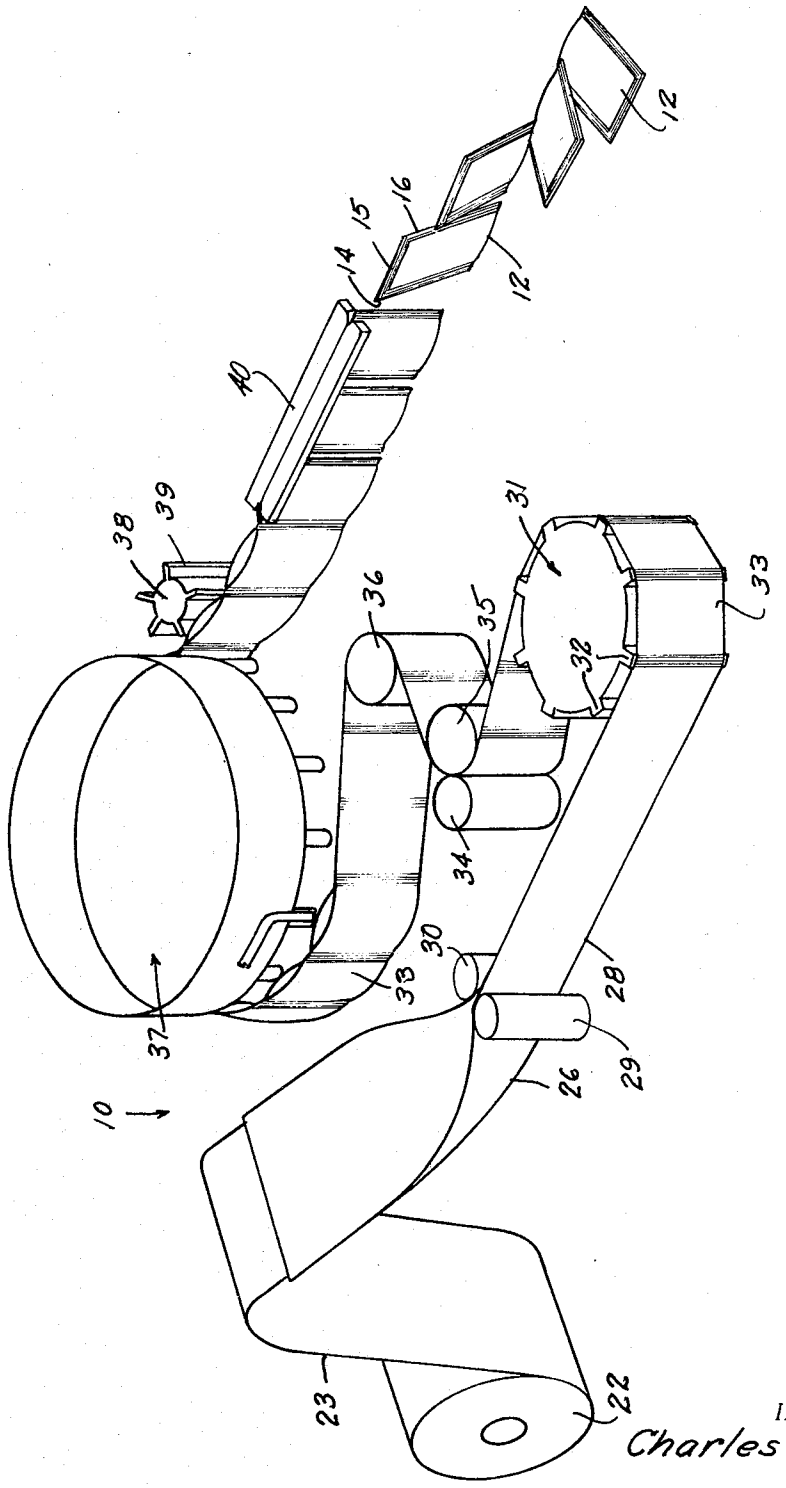
April 14, 1970 C. E. CLOUD 3,505,776

PACKAGING MACHINE

Filed Sept. 1, 1967 5 Sheets-Sheet 1

Fig. 1



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April 14, 1970 C. E. CLOUD 3,505,776

PACKAGING MACHINE

Filed Sept. 1, 1967 5 Sheets-Sheet 2

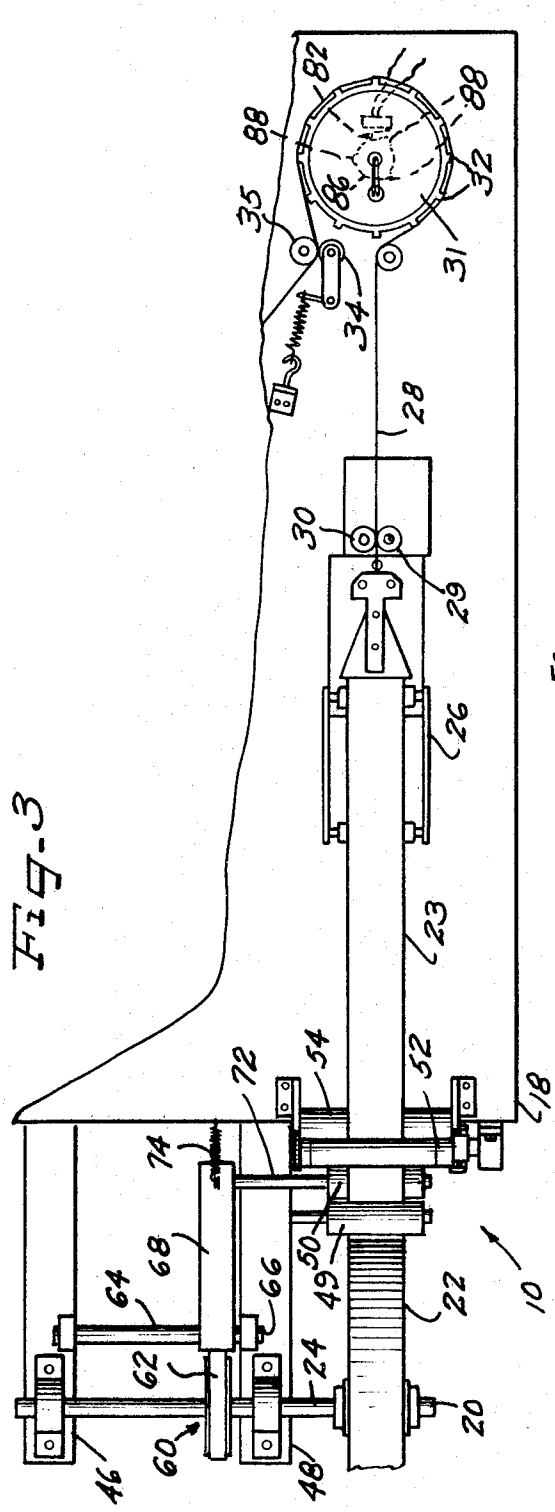


Fig-3

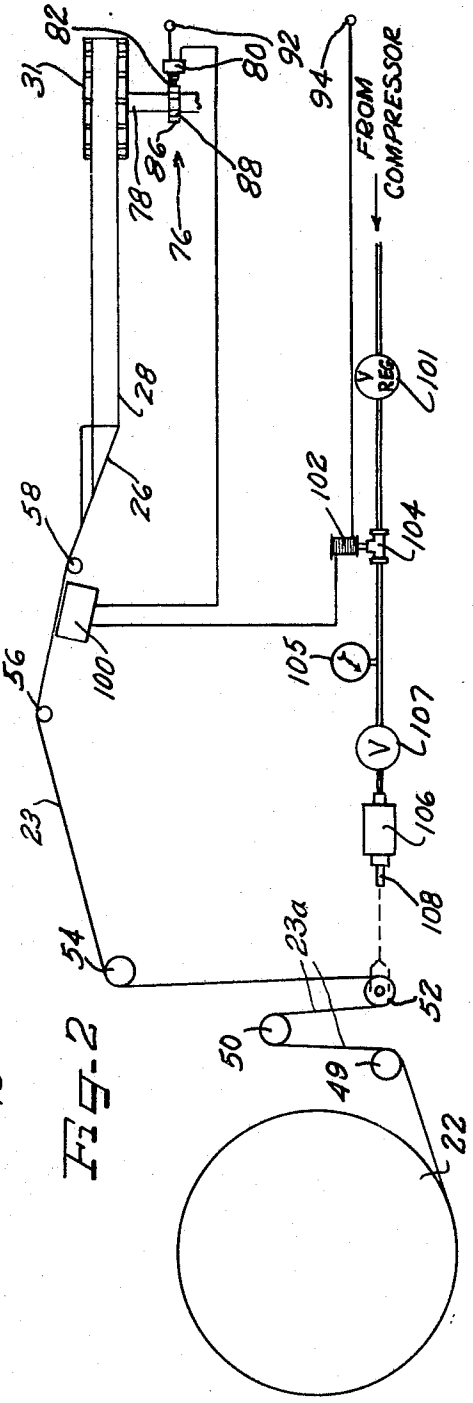


Fig-2

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April 14, 1970 C. E. CLOUD 3,505,776

PACKAGING MACHINE

Filed Sept. 1, 1967 5 Sheets-Sheet 3

Fig. 4

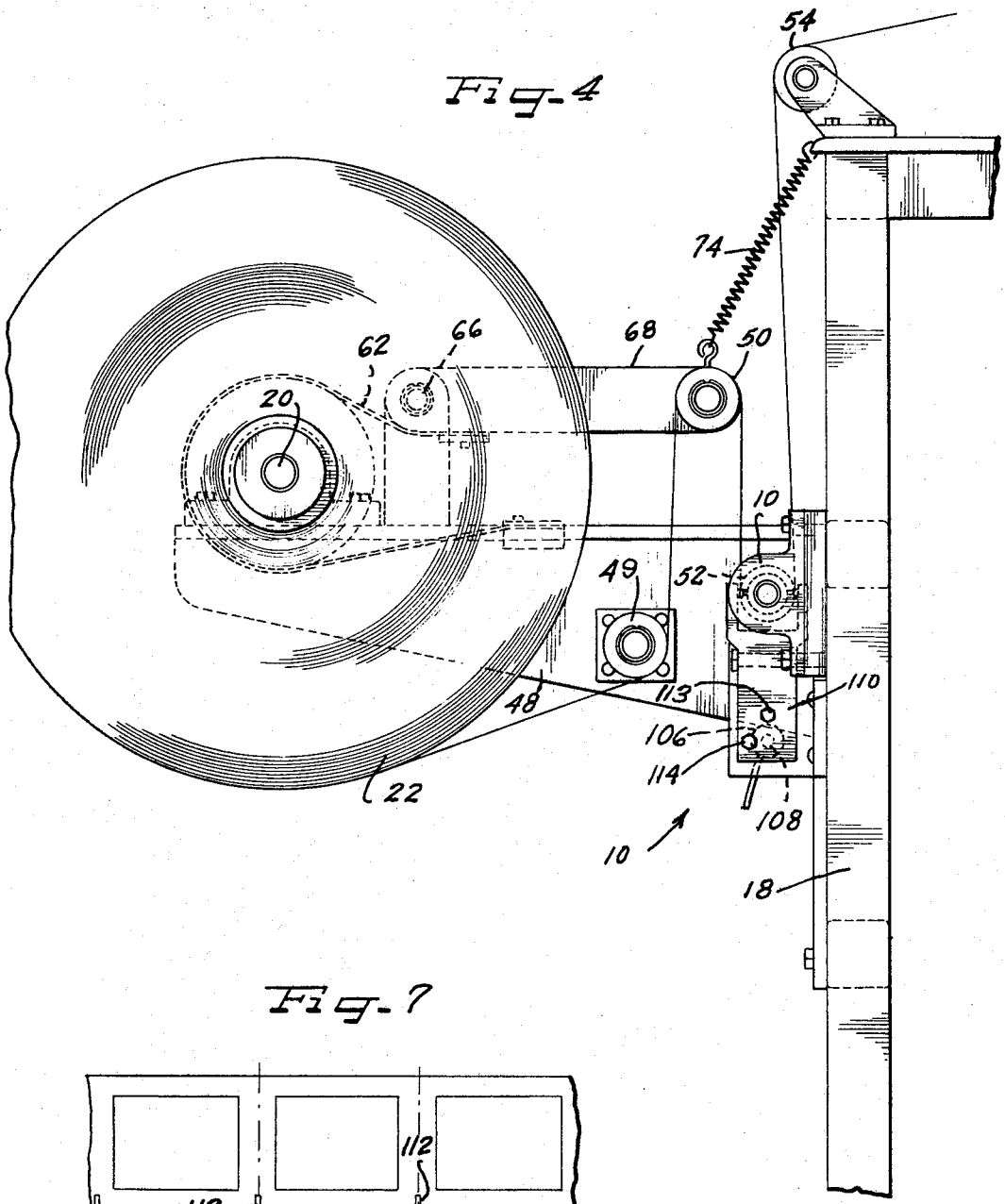
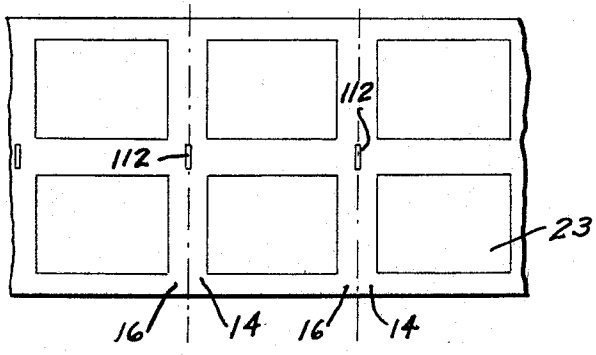


Fig. 7



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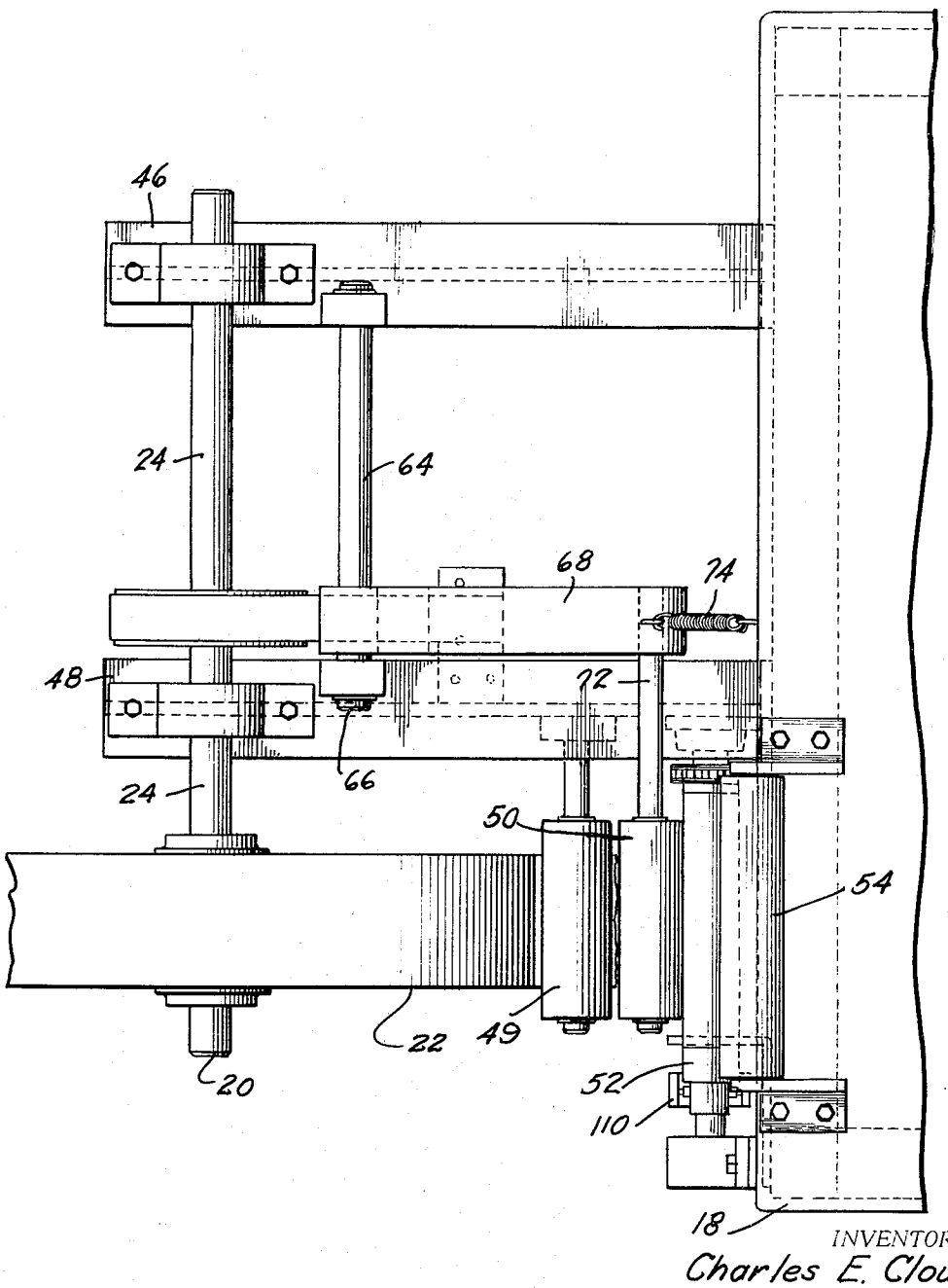
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April 14, 1970 C. E. CLOUD 3,505,776

PACKAGING MACHINE

Filed Sept. 1, 1967 5 Sheets-Sheet 4

Fig. 5



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April 14, 1970 C. E. CLOUD 3,505,776

PACKAGING MACHINE

Filed Sept. 1, 1967 5 Sheets-Sheet 5

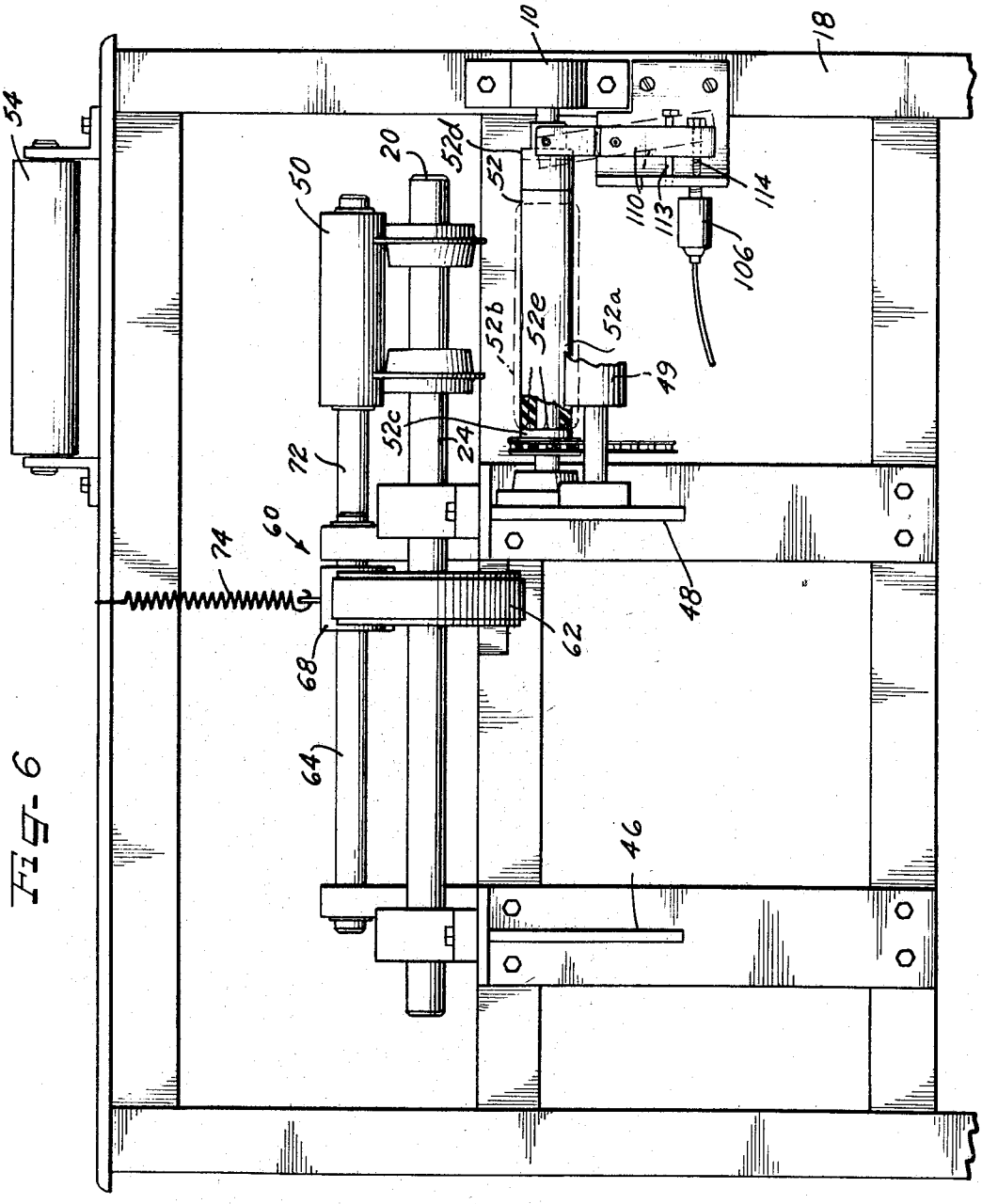


FIG. 6

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United States Patent Office 3,505,776 Patented Apr. 14, 1970

3,505,776

PACKAGING MACHINE

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Filed Sept. 1, 1967, Ser. No. 664,996
Int. Cl. B65b 41/18, 9/08
U.S. Cl. 53—51 24 Claims

ABSTRACT OF THE DISCLOSURE

A continuous packaging apparatus having a roll of film, a deformable roller, a brake to control the tension of the film, an electric eye to sense the alignment of print marks on the film and a registration unit cooperable with the eye to actuate a solenoid operated valve which controls the diameter of the deformable roller to thereby regulate the speed of the film, a filler, a cut-off unit and a longitudinal sealer to make a complete package.

BACKGROUND OF THE INVENTION

The illustrated embodiment of the invention discloses a machine and method for continuously forming a series of filled packages from a continuous length of film or flexible material such as a paper, cloth or metal strip, transparent or otherwise. The material may be any that conforms to the herein described requirements. If desired, the film material may be plastic coated where the pockets are to be formed in a heat sealing operation.

A need has developed in the industry for more accurate controls for regulating the speed of an article or the speed of a web of material such as film, and the present invention is concerned with a new and improved apparatus for dealing with this problem. According to the present invention it is contemplated that the machine be provided with a deformable roller and so positioned that the articles or web can be trained thereover. Controls are provided for detecting misalignment of the articles or web and for transmitting the sensed signal to the deformable roller for causing the diameter of the roller to be varied thereby causing the speed of the articles or web to be varied to correct the misalignment. The misalignment may occur at the sealer, as illustrated, or at other stations on various different types of equipment. According to still other important features of this invention, the deformable roller and the controls operating the same have been provided on a packaging machine for detecting misalignments of the web of material being fed therethrough. By use of the inventions here disclosed rapid adjustments can be made to compensate for the misalignments of the web so that many adjustments per minute can be made.

While various different devices have been used in the past to regulate the alignment of film with respect to various other mechanisms on packaging equipment, deformable rollers and controls of the type here disclosed are believed to be novel and distinctly advantageous over the predecessor devices.

In the prior art there is shown method and apparatus for forming vertical seals including both sensing the position of a film during the sealing process and the position of a film prior to sealing in order to regulate the speed of a film.

This has been accomplished by a cam actuated switch at the position of the sealing device and an electric eye at a position preceding the vertical sealing in order to compare the alignment between the mechanically actuated switch and the position of marks on the film which indicate the alignment of the film relative to the sealer.

SUMMARY OF THE INVENTION

I have provided a complete packaging apparatus and method utilizing a novel deformable roller to control the position of an article or a web or a film of material such as paper to be processed relative to a target point.

Accordingly, it is an object of this invention to provide a deformable roller cooperable with other mechanisms to control the position of an article relative to another article handling or processing mechanism.

It is one object of the present invention to provide a continuous packaging method and apparatus for the high speed manufacture of filled packages from continuous film material free of packaging defects.

Another object of the present invention is to provide a new and improved registration unit for controlling the speed of a film relative to a target point such as a vertical sealing operation.

A further object of the present invention is to provide a new and improved cam actuated film registration unit and an electric eye control which is reliable, simple, durable and less costly than previous controls.

A still further object of the present invention is to provide a dancer roller which actuates a brake to control the tension of the film.

Many other advantages, features and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying sheets of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example.

ON THE DRAWINGS

FIG. 1 is a schematic view illustrating the packaging machine of the invention;

FIG. 2 is a diagrammatic view illustrating the registration control system of the packaging machine;

FIG. 3 is a top fragmentary view of the packaging machine;

FIG. 4 is a side fragmentary view of the speed control and film supply for the machine;

FIG. 5 is an enlarged top fragmentary view of the unit and film supply for the packaging machine;

FIG. 6 is an enlarged fragmentary front view of the packaging machine; and

FIG. 7 is a view illustrating the film for use in the packaging machine.

AS SHOWN ON THE DRAWINGS

The principles of this invention are particularly useful when embodied in a packaging machine such as illustrated in FIGS. 1–5, generally indicated by the numeral **10**. The packaging machine **10** produces a filled package **12** having a left and right seal **14, 16** respectively, at the rate of hundreds per minute. The packages **12** may be produced from a continuous film of material or from several continuous films of material, as desired. Some packaging materials can be more readily folded than other films, and machines of the type shown in the drawing can be readily used for producing filled packages of this type. Where other types of film are employed which cannot be readily folded, it may be desirable to form packages from a pair of lengths of material.

The machine **10** has a base **18** supporting various components including a roll stand **20** which supports a roll strip or continuous film of packaging material **22**. The roll of film **22** is supported on shaft **24** in such a manner that when the film **23** is unrolled it is disposed generally in a horizontal plane.

The film **23** may be of any suitable type and can be coated on at least one side with a sealable material such as plastic or other suitable adhesive. The film of packag-

ing material **23** can be supplied in printed form or can be printed while on the machine **10** by providing a suitable printing device (not shown). The strip (if not printed, can be printed by moving the same through the printing device.

A paper plow **26** is supported on the frame **18** forwardly of a printer (where required) for folding the film **23**. When the film is folded at **28**, FIG. 1, the fold is disposed at the bottom of the film as the film then assumes a generally V-shape.

In order to further prepare the film **23** so that filled packages may be formed, a pair of guide rollers **29, 30** is disposed on the downstream side of the plow **26** and the folded film **23** is guided therebetween to a vertical sealer **31**. The film **23** is adapted to be pulled and moved through an arc as the vertical sealer is driven contemporaneously with drive roller **35**. The vertical sealer **31** has a series of vertically extending circumferentially spaced heated lands **32** which are provided to form longitudinally spaced vertically extending heat seals **14, 16** in the film (FIG. 1). After the film has been heat sealed in the manner described, pockets **33** are formed and each is disposed between a pair of rollers **34, 35**.

The film **23** then passes over a driven feed roll **35** to a filling station wheel **37**. Each pocket **33** may be filled with a desired amount of the product to be packaged such as a food or drink flavoring. When material such as drink flavoring is to be placed in the pockets **33**, the pockets are filled in a pouring operation, as shown, which is further described in copending U.S. application Ser. No. 484,481, entitled "Manufacturing of Sealed Packages from Strip Stock," and now Patent No. 3,453,799. Thereafter, the strip is moved into a cutting position where a shear type cutter or cutter mechanism **38** having shear blades **39** are cooperable with cutter blades of lands (not shown) provided on the filling wheel **37**. The blades are disposed at spaced intervals around the perimeter of the filling wheel **37**. The cutter or shear mechanism **38** includes the shear blade **39** mounted on a vertical axis or cutter drive shaft (not shown) in order that the filled packages or package **12** are severed from the strip **23** at the area of the heat seals **14, 16** while the packages **12** are in an upright position. The open ended filled packages **12** are led onto an infeed conveyor (not shown) to be transported to a heat sealer **40** for forming a longitudinal end seal **15** at the open end of the package **12**.

At this point, the package **12** is complete and is transported to a packaging station for the completed packages.

The film material **23** is unwound from the supply roll **22** which it rotatably mounted on the roll stand **20**. The shaft **24** supports the supply roll **22** and is mounted on bracket supports **46, 48** which maintain the shaft **24** in an adequate spaced relationship with the base **18** of the packaging machine **10** in order to support a large diameter roll **22** indicated herein. It will be appreciated that while the film roll **22** is free to unreel that its transverse position is fixed.

As the film material **23** is unwound from the film supply roll **22**, it is fed through a series of rollers **49, 50, 52, 54, 56** and **58** which both drive and guide the web from the roll to the plow **26** which folds the film **23**. The roller **50** is a dancer roller controlling a brake and the roller **52** is a driven deformable roller.

The tension of the packaging film **23** is controlled by a brake unit **60** through roll shaft **24** to the roll stand **20**. A U-shaped braking belt **62** has an end mounted on a brake arm **64** which is pivoted at **66**. The brake arm **64** is mounted on the bracket supports **46, 48** and forms a pivot for a brake lever **68** which is operated by a dancer roller arm **72**. The roller arm **72** is mounted between the dancer roller **50** and the brake lever **68**. The roller **50** is supported by a brake tensioning spring **74**.

In the regulation of the tension of the web of film **23** to the vertical sealer, the brake unit **60** operates in response to the diameter of roll **22**. As the diameter of the roll **22** decreases, the dancer roller **50** is pulled down by the film **23**. The braking lever **68** is pulled down around the pivot **66** to turn the brake arm **64** in a direction to release the brake **62** and thereby lower the tension on the film **23**.

The registration unit **76** is driven by a vertical shaft **78** that is mounted on the same axis as the vertical sealer **31**. Fixed to the shaft **78** for rotation therewith is a cam switch actuator **86** having three lands **88** corresponding to the vertical sealer lands **32** on the vertical sealer **31** such that there is one land **88** for every four vertical sealer lands **32**.

In the feeding of film **23** into the packaging machine **10** to the vertical sealer **31**, there is a tendency for the film to oscillate and, according to important features of this invention, a new method and apparatus has been developed for controlling the film **23** to maintain the printed marks **112** on the film in proper alignment with respect to the vertical sealer **31** so the vertical seals **14, 16** can be properly positioned.

The electric eye **100** here employed utilizes a light that cooperates with light and dark marks **112** on the film **23** (FIG. 7). When the film **23** is properly oriented with relation to the vertical sealer **31**, the eye **100** is aligned with the marks **112**.

The registration unit **76** operates with an electric eye **100** positioned on the upstream side of the vertical sealer **31**. The microswitch **80** of the registration unit **76** and electric eye **100** are in a series electric circuit with a solenoid **102** which operates an air valve **104**. The series circuit is connected to power supply terminals **92, 94**.

In the air supply circuit which is regulated by the solenoid valve **104**, is a source of compressed air (not shown), and a regulator valve **101** leading to the valve **104**. On the operating side of the valve **104** is a meter **105**, a bleed valve **107**, an air cyclinder **106**, and a ram **108** which operates a lever **110**.

The regulator valve **101** is used for controlling the pressure of air supplied from the compressor. The meter **105** is an air pressure meter which indicates the pressure of air supplied from the valve **104** to the air cylinder **106**. The bleed valve **107** is open at all times so that when compressed air is being delivered to the air cylinder **106** some of the air pressure is lost through the bleed valve **107**.

The solenoid **102** when deenergized shuts off the air supply to the air cylinder **106** by closing solenoid valve **104**. The bleed valve **107** serves to allow the pressurized air in the air cylinder **106** to be discharged so that the lever **110** acting on the deformable roller **52** can return the roller to a normal position **52***a*, FIG. 6.

The roller **52** is a natural gum rubber which is compressible and resilient and mounted between a pair of collars **52***c* and **52***d*. The collar **52***c* has four pins **52***e* which project axially therefrom in a direction towards the adjacent collar **52***d* so that when the rubber roller **52** is urged into engagement with the collar **52***c* the pins or tangs become embedded therein to insure that the roller **52** will corotate with the collars. The roller **52** most desirably will have a greater width than the web. The roller **52** is driven and designed with each revolution to yield enough material by supplying film **23** to make three packages **12**. The sealer **30** produces twelve packages **12** in one revolution. Thus, the deformable roller **52** must travel or rotate four times to every revolution of the sealer **31**.

Alternatively, the deformable roller **52** can be run in an expanded position **52***b* so that when correction is needed the solenoid **102** would close and let air out of the air cylinder through the bleeder valve **107** in order to allow the expanded roller **52** to decrease in diameter to advance film **23** at a slower rate and thereby correct in a backward direction as compared to the embodiment operation as shown in FIGS. 1 and 2.

The electric eye **100** represents a standard electric eye system which senses registration marks and thereby actuates the solenoid **102** when there is a correspondence be-

tween actuation of the microswitch **80** and the registration of a registration mark on the electric eye **100**.

In operation, the film **23** oscillates constantly about the lands **32** of the vertical sealer **31**. The deformable roller **52** is acted upon through the speed control system for the web **23** constantly to achieve the proper alignment of the eye marks **112** with the vertical seals **14, 16** on the package **12** and acts to prevent a misalignment. The printed message would ordinarily fall between the eye marks **112** and the vertical seals **14, 16**.

As used in this invention, the electric eye **100** is a reflective scanner **42** RA **1** used with a high speed impulse control **23** DF **3** manufactured by Electronics Corporation of America. It is responsive to abrupt changes in light intensity such as from the printed alignment marks **112** on the film **23**. The electric eye **100** is connected to close the circuit between the terminals **92** and **94** after registration of a print mark **112** and remain closed for approximately .075 second and then open. When this corresponds with the closing of microswitch **80**, a series circuit is formed between the terminals **92** and **94**, and the solenoid **102** is energized. This allows air to pass to the air cylinder **106** and operate lever **110** to deform the roller **52** to increase its peripheral velocity.

The lever **110** has a pair of stops **113, 114** parallel to the direction of travel of the ram **108**.

Summarizing, the solenoid **102** is operated on actuation of the microswitch **80** of registration unit **76** and a sensing by the electric eye **100** which is .075 second within the actuation of the microswitch. The electric eye **100** may operate prior to and during the actuation of the microswitch **80** to energize the solenoid **102**.

The solenoid **102** cannot operate without receiving both signals. The solenoid valve **104** is opened on energization of the solenoid **102** and closed on deenergization of the solenoid **102**. Thus, when signals from the electric eye **100** and registration unit **76** coincide as above, the deformable roller **52** is acted upon by the lever **110** to increase the diameter **52***b* of the roller **52** and thereby increase the speed of the film **23**.

The registration unit **76** provides an additional control not provided by the electric eye since it gives a signal indication as to the extent that the film marks **112** are misaligned with respect to the vertical sealer **31**.

Ordinarily, the film **23** does not move out of alignment in excess of $\frac{1}{16}$ of an inch. If, during the course of rotation of the vertical sealer **31** the film marks are properly oriented and aligned with respect to the cam lands **88**, the switch actuator **82** would close the circuit through the switch **80** and this signal would be transmitted to the solenoid **102**. Since the signal was previously transferred by the electric eye **100** sensing a print mark within .075 second, the solenoid **102** is actuated and thereby causes deformation of the feed roller **52** to increase the speed of the film **23** as it is fed to the packaging machine **10**.

Alternatively, if there is a failure of coincidence of the registration unit **76** with a sensing of the print mark **112** by the electric eye **100** within .075 second the deformable roller **52** is caused to decrease in size **52***a* thereby to slow the supply of film to the packaging machine **10**.

These corrections are constant and the speed of the film oscillates about an ideal speed for achieving proper vertical sealing by vertical sealer **31**. The package **12** is thus formed with the printing thereon which is properly oriented by the vertical sealer **31**.

The purpose of the roller **49** is to maintain the web at a desired angle relative to the next roller. A preferred angle would be one where web segments **23***a*—**23***a* on opposite sides of the roller **49** are maintained essentially parallel to eliminate the diameter of the feed roll from being a factor on the tension of the web.

In the illustrated form of the invention it is noted that the packages are cut off before they are sealed at their upper open ends. Insofar as the present invention is concerned, it will be appreciated that the package also could be sealed at its open end and then cut off as shown in copending U.S. application Ser. No. 290,725 entitled "Method and Apparatus for Packaging," now United States Patent No. 3,344,576.

Although minor modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon, all such modifications as reasonably and properly come within the scope of my contribution to the art.

I claim:

1. A method of controlling longitudinally spaced positions on a strip relative to a target point periodically moving into contact with the strip, comprising the steps of:

training a strip of material having longitudinally spaced positions defined thereon by markings around a radially deformable feed roll having a normal diameter and being deformable to an abnormal diameter;

directing the strip from the feed roll toward a moving target periodically contacting the strip;

periodically sensing a contact position of the target for a certain time interval;

periodically sensing markings at a position upstream of the target and for another certain time interval; and

periodically deforming the feed roll to the abnormal diameter for a time interval determined by the time during which both the mark and the target are coincidentally sensed;

whereby a mean diameter of the feed roll is varied according to a proportionate amount of time per revolution during which the roll is held at the abnormal diameter, thereby to oscillate a path of travel of the strip about a desired length for bringing the marking into coincidental contact with the target and as a function of the time during which both the markings and the target are coincidentally sensed.

2. An apparatus having:

feed means for feeding material;

radially deformable roller means composed of elastomeric material and cooperating with said feed means for varying a path of travel of the material;

eye means for sensing the position of the material at a selected point on the apparatus downstream of said roller means; and

a means cooperable with said eye means upon receiving misalignment signals for varying a mean diameter of said deformable roller, thereby to vary the speed of the material to correct any misalignment.

3. A continuous packaging apparatus having:

a sealer for forming spaced seals along a length of film relative to print marks thereon;

feed means for feeding the film to said sealer;

deformable roller means cooperable with said feed means for regulating the speed of the film;

eye means for sensing the print marks; and

a registration unit cooperable with said eye means for signalling misalignment so that said roller means deforms and thereby varies the speed of said film from said feed means to correct the misalignment.

4. A continuous packaging apparatus as recited in claim **3**, wherein said eye means is operatively connected with said registration unit and roller means to vary the rate of travel of the film when improper alignment is sensed.

5. A continuous packaging apparatus as recited in claim **3** wherein said registration unit includes a cam assembly driven in time with said sealer to periodically actuate switch means for desired intervals.

6. A continuous packaging apparatus as recited in claim **3** wherein said switch means on the registration unit includes a microswitch and cam assembly driven directly by said sealer.

7. A continuous packaging apparatus as recited in claim 3 wherein said eye means and registration unit are serially connected to control said roller means, said roller means including lever means to change the diameter of a driven feed roller and thereby control the speed of said film.

8. A continuous packaging apparatus as recited in claim 7 wherein said roller means includes a valve for supplying high pressure air to actuate said lever means.

9. A continuous packaging apparatus having:
- a sealer for forming spaced transverse seals along a length of film between print marks thereon to form pockets;
- feed means for feeding the length of film to said sealer;
- a brake cooperable with said feed means for controlling film tension;
- a dancer roller operably connected to said brake for controlling the feed rate of the film;
- deformable roller means included in said feed means;
- a speed control unit cooperable with said roller means to oscillate the film speed and thereby align said sealer with the print marks on the film;
- filler means to fill the pockets in the sealed film with a product; and
- longitudinal sealer means for closing the pockets.

10. A continuous packaging apparatus as recited in claim 9 wherein said speed control unit includes a microswitch and cam assembly driven directly by said sealer.

11. A continuous packaging apparatus as recited in claim 10 wherein said speed control unit includes an electric eye and said microswitch are serially connected to said deformable roller means, said deformable roller means comprising a feed roller, and lever means responsive to signals from the speed control unit to control the diameter of the feed roller and thereby control the oscillation of the film speed.

12. A continuous packaging apparatus as recited in claim 11 wherein said deformable roller means includes a valve for supplying high pressure air to actuate said lever means.

13. A continuous packaging apparatus as recited in claim 9 wherein said brake is a U-shaped braking belt around a brake drum coaxial with the film roll and cooperable with a dancer roll carried on a pivot arm whereby the dancer roll senses the film tension and controls the brake tension.

14. A continuous packaging apparatus as recited in claim 9 wherein said speed control unit includes eye means and a registration unit which are serially connected to control said roller means.

15. A packaging apparatus as defined in claim 9 wherein the deformable roller has a width in excess of the film width and is comprised of compressible resilient material.

16. The apparatus of claim 15 wherein said deformable roller is comprised of natural gum rubber.

17. A continuous packaging apparatus having:
- a sealer for forming spaced seals along a length of a film relative to print marks thereon;
- feed means for feeding the film to said sealer;
- a deformable roller cooperable with said feed means for regulating the speed of the film;
- eye means for sensing the print marks;
- a registration unit cooperable with said eye means for signalling misalignment so that said roller means deforms and thereby varies the speed of said film from said feed means to correct the misalignment; and
- means for deforming the roller in response to signals received from said registration unit.

18. The apparatus of claim 17 further characterized by said roller comprising a rubber sleeve mounted between a pair of collars, and means to insure corotation of the rubber sleeve with the collars.

19. An apparatus having:
- feed means for feeding material;
- deformable roller means cooperable with said feed means for varying a path of travel of the material;
- eye means disposed downstream of said roller for sensing the position of the material at a selected point on the apparatus;
- target means periodically contacting the strip;
- a registration unit sensing a contact position of said target means; and
- means cooperable with said eye means and said registration unit upon receiving misalignment signals for varying the diameter of said deformable roller and thereby varying a path of travel of the material to correct misalignment of the material with the target means.

20. An apparatus as recited in claim 19 wherein said feed means includes an idler and a dancer roller which are positioned relative to said deformable roller so that film segments moving to said deformable roller are maintained in essentially parallel relation to minimize said deformable roller as a factor in film tension.

21. An apparatus as defined in claim 19 wherein the deformable roller has a width in excess of the film width and is comprised of compressible resilient material.

22. The apparatus as defined in claim 19 wherein said deformable roller is comprised of natural gum rubber.

23. The apparatus of claim 19 further characterized by said roller comprising a rubber sleeve mounted between a pair of collars, and means to insure corotation of the rubber sleeve with the collars.

24. An apparatus having:
- feed means for feeding strip material having longitudinally spaced markings thereon;
- deformable roller means having a normal diameter, disposed to cooperate with said feed means for varying a path of travel of the material, and said roller being deformable to an abnormal diameter;
- means for sensing the markings at a selected point on the apparatus and for a certain time interval;
- target means periodically contacting the strip;
- a registration unit sensing a contact position of said target means for another certain time interval; and
- means actuated by said means sensing the markings and said registration unit for periodically deforming said deformable roller means to the abnormal diameter for a time period determined by the time during which both said target and one of the markings are sensed;

thereby varying a mean diameter of the deformable roller and thus varying a path of travel of the material to bring the markings into coincidental contact with the target.

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U.S. Cl. X.R.

53—183; 226—2, 29, 175