United States Patent

Smith et al.

[15] **3,699,832**

[45] **Oct. 24, 1972**

[54] **CONTROL CIRCUIT FOR AUTOMATING THE OPERATION OF A FILM CUTTER OR LIKE APPARATUS**

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[73] Assignee: **Eastman Kodak Company,** Rochester, N.Y.

[22] Filed: **April 16, 1971**

[21] Appl. No.: **134,789**

[52] **U.S. Cl.** **83/210,** 83/238, 83/261, 83/268, 83/358, 83/364, 83/365, 83/367, 83/371, 83/391, 83/419

[51] **Int. Cl.** **B26d 5/32,** B26d 5/34

[58] **Field of Search**........83/210, 238, 261, 268, 358, 83/364, 365, 367, 371, 391, 419, 446, 449

[56] **References Cited**

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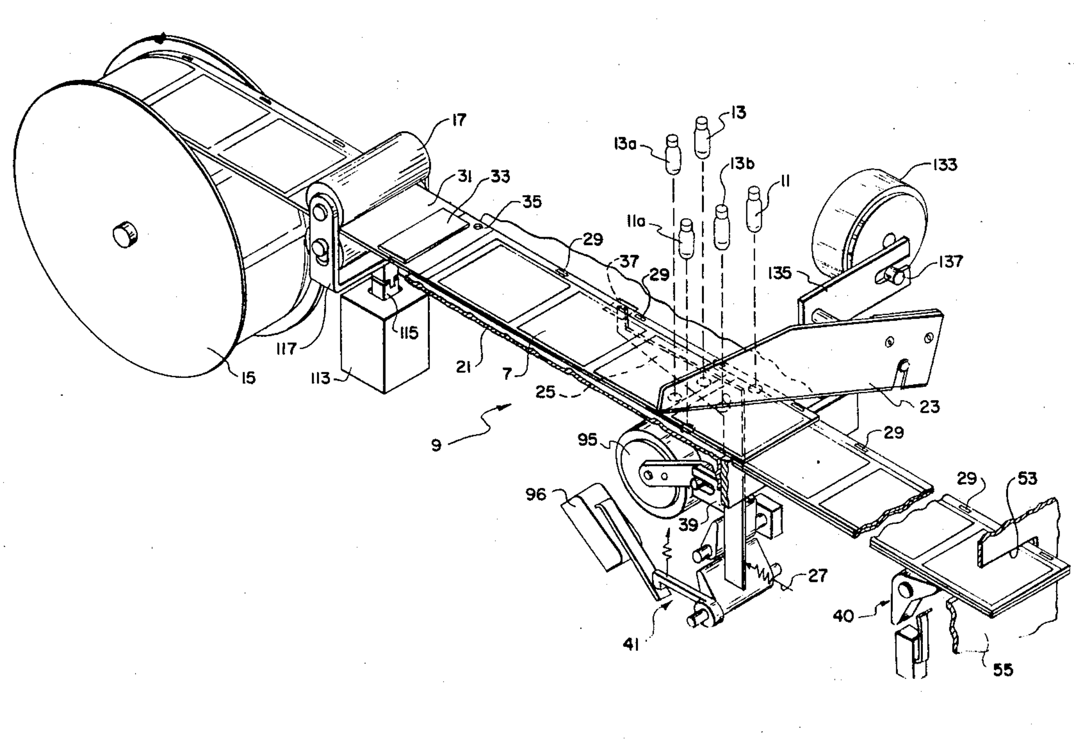
[57] **ABSTRACT**

A control circuit for automating the operation of a film cutter of the type suitable for cutting large, continuous roll of film having regularly spaced edge perforations fixedly oriented with respect to the exposed frames thereof which continuous rolls are made up of spliced, intermingled customer rolls of 12 or 20 frames each. Cutting of the film into strips of four exposure frames each, plus a strip of four exposure frames and the splice frame, is controlled by the response of photosensitive detectors which monitor passage of the film perforations and the splice frame. The photosensitive detectors are connected to a counting circuit which generates, in its first frame first mode of operation, an output signal for each four film perforations counted. In its Last Frame First mode of operation, the counting circuit is logically controlled so that it counts five perforations prior to the first cut in the customer roll and four perforations thereafter. In response the output signal of the counting circuit, a pivotally mounted pawl located in the cutter is caused to swing upwards to engage the next following film perforation. Engagement of the pawl, in turn, causes the film drive to stop. The cutter blade is actuated in response to engagement of the pawl with the film perforation, thereby severing an initial strip of film containing four images in the First Frame First mode or an initial strip of film containing five images in the Last Frame First mode. The same signal which caused the film drive to stop and the cutter to sever a strip of film, after a time delay greater than that required for complete cutter blade movement is employed to drop the pawl out of engagement and restart film drive. This operation is repeated until a splice is sensed, whereupon the pawl remains engaged, halting further film drive until the previously cut strips are removed from the exit therefor provided in the cutter housing. A mode switch appropriately located on the cutter allows the operator to automatically cut the larger rolls of film regardless of whether the splice frame leads or trails the individual customer rolls.

18 Claims, 8 Drawing Figures



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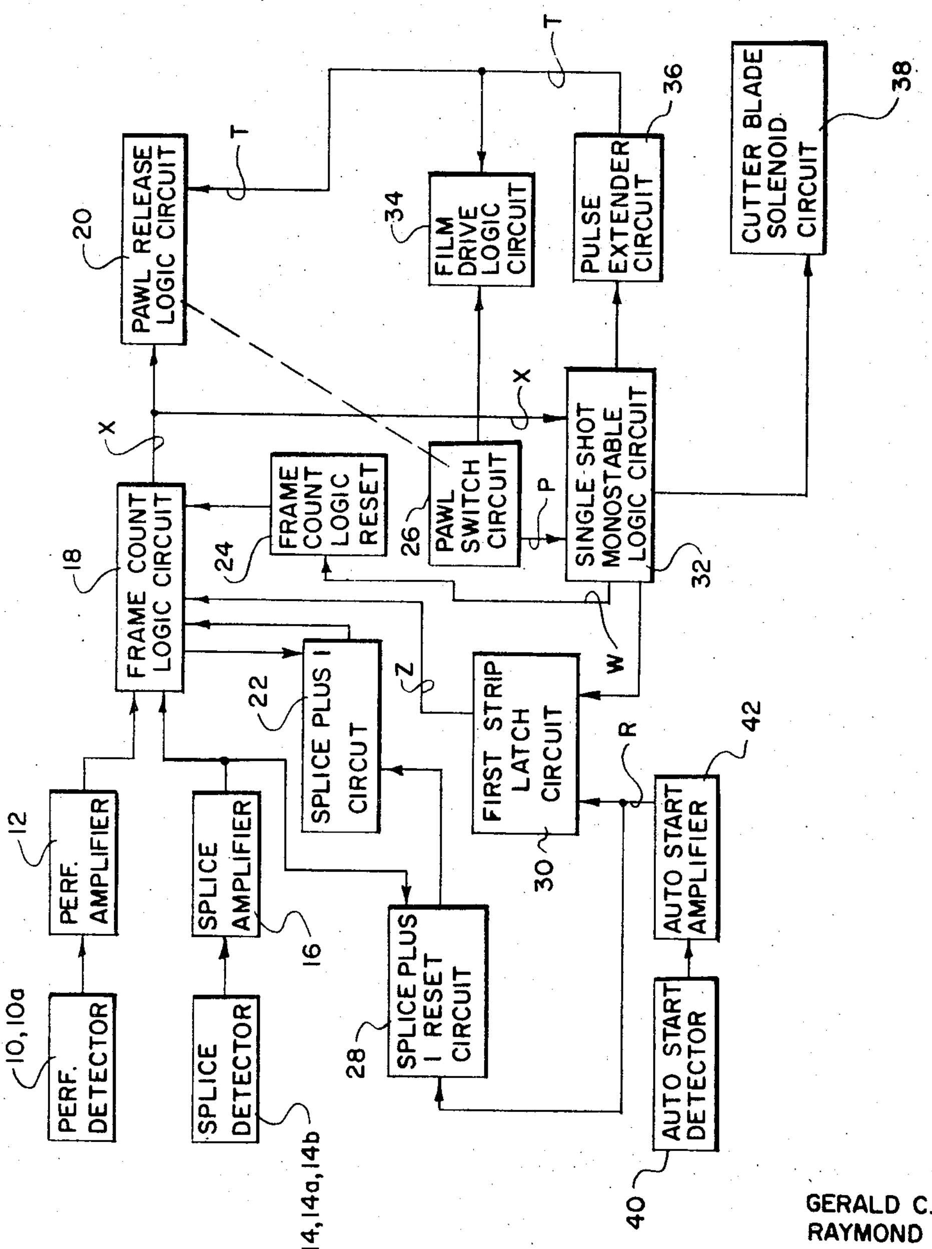

FIG.1A

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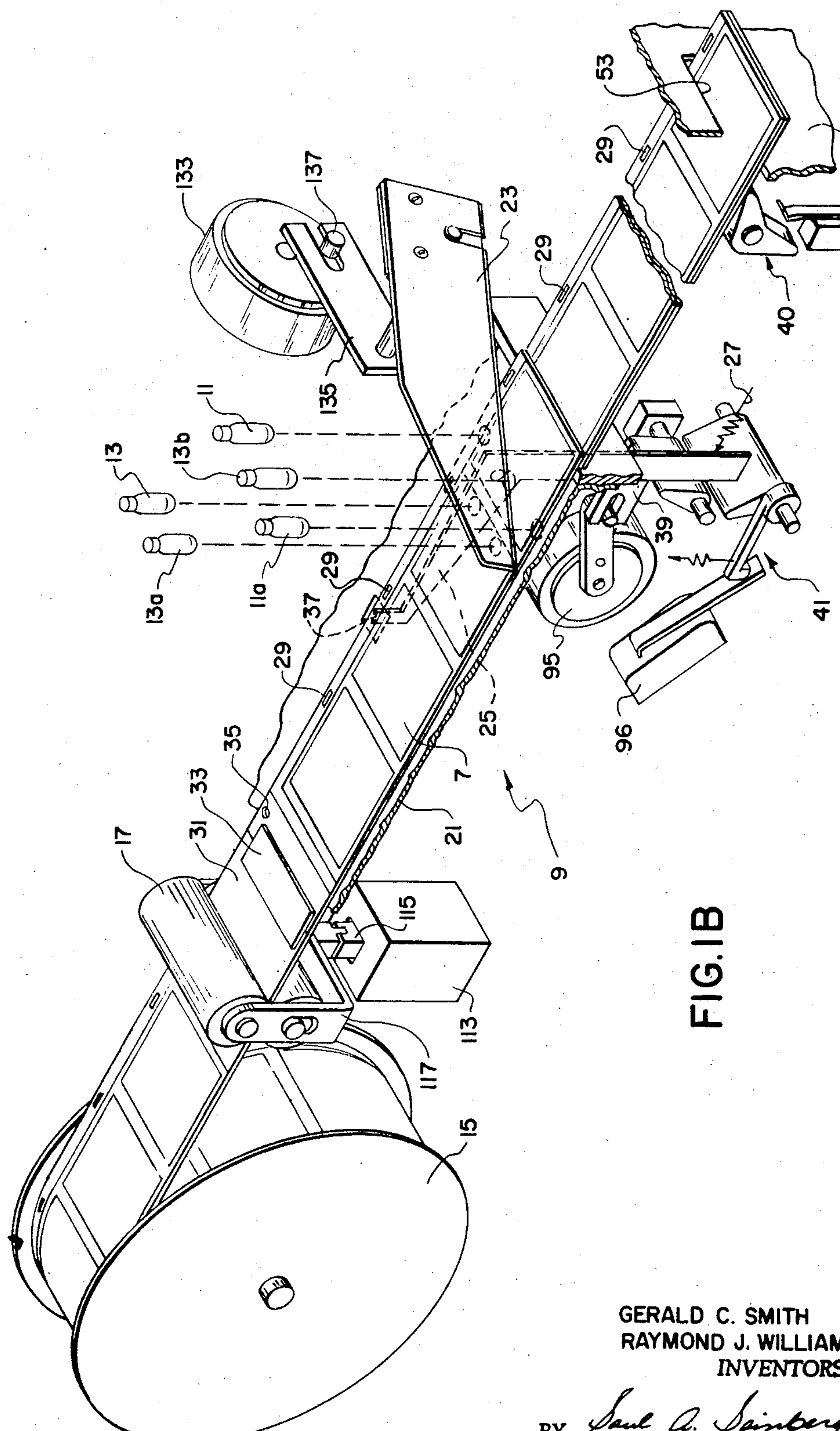

FIG.1B

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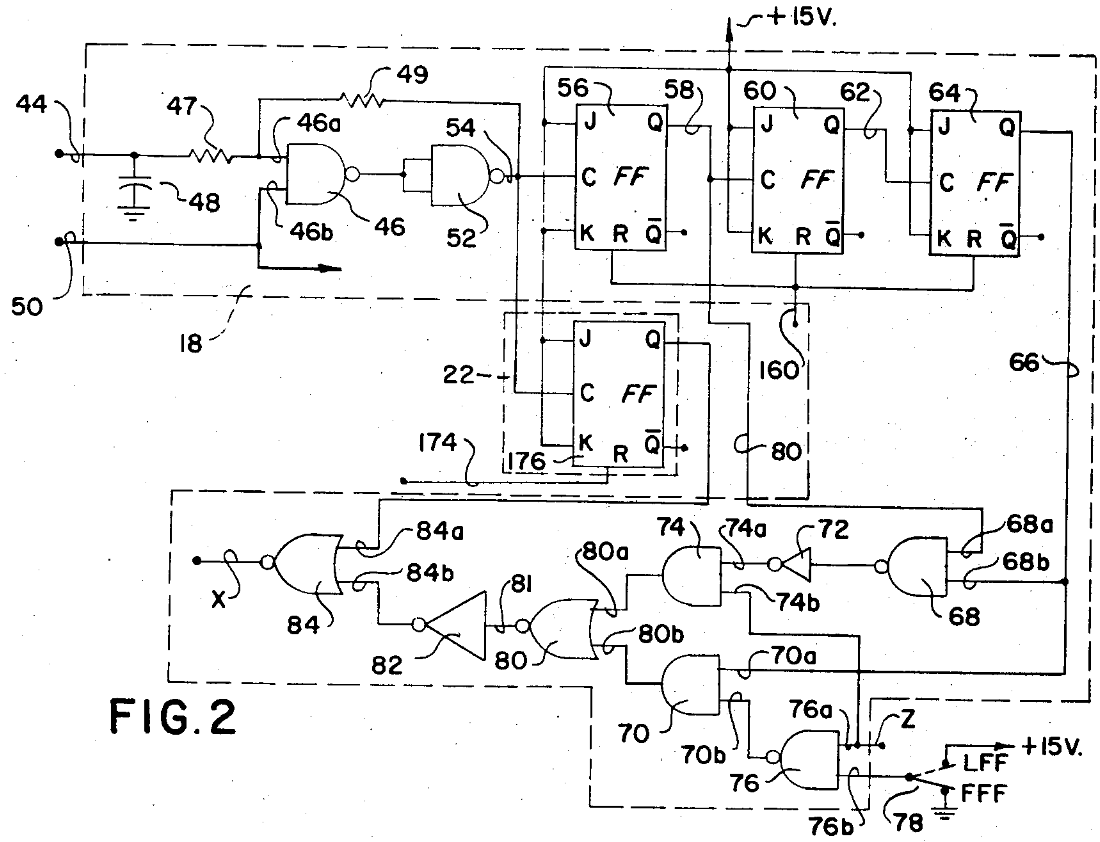
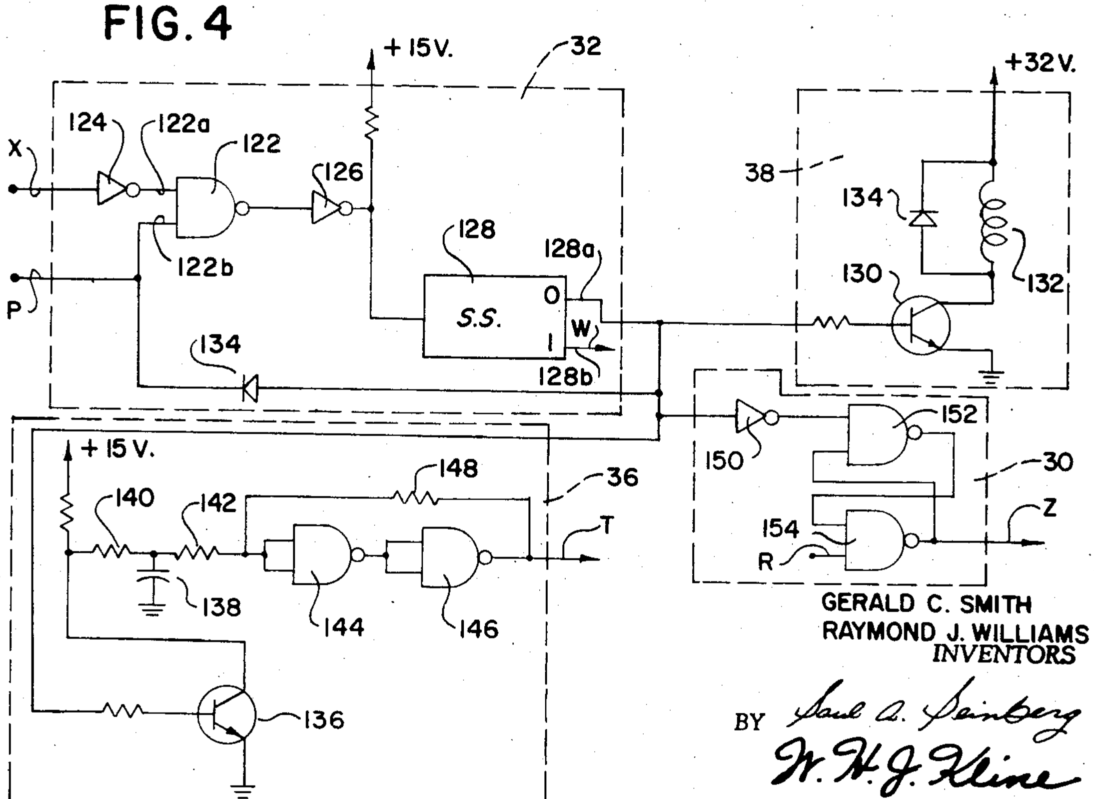


FIG. 2

FIG. 4



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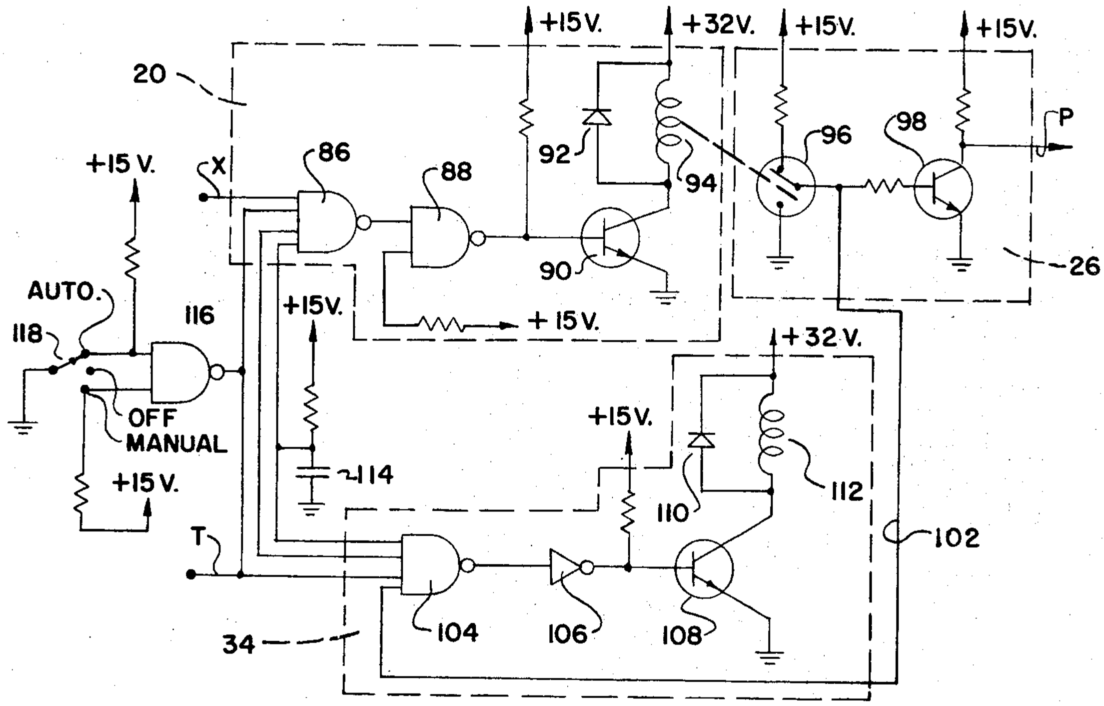
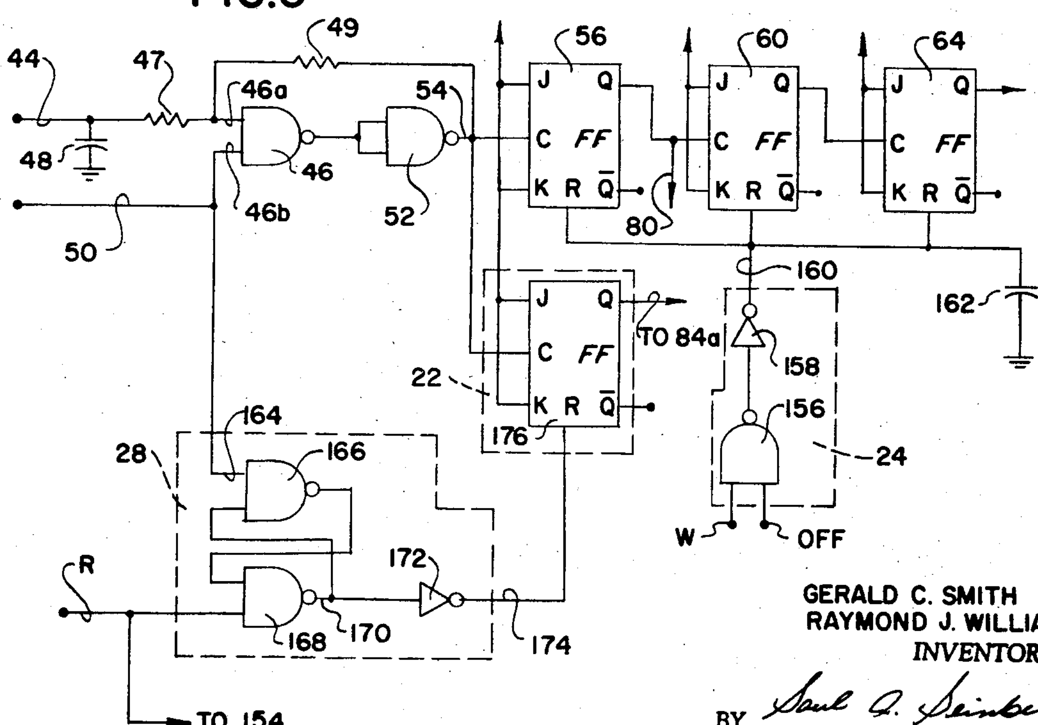


FIG.3

FIG.5



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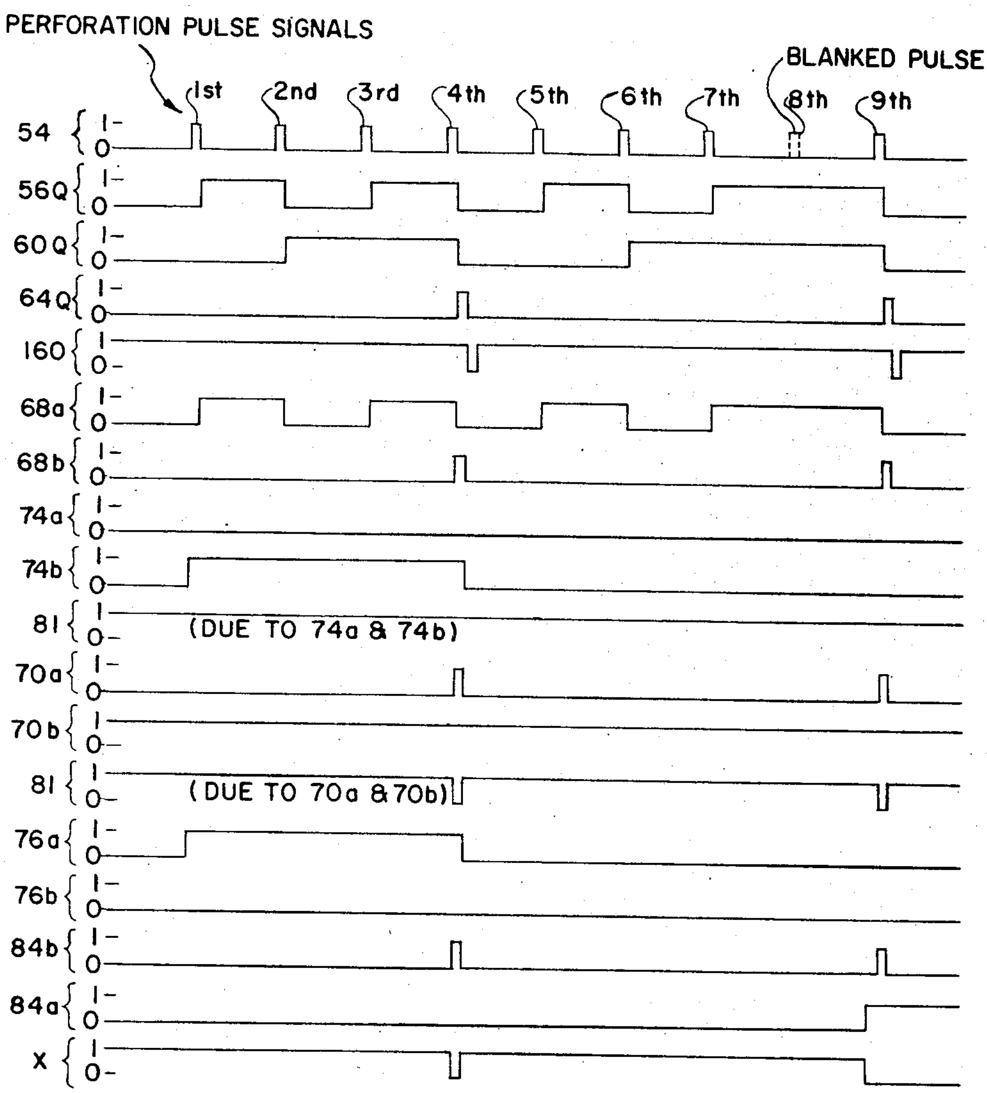

FIG.6

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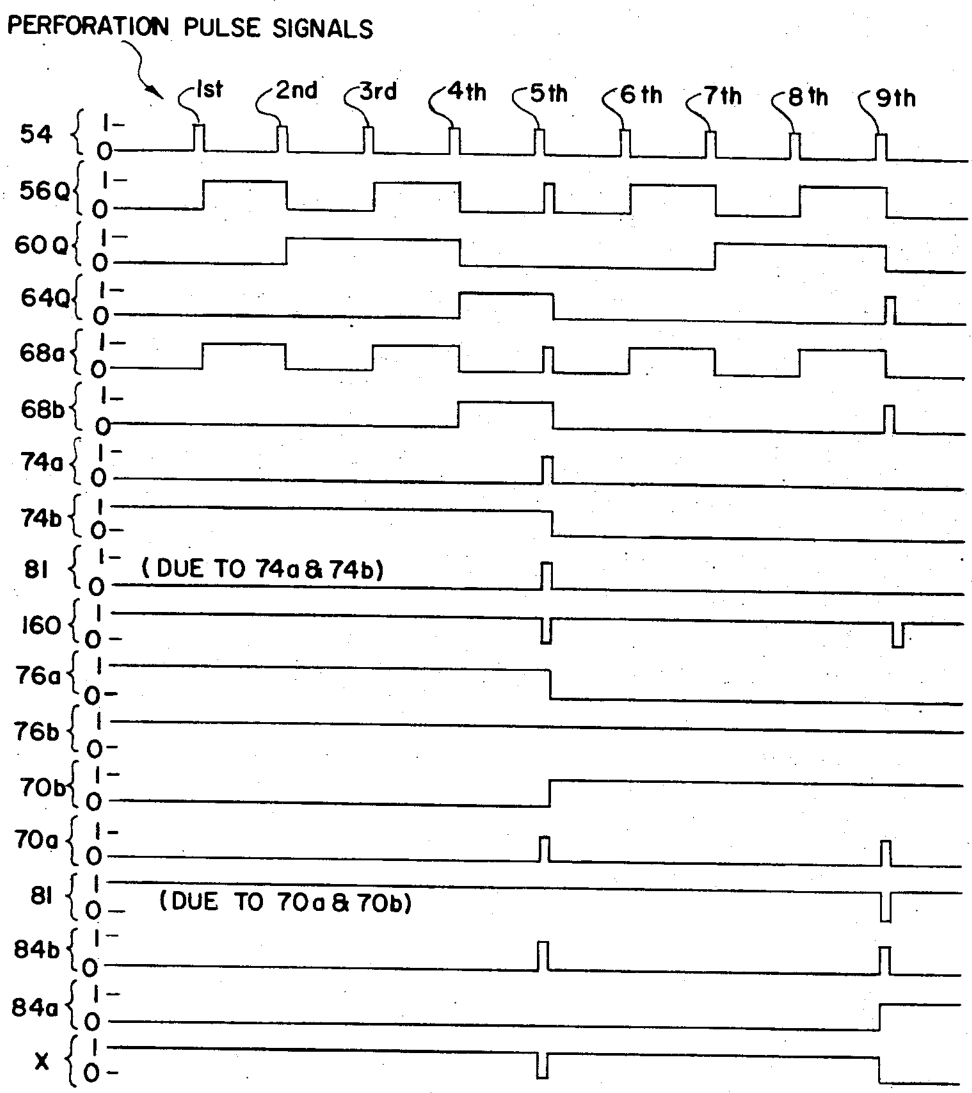

FIG.7

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CONTROL CIRCUIT FOR AUTOMATING THE OPERATION OF A FILM CUTTER OR LIKE APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

Reference is hereby made to commonly assigned, copending U.S. Pat. application Ser. No. 134,791, entitled APPARATUS FOR CORRELATING REJECTED PHOTOGRAPHIC PRINTS WITH CORRESPONDING PHOTOGRAPHIC NEGATIVES, filed in the name of Gerald C. Smith on Apr. 16, 1971; U.S. Pat. application Ser. No. 134,786, entitled APPARATUS FOR FACILITATING THE PACKAGING AND PRICING OF PHOTOGRAPHIC PRINTS, filed in the names of Thomas W. Bracken, Thomas C. Laughon and Gerald C. Smith on Apr. 16, 1971; U.S. Pat. application Ser. No. 134,787, entitled DISPENSING DEVICE FOR POCKETED ENVELOPES, filed in the name of James E. Ferris on Apr. 16, 1971; and U.S. Pat. application Ser. No. 134,788, entitled BIMODEL FILM CUTTER ADAPTED TO HANDLE DIFFERENT FILM WIDTHS, filed in the name of Thomas W. Bracken on Apr. 16, 1971.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to film cutter control apparatus and, more particularly, to the automated control of a film cutter which drives and cuts large, continuous rolls of film having regularly spaced edge perforations located in a predetermined orientation with respect to the exposed frames thereof, the continuous rolls being made up of spliced, intermingled rolls of 12 or 20 frames each.

2. Description of the Prior Art

In recent years, cameras which use 126 type film, such as the Kodak "Instamatic" camera line, have gained widespread popularity. Such cameras have especially gained extraordinary popularity with the neophyte and amateur photographer. This has resulted in increased volume for the photofinishing industry, which was consequently obliged to develop new equipment to cope with the increased processing demand.

Such cameras use film which has regularly spaced edge perforations and feature film drive mechanisms which advance such film in the camera, via these perforations, in substantially equal increments. Thus, the exposed film will have a given number of latent images or frames equally spaced thereon, each frame having one perforation associated therewith. Such a feature was a departure from what had been done heretofore with respect to perforated roll film, as for example in 35mm cameras, which use film having regularly spaced edge perforations which are in random orientation with respect to the exposed frames.

When the 126 type film is received from customers, the individual customer rolls, which may be of 12 or 20 frame length, are joined for processing by opaque splices to which are affixed a "twin-check" or coded label identifying a particular customer order. The large, continuous roll formed thereby is developed and printed. However, in order to return the finished order to the customer, the large roll of film must be cut, preferably for ease of handling, into segments which are even shorter than the lengths of the original 12 or 20 frame rolls received from the customer.

Various film cutters have been designed and are known in the prior art for achieving this result. Some of these film cutters are essentially manually operated and require constant operator interaction to achieve the desired results. An example of such a manual film cutter is the "Byers Film Cutter, Model 126," manufactured by the Byers Photo Equipment Company of Portland, Oregon. While such film cutters achieved the desired results, they were slow, required constant operator attention and ultimately prevented the film processor from fully reaping the benefits of automating other operations in the processing cycle.

In time, automated versions of film cutters became available and greatly reduced certain of the problems associated with the older manual type. An example of such a film cutter is the "Fox Continuous 126 Film Cutter," manufactured by Fox-Stanley Photo Products, Inc., of San Antonio, Texas. A typical control system for such a film cutter is disclosed in U.S. Pat. No. 3,464,624 issued to D. L. Becker and assigned to Fox-Stanley Photo Products, Inc.

In the control system disclosed in U.S. Pat. No. 3,464,624, the number of frames present in a delivered film segment is determined by control of a reciprocating film drive pawl through a predetermined number of strokes, each stroke corresponding to film advance of one frame. A photodetector is employed to sense the roll splices which causes the pawl to make one additional reciprocation. However, the disclosed control system is time dependent and does not actually count the number of frames advanced past the cutter blade. Thus, the reciprocating film drive pawl may not, for some reason, engage a film perforation, but will nevertheless continue to reciprocate through its complete cycle. For example, the film may jam upstream of the pawl and the control system will still reciprocate the pawl or, should the pawl fail to engage one or more film perforations, the ultimately severed film segment will not contain the desired number of frames.

SUMMARY OF THE INVENTION

It is, therefore, a primary object of the present invention to provide a control circuit for a film cutter which handles film of the type described which control circuit is reliable in operation.

It is another object of the present invention to provide such a control circuit which can sever a large continuous roll of film into segments of predetermined length.

It is yet another object of the present invention to provide a control circuit for a film cutter of the type described wherein control of the subdivided segment lengths is based on counting of the film perforations.

Accordingly, there is provided a control circuit in which a photodetector sensor monitors passage of the film and splice perforations. A counting circuit responsive to the periodic signals generated by the perforation photodetectors generates a "cut" signal after passage of a predetermined number of frames. The cut signal causes a pivotably mounted pawl in the film cutter to move. The pawl then rides under the still driven film coming into engagement with the next following film perforation, which result signals the film drive to stop. A singlesshot monostable now triggers movement of the cutting blade in response to pawl engagement and the presence of a "cut" signal thereby severing a predetermined length of film. The signal to the cutting blade, after a delay period longer than that required for a complete cutter blade cycle, automatically causes the pawl to disengage which, in turn, restarts film drive. This complete cycle is repeated until a splice photodetector, positioned one frame distance upstream from the perforation photodetector, senses a splice. A splice latch logic circuit, which is responsive to the splice detector output, is set and causes a signal to be generated which holds the pawl in engagement with the film perforation, which action prevents further film drive. Removal of the strips from an exit port provided therefor in the cutter housing actuates a switch which resets the control circuitry and automatically initiates the next cycle of operation.

A panel mounted mode switch enables a user to select either "First Frame First" (hereinafter FFF) or "Last Frame First" (hereinafter LFF) operation. Thus, the film cutter will operate as described regardless of whether the splice frame trails or leads the individual customer rolls.

Other objects and advantages of this invention will become apparent from the following description thereof, taken in connection with the accompanying drawings, wherein there is set forth by way of illustrative example, an embodiment of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1*a* illustrates a block diagram of film cutter control circuitry according to the present invention.

FIG. 1*b* illustrates in perspective a film cutter adapted to utilize the present invention as shown in FIG. 1*a*.

FIG. 2 is a logic diagram of the frame counting logic circuit and the splice plus one circuit used in the control circuitry of FIG. 1.

FIG. 3 is a combined schematic and logic diagram of the pawl release and film drive control circuit employed in the control circuitry of FIG. 1.

FIG. 4 is a combined schematic and logic diagram of the film cutting circuit used in the control circuitry of FIG. 1.

FIG. 5 is a logic diagram of the splice latch reset circuit employed in the control circuitry of FIG. 1.

FIG. 6 is a timing diagram illustrative of the states certain of the logic elements of FIG. 2 in the FFF mode of operation.

FIG. 7 is a timing diagram illustrative of the states of the elements identified in FIG. 6 when used in the LFF mode of operation.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings wherein like reference numerals have been used in the several views for like elements, FIG. 1*a* illustrates a block diagram of a control circuit for a film cutter of the type described fully in the above-identified U.S. Pat. application Ser. No. 134,788 and representatively illustrated in FIG. 1*b*. It will be assumed, for the initial portion of this discussion, that the large roll of film to be cut is arranged with the splice frame trailing the individual customer orders or rolls, the FFF mode of operation.

After a large roll of spliced film **15** has been properly mounted on the film cutter, the leading end of the film is passed between the film drive pinch rollers **17** and **19**, which are not drivingly engaged at this time. The film is thereafter slid along the film bed, with its edges being held by guide members positioned beside the film bed **21**, towards the cutter blade **23**. In some instances, the leading end of roll **15** will have a leader spliced thereto which may or may not contain edge perforations. In other instances, there will be no leader. In either event, with power on, the leading edge of the film is aligned approximately with the cutting plane by manually initiating the release of a pivotally mounted pawl **25** in the cutter, since when pawl release is effected, the film can more readily be slid over the bed. Once approximate alignment is achieved, pawl **25** is allowed to swing upward under the influence of resilient means **27** to positively engage a film or leader perforation **29**. If a perforationless leader is employed, the pawl will ride under the leader. Film drive is now initiated, in a manner to be hereinafter explained, causing the film to advance. If a leader has been utilized, the film will be advanced to the first splice frame and the leader will be severed. If a leader has not been used, the control circuit according to the present invention will cause the first customer order to be cut.

A perforation photodetector **10**, shown in FIG. **1***a*, is mounted in the cutter housing in alignment with the film perforations **29**. Although a number of such detectors may be used, one for each of the different film widths which can be handled by the film cutter **9** in each of its two possible orientations or modes of operation, only one is utilized for a given roll of film at one time. In FIG. **1***b*, the lamps **11**, **11***a*, **13**, **13***a* and **13***b* or radiation sources corresponding to each detector are shown for the sake of clarity, since the detectors or sensors themselves are hidden in the film cutter housing **55**. The perforation detector **10** generates a positive pulse for each perforation detected, which pulses are amplified, in a conventional manner, by the perforation amplifier **12**. The amplified pulses are fed to frame count logic circuit **18** which generates an output signal X or "cut" signal each time a predetermined number of pulses have been detected and received. In the preferred embodiment, the frame count logic circuit output signal X is generated in response to the receipt of four perforation pulses in the First Frame First mode of operation. It will be understood, however, that the count logic circuit **18** can be readily modified to generate an output signal in response to the receipt of any number of perforation pulses. Since each perforation pulse corresponds to the passage of one film frame, circuit **18** is more aptly identified as the frame count logic circuit **18**.

The frame count logic circuit output signal X is fed to a pawl release logic circuit **20** and a single-shot monostable logic circuit **32**. Receipt of signal X by the pawl release logic circuit **20** causes deengergization of pawl solenoid coil **94** which results in the pawl being released to swing upwards beneath the driven film. When the pawl **25** engages the next following perforation, pawl switch **96** is made, causing film drive to be shut off. As this happens, the single-shot monostable logic circuit 32 fires, generating an output pulse of fixed duration which, via frame count logic reset circuit 24, resets frame count logic circuit 18 to prepare it for the next series of perforation pulses. The output pulse signal from the single-shot monostable logic circuit 32 is also fed to the cutter blade solenoid circuit 38 which causes the cutting blade 23 to cycle and sever the four frame film segment advanced past the cutter blade 23. The output pulse signal from the single-shot monostable 32 is additionally fed to a pulse extender circuit 36 which passes it back to the pawl release logic circuit 20 and the film drive logic circuit 34, after expiration of a fixed delay period chosen to be greater than the time required for the cutting blade 23 to cycle. Receipt of the delayed single-shot output signal by the pawl release logic circuit 20, which has previously sensed the making of pawl switch 96, causes pawl solenoid coil 94 to be energized, pulling the pawl 25 out of engagement with the film perforation which resets the pawl switch circuit 26. This causes film drive to start again and the cutting of four frame film segments is automatically repeated until a splice 31 is sensed.

When the splice photodetector 14 detects a splice 31, it generates an output pulse in response thereto which is amplified in a conventional manner by splice amplifier 16. It is important to note that in FFF operation, perforation detector 10 and splice detector 14 are physically spaced apart by a predetermined distance which insures that a fourth occurring perforation pulse is sensed at the same time the splice frame 31 is sensed. Mode switch 78, when set to its FFF terminal switches in these detectors in a conventional manner.

The amplified splice pulse is fed to the splice plus one circuit 22 which then generates an output signal in response to the next following perforation pulse, hence the name "splice plus one." The output signal from the splice amplifier 16 is also fed to the frame count logic circuit 18 and causes it to ignore the perforation pulse signal which occurs simultaneously with the splice signal. On the next following perforation signal, the frame count logic circuit 18 generates its output signal, causing the pawl 25 to engage, film drive to stop and the cutter blade 23 to be actuated as described above. In this instance, however, due to the inhibiting of the frame count logic circuit 18 by the splice signal, the count of four frames is made over a five frame period. Consequently, five and not four frames of film are advanced past the cutter blade.

The presence of a splice signal causes the splice plus one circuit 22 to hold the output signal X of the frame count logic circuit 18 at that signal level which causes the pawl to remain engaged and film drive stopped. At this point, the control circuit according to the present invention, has caused the severance of the first customer order to be cut into a number of four frame segments and a single segment of five frame length which contains the splice frame bearing the "twin check" 33 or customer identification code. These film segments are delivered to and stacked in an exit port 53 in the cutter housing 55 from whence the operator can remove them for packaging in a customer order envelope, as described in the above-identified U.S. Pat. application Ser. Nos. 134,786 and 134,791.

Mounted in the film exit port 53 is an automatic start detector 40 which is employed to sense the operator's removal of the properly severed customer order. When those film strips are removed from the exit port, a signal indicative thereof is generated, amplified in a conventional manner by the automatic start amplifier 42, and then fed to the splice plus one reset circuit 28. The splice plus one reset circuit 28, as its name implies, resets the splice plus one circuit 22 which changes the state of output signal X from the frame count logic circuit 18. In response to this change, the pawl 25 is disengaged and film drive is started, resulting in the cutting of the next customer order. The signal from the automatic start amplifier 42 also resets the first strip latch circuit 30, which conditions the frame count logic circuit 18 for the following customer order, which result, as shall be hereinafter explained, is only significant in LFF operation.

Returning briefly to the beginning of this discussion, it will be recalled that the large continuous roll of spliced film 15 could be provided with or without a leader. As described above, if no leader is present, the first customer roll is processed by the film cutter under the influence and cooperation of the FIG. 1*a* circuits. If a leader is used, whether or not it has edge perforations 29, it is advanced through the film cutter 9 until the splice frame 31 by which it has been attached to the large roll of film 15 is sensed. This results in the leader being severed and, when removed from the exit port 53, the cutting of the first customer order. It should be noted that if the leader does not contain edge perforations, it will be advanced to and through the exit port 53 in one strip which includes its splice frame. If, on the other hand, the leader does contain edge perforations 29, it will be advanced, as described above, under the influence of the frame count logic circuit 18. If the leader perforations 29 total some multiple of 4, then it will be cut in the same manner as a customer order, that is, into a number of equal four frame length strips and a final strip of five frame length containing the splice frame. If the leader does not contain total perforations which are a multiple of four, the strips will not be cut in the manner described. It is also possible to have a leader of only four frame length or less plus the splice frame, in which event only one leader strip will be cut. In any event, when the leader splice 31 is sensed and then cut from the roll 15, the processing of the roll by the film cutter 9 can begin once the leader segment or segments are removed from the exit port 53.

As shown in FIG. 1*b*, the film 7 is advanced from the supply roll 15 to the cutter blade 23 by the action of pinch rollers 17 and 19. When the solenoid coil 112 of the film drive solenoid 113 is energized, armature 115 is pulled downward which also pulls down yoke assembly 117 to which it is connected. Pinch roller 17, which is rotatably mounted in yoke assembly 117, is thereby pulled down against the film 7 pressing it against the drive pinch roller 19. Pinch roller 19, with power on, is continuously rotated by a motor (not shown) of a conventional type. When solenoid coil 112 is deenergized, armature 115 and yoke assembly 117 are released and move upward, thereby lifting pinch roller 17 from the film and stopping film drive.

Pawl 25 is pivotally mounted below film bed 21 and is normally urged upwardly by resilient means 27 through the film bed opening 37. Pawl 25 is located so that it is in alignment with the film perforations 29.

When solenoid coil **94** of the pawl solenoid **95** is energized, it pushes the pawl **25**, via the pawl drive assembly **39**, against the bias of resilient means **27**, thereby forcing the pawl out of engagement with a film perforation **29**. When this occurs, pawl switch **96** is released through the action of the resiliently biased pawl switch contact assembly **41**. When solenoid coil **94** is deenergized, pawl **25** is pivoted upwardly by the action of resilient means **27**, but is restrained from reaching its ultimate rest position by the still driven film under which pawl **25** rides. Following deenergization of solenoid coil **94**, pawl **25** engages the next following film perforation **29**. This final movement of pawl **25** causes the pawl switch contact assembly **41** to make pawl switch **96**.

The cutter blade **23** is driven by the rotary cutter solenoid **133** and the cutter blade drive assembly **135** which is connected therebetween. When cutter solenoid coil **132** is energized, armature **137** is rotated causing the cutter blade drive assembly **137** to cycle cutter blade **23**. The driven cutter blade **23** will then sever the segment of film **7** advanced by the action of pinch rollers **17** and **19** past the cutting plane.

Referring now to FIG. **2**, there is illustrated the frame count logic circuit **18** and the splice plus one circuit **22**. The frame count logic circuit **18** for FFF operation works in the following manner. Signals from the perforation amplifier **12**, each of which represent film advance of one frame, are received via line **44** which comprises one input **46*a*** to NAND gate **46**. Capacitor **48** is connected between line **44** and ground and provides input noise suppression. Line **44** goes to a logical "high" (hereinafter HI) whenever a perforation is detected, remaining at a logical "low" (hereinafter LO) at all other times. Line **50** connects the output of splice amplifier **16** to NAND gate **46**. The output of splice amplifier **16** is HI in the absence of a splice, assuming a LO state when a splice is detected. In the FFF mode of operation, which is assumed at this point, the first perforations signal switches NAND gate **46**, causing its output to be set LO. Inverter **52** changes the state of this signal and transmits a HI pulse to the clock input of flip-flop **56** via line **54**. Resistors **47** and **49** are connected in the manner shown to and around gate **46** and inverter **52** and provide pulse shaping for the transmitted perforation pulses. The achieved pulse shaping insures that the negative-going transitions from inverter **52** are quick enough to toggle flip-flop **56**. The Q output of flip-flop **56** goes HI, in response to the negative-going transition of the received clock pulse or first perforation pulse and remains in that state. The second perforation pulse switches the Q output of flip-flop **56** back to LO, which negative-going transition is fed, via line **58**, to flip-flop **60**, causing its Q output to go HI. The third perforation pulse toggles flip-flop **56** once again, setting its Q output HI. Receipt of the fourth perforation pulse switches flip-flop **56** again causing its Q output to go LO. This negative-going transition toggles flip-flop **60** causing its Q output to go LO also. Then, via line **62**, this negative-going transition toggles flip-flop **64**, setting its output HI.

The Q output of flip-flop **64** is connected to one input **68*a*** of NAND gate **68** and to one input **70*a*** of AND gate **70**, respectively, by line **66**. The other input **68*b*** to NAND gate **68** is the Q output of flip-flop **56** with connection being made through line **80**. Since the Q output of flip-flop **58** is LO when the Q output of flip-flop **64** goes HI, in response to a perforation count of four, the output of NAND gate **68** remains HI. Inverter **72** reverses this, feeding a LO signal to one input **74*a*** of AND gate **74** holding its output LO.

The panel mounted mode switch **78** has been set for FFF operation, which holds input **76*b*** to NAND gate **76** LO. This maintains its output and input **70*b*** to AND gate **70** HI. When the other input line **70*a*** to AND gate **70**, which is connected to the Q output of flip-flop **64** via line **66**, goes HI in response to a count of four, AND gate **70** is switched, setting its output HI. The transition of the output of AND gate **70** to HI, switches NOR gate **80** to which it is connected. In response thereto, the output of NOR gate **80** goes LO, sending input **84*b*** to NOR gate **84** HI, as a result of signal inversion by inverter **82**. When the input to NOR gate **84** goes HI, its output line X goes LO.

As schematically illustrated in FIG. **3**, line X is connected to NAND gate **86**. Since the other inputs to NAND gate **86** are normally HI, as is the signal on line X, the transition of line X to LO in response to a count of four perforations switches the output of NAND gate **86** from LO to HI. This causes NAND gate **88** to switch to LO, which turns off transistor **90**. When transistor **90** is turned off, current flow through the pawl solenoid **94** is halted, which releases the pawl. Once released, the pawl **25** under the influence of its biasing means **27**, is urged upward where it rides under the still driven film. Diode **92** is connected around pawl solenoid coil **94** and serves to provide a protective discharge or quenching path therefor when transistor **90** is switched off.

When the next following film perforation passes the pawl **25**, it swings fully upward engaging that perforation making the magnetic reed pawl switch **96**. When pawl switch **96** is made, line **102** goes LO and transistor **98** is shut off. This causes line P to go HI and the output of NAND gate **104**, the inputs of which are all normally HI, to be switched LO. In response thereto, transistor **108** is turned off, removing current flow from the film drive solenoid coil **112**. Actuation of the film drive solenoid coil **112** releases pinch roller **17**, otherwise in driving contact with the film **7**, which terminates film drive.

As is also shown in FIG. **3**, the function switch **118**, when set to AUTO, maintains one input to each of NAND gates **86** and **104** HI through NAND gate **116**. Line T, which is normally HI, does the same for another input to each of NAND gates **86** and **104**. Jam relay **114**, in the absence of film jam, is normally open which maintains still another input to each of NAND gates **86** and **104** HI. The remaining input to NAND gate **86**, line X, is normally HI, as explained above. The remaining input to NAND gate **104**, line **102**, is normally HI, as also explained above. Thus, when line X goes LO in response to a count of four film perforations, the pawl solenoid coil **94** is deenergized allowing the pawl **25** to swing upwards where it rides under the still driven film, whereupon engagement of the next following film perforation by the pawl **25**, makes pawl switch **96**, shutting off film drive after four frames of film have been advanced past the cutter blade.

As previously described, when pawl switch **96** is made, transistor **98** is switched off, setting line P HI. It should be noted that line P is normally LO since when transistor **98** is switched on, its collector is at substantially ground potential. As shown in FIG. **4**, line P serves as one input to NAND gate **122**, line X serving as the other input through inverter **124**. Thus, when line X goes LO in response to a count of four perforations and line P goes HI, meaning that the pawl is engaged and film drive has been halted, NAND gate **122** is switched LO and inverter **126** HI triggering the single-shot monostable **128**. It will be noted that with both the pawl engaged and film drive halted, it is now safe to cut the film. When the single-shot monostable **128** is fired, its normally LO output **128***a* goes HI, in a known manner, for a period fixed by the values of its internal components. Output line **128***b*, on the other hand, goes LO during this period. When line **128***a* goes HI, Darlington transistor **130** is switched on, drawing current through the cutter blade solenoid coil **132**. This causes the solenoid coil **132** to actuate the cutter blade **23**, pulling it down through the film which severs the four frame length of film previously advanced past the cutter blade **23**. Diode **134** is connected in parallel about solenoid **132** to provide a discharge path for the current induced by the collapsing field resulting from removal of current flow through the solenoid coil **132** when transistor **130** is shut off.

The normally LO output **128***a* of the single shot monostable **128** is also connected to the base of transistor **136**. When monostable **128** fires, transistor **136** is turned on, causing the collector thereof to be pulled down to substantially ground potential or LO. This causes the output T of the pulse extender circuit **36** to go LO. Resistors **142** and **148** are connected around and in series, respectively, with back-to-back inverters **144** and **146** to provide pulse shaping. These elements cooperate to insure that when transistor **136** is switched on, the negative-going transition on line T is rather steep or quick.

When the output line **128***a* of monostable **128** goes LO at the end of the single shot time period, transistor **136** turns off since its base-emitter junction is no longer forward biased. The output of inverter **146** would ordinarily go HI at this point. However, before it can go HI, capacitor **138** must be charged through resistor **140**. The time constant for the charging rate is dependent obviously on the resistance and capacitance values of resistor **140** and capacitor **138**. The values are selected so that the time required for the output of inverter **146** to switch from LO to HI, after the single-shot monostable **128** turns off, is greater than the time required for the cutter blade to complete its cycle of operation. In this manner, the transition time of a signal change on line T when switched from LO to HI is extended by a period which is safely greater than that required for completion of a cutting cycle. It should be noted that when transistor **136** is switched on by the firing of monostable **128**, capacitor **138** discharges through resistor **140** to ground in preparation for the next transition.

The firing of monostable **128** is also sensed by the first-strip latch circuit **30** comprised of inverter **150** and latch connected NAND gates **152** and **154**. When line **128***a* goes HI, inverter **150** causes a LO pulse on the input to latch NAND gate **152** which sets the latch **30**, causing its output line Z to be set LO. Line R carries the output signal from the automatic start detector amplifier **42**. When film is advanced towards the exit port **53** in the cutter housing **55**, the automatic start detector **40** senses this and causes line R, which is otherwise LO, to go HI. Detector **40** is located so that from the start or aligned position, advancement of one frame towards and through the exit port sets line R HI. When monostable **128** fires, the first strip latch **30** is set causing line Z to go LO. Line Z then remains LO until the film strips are removed by the operator from the exit port **53**.

Diode **134** is connected between input **122***b* to NAND gate **122** and the output line **128***a* of monostable **128**. It provides an interlock which insures that the cutter blade will not be caused to cycle as a result of a spurious signal. Should monostable **128** fire accidentally, the cutter solenoid **132** will be energized, even though line X has not been set LO, which would be the case after four perforations have been counted. In the event of an accidental trigger of monostable **128**, line X is HI, but line P is LO as previously explained. Thus, when the spurious firing of monostable **128** occurs, if it does, diode **134** becomes forward biased rendering it conductive. This result pulls the base of transistor **130** substantially to ground preventing it from becoming forward biased and switching on, which would otherwise actuate solenoid **132** and the cutter blade. Diode **134**, therefore, acts as a safety interlock which prevents transistor **130** from being switched on until line X goes LO, meaning four perforations have been counted, and line P goes HI, meaning the pawl **25** has been engaged and film drive has been stopped.

When the monostable fires, line W or output **128**b, goes LO for the duration of the single-shot period. As shown in FIG. **5**, this transition is sensed by NAND gate **156** on one of its input lines. The other input line to NAND gate **156**, the $\overline{\text{OFF}}$ line, is normally HI with power on, so that the transition on line W from HI to LO when monostable **128** fires, causes the output of NAND gate **156** to be set HI. Inverter **158** connected thereto, in turn, feeds a LO signal pulse to the reset terminals of flip-flops **56**, **60** and **64** via line **160**. This reset pulse readies flip-flops **56**, **60** and **64** for the next series of perforation pulses to be counted.

As discussed above, line T goes HI at the expiration of the extending period provided by the RC time constant of resistor **140** and capacitor **138**. When line T goes HI, NAND gate **86**, see FIG. **3**, is switched since line X has already set HI via the action of the frame count logic reset circuit **24**. When NAND gate **86** is switched in this case, its output goes LO causing NAND gate **88** to be switched HI which removes forward bias from the base-emitter junction of transistor **90** energizing the pawl solenoid coil **94**. As the pawl **25** drops out of engagement with the film perforation, pawl switch **96** is released turning on transistor **98** which causes line P to return to a LO signal level. At the same time, input line **102** to NAND gate **104** goes HI switching that gate's output LO and energizing the film drive solenoid coil **112** by turning on transistor **108**. This causes the pinch roller **17** to be pulled down by the solenoid **113**, allowing pinch roller **17** to contact the film and commence film drive.

The above-described cycle of operation is repeated, that is, a four frame film segment is periodically and automatically cut, until a splice frame **31** is sensed. It should be noted that the splice frame **31** does have an edge perforation **35**, see FIG. 1*b*, although it may not be of the same configuration as the film edge perforations. The splice perforation **35** is generally in pitch, that is equispaced from the film edge perforations **29**, although slight shifts in its location can be readily accommodated. It has been found that acceptable performance is possible even though the splice perforation **35** is shifted as much as ±½ frame from an in-pitch location. When the splice detector **14** which is located upstream of the perforation detector **10** senses a splice **31**, line **50** is set LO (see FIG. **2**). This causes the output of NAND gate **46** to be held HI, even though a perforation pulse has been detected. Thus, when a splice frame **31** is detected, a simultaneously occurring perforation pulse is blocked or blanked and thereby prevented from clocking flip-flop **56**. Since the next perforation pulse will toggle flip-flop **56**, film drive will then cease and a film segment of five frame length, including the splice frame **31** will be severed. In the presence of a splice frame **31**, therefore, the asynchronously connected flip-flops **56, 60** and **64** will count four out of five perforation pulses, rather than the four consecutive perforation pulses counted when a splice frame **31** is not detected.

Referring now to FIG. **5**, it is shown that line **50** is connected to the "set" terminal **164** of the splice plus one reset circuit **28**. When a splice is detected and line **50** goes LO, the splice latch, comprised of NAND gates **166** and **168**, is switched setting output line **170** LO. The reset line of the splice latch is connected to the automatic start amplifier **42** via line R which is now HI, film having been advanced past the automatic start detector **40**. When output line **170** goes LO, inverter **172** causes a HI pulse signal to be applied, via line **174** to the reset terminal of the splice plus one flip-flop **176**. Since line **174** normally carries a LO signal in the absence of a splice pulse, flip-flop **176** is not affected by pulses appearing at the output of inverter **52**. However, once enabled by the splice plus one reset circuit **28**, flip-flop **176** is toggled by the next following perforation pulse. When this occurs, see FIG. **2**, the Q output of flip-flop **176** is switched HI setting input **84***a* of NOR gate **84** HI. This makes the signal on line X LO and, as previously described, causes the pawl **25** to swing upward riding under the still driven film to then engage the following film perforation, which turns off film drive and causes the film to be severed. In this instance, due to the blanking effect of the splice signal, the cut is effected on the fifth perforation pulse rather than on the fourth.

It will be recalled that when the four frame length segments were cut, film drive and subsequent severance of additional four frame length segments was automatic. This was due to the fact that the signal on line X was switched from LO to HI in response to the resetting of flip-flops **56, 60** and **64** and the resetting of line T (see FIG. **3**) HI after the pulse extender circuit **36** times out. In this case, input line **84**b is again switched from HI to LO in response to the resetting of flip-flops **56, 60** and **64**, which would ordinarily, in the absence of a splice, reset line X HI. However, input line **84***a*, due to the sensing of the splice frame and the following film perforation, has been set to and remains HI. This causes line X to remain LO resulting in, among other things, a lack of film drive. However, when the operator removes all of the severed film segments from the exit port, the signal on line R goes LO resetting the splice plus one reset circuit **28**, which, in turn, resets flip-flop **176** causing its Q output and input line **86***a* to NOR GATE **84** to be set LO. In response thereto, the signal on line X goes HI which causes the pawl **25** to disengage and film drive to start.

FIG. **6** illustrates the time-based relationships in FFF operation of the pertinent signals and the element inputs or outputs where they appear for the logic elements of FIG. **2**. The element reference numeral and/or the corresponding line on which the illustrated signals appear is set forth in the extreme left-hand portion of the drawing.

In the LFF mode of operation, the splice frame appears at the leading end of the customer order and so, the strip segments are cut in reverse order. That is, the first segment will be of five frame length and the remaining segments will be of four frame length. The control circuitry, with switch **78** set to its LFF terminal, as shown in phantom in FIG. **2**, works as follows. The leading end of the film is aligned as previously described. With output line Z of the first strip latch circuit **30** set HI by the starting conditions and input line **76***b* set HI by switch **78**, both inputs to NAND gate **76** are HI, causing its output and input line **70**b to be LO. This condition holds the input line **80***b* to NOR gate **80** LO. With input line **74***a* LO because the Q outputs of flip-flops **56** and **64** are LO, input **80***a* to NOR gate **80** is also LO. With both of its inputs set LO, NOR gate **80**'s output is HI, causing input line **84***b* to NOR gate **84** to be LO. Since the splice detector does not detect the forwardly aligned splice, input line **84***a* is also LO. This leaves a HI signal on line X and film drive commences, as previously described. When the fourth perforation signal is counted, line **68***a* to NAND gate **68** is LO, thereby maintaining input line **80***a* to NOR gate LO. Input line **80***b* is also LO since the output of AND gate **70** remains LO under the influence of its input line **70**b which is still LO. On the fifth perforation signal, the Q output of flip-flop **56** is set HI. This transition has no effect on flip-flop **60**, which is only toggled by negative-going transitions from the Q output of flip-flops **56**. Flip-flop **64** is likewise unaffected by the Q output transition of flip-flop **56**, since flip-flop **60** has not been toggled, and its Q output remains HI. Now, after the fifth perforation pulse and a corresponding film advancement of five frames, including the splice frame, input lines **68***a* and **68***b* to NAND gate **68** are both HI causing its output to go LO. Inverter **72** sets input line **74** *a* HI in response and with input line **74**b already HI, AND gate **74** switches setting input line **80***a* of NOR gate **80** HI. This chain of events, causes line **81** to go LO and input line **84***b* to go HI. As previously discussed, when one of the input lines to NOR gate **84** goes HI, line X is set low, causing pawl **25** to move upward where it is eventually engaged, stopping film drive and causing the advanced strip of film to be cut. This happens because monostable **128** is triggered resetting the first strip latch circuit **30** which causes the signal on line Z to be set LO. This result returns the logic gates

70, 74, 76 and 80 to their FFF mode of operation interaction so that the following strips of advanced and severed film contain only four frames.

FIG. 7 illustrates the time-based relationships in LFF operation of the pertinent signals and the element inputs and/or outputs where they appear for the logic elements of FIG. 2. The element reference numeral and/or the corresponding line on which the illustrated signals appear is set forth in the extreme left-hand portion of the drawing.

As previously noted, setting switch 78 to its LFF terminal, switches in a different splice detector 10*a* and a different perforation detector 14*a*, as well as corresponding lamps 11*a* and 13*a* (see FIG. 2). These detectors are physically spaced so that the splice frame is sensed prior to a corresponding fourth perforation. It will be recalled that in FFF operation, the splice and perforation detectors, 10 and 14 respectfully, and their corresponding lamps 11 and 13, were arranged so that the splice frame and the fourth perforation were sensed at substantially the same time which resulted in the fourth perforation pulse signal being blanked by NAND gate 46. In LFF operation, detectors 10*a* and 14*a* are arranged so that the splice frame is sensed prior to the sensing of the fourth perforation pulse. Consequently, in LFF operation, the splice frame pulse, signifying the start of the following customer order, resets the splice plus one reset circuit 28 which, in turn, sets line 174 HI, enabling flip-flop 176. The next following perforation pulse signal, which is the fourth perforation pulse signal in LFF operation, causes the Q output of flip-flop 176 to go HI which causes the signal on line X to go LO. This transition causes the pawl 25 to engage, film drive to stop and the advanced four frame length of film to be cut, as previously described. The customer order is now completely and properly severed.

Since the Q output of flip-flop 176 remains HI, film drive remains inhibited, until the severed strips are removed from the exit port 53 of the film cutter 9. When these strips are removed, the splice plus one reset circuit 28 is reset causing the Q output of flip-flop 176 to go LO. This starts film drive again as previously described.

Removal of the film strips from the exit port 53 also resets the first strip latch circuit 30 allowing, in LFF operation, each of the first cut segments of a customer order to be of five frame length. While the first strip latch circuit 30 is also reset in FFF operation, the transition has no logical importance since input line 76*b* to NAND gate 76 is always LO due to the position of mode switch 78.

It is also worthwhile to note that a bad splice frame, that is one where the film edges are not abutting, may cause the perforation detector 10 to generate a pluse signal where no perforation actually is present. To avoid this, an additional splice detector 14*b*, and a corresponding lamp 13*b*, is employed and positioned in alignment with the perforation detector 10, that is detectors 10 and 14*b* are positioned side-by-side. Thus, if a spurious perforation signal is sensed due to a splice frame abnormality, detection of the splice frame 31 by detector 14*b* causes the NAND gate 46 to blank or ignore the false perforation pulse signal. Since the splice plus one reset circuit 28 has already been latched by the sensing of the splice by detector 14, no further changes or transitions are caused by the splice pulse signal from detector 14b. The splice detector 14*b* arrangement is used only in FFF operation. It is not needed in LFF operation since four frames have been counted and pawl 25 engaged prior to the possible arrival of the false signal.

Finally, except as otherwise specifically noted, all the various resistors shown in FIGS. 2–5 serve as current limiting elements and are not consequently identified by reference numerals.

The invention has been described in detail with particular reference to a preferred embodiment thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

We claim:

1. Apparatus for automating the operation of a film cutter of the type having continuously energized film drive means for driving film from a large, continuous roll made up of smaller customer orders spliced together, the film having regularly spaced edge perforations each of which corresponds to one of the exposed frames thereon and the splice frame which trails each customers order having an edge perforation substantially in pitch with the film edge perforations, to a cutter blade for the severance of each customer order into a number of segments each of which contains an equal predetermined number of frames, one segment of which additionally contains the splice frame, said apparatus comprising:

a. perforation sensing means for detecting the passage of the film and splice edge perforations when the film is driven thereby and for generating an output signal in response to the passage of each perforation;

b. splice sensing means for detecting the passage of the splice frames when the film is driven thereby and for generating an output signal in response to the passage of each splice frame, said splice sensing means being located ahead of said perforation sensing means by a distance which insures that the detection of a splice frame, when present, will occur simultaneously with the detection of the edge perforation corresponding to the last of the predetermined number of frames;

c. first circuit means responsive to said output signals of said perforation sensing means and said splice sensing means for counting said perforation sensing means output signals and for generating an output signal when the predetermined number of perforation sensing means output signals have been counted, said first circuit means including circuit means for blanking a perforation sensing means output signal occurring simultaneously with an output signal from said splice sensing means to thereby delay the generation of an output signal by said first circuit means until the following output signal from the perforation sensing means is received; and

d. second circuit means responsive to output signals from said first circuit means cooperatively connected to the film drive means, said first circuit means and the cutter blade for sequentially disabling the film drive means and actuating the cutter blade in response to the generation of an output signal by said first circuit means, for resetting said first circuit means to count the next series of perforation sensing means output signals and for enabling the film drive means in the absence of said first circuit means output signals.

2. The apparatus according to claim 1 wherein said second circuit means includes delay means for preventing said second circuit means from enabling the film drive means in the absence of said first circuit means output signals until after the cutter blade has completed its cutting cycle.

3. The apparatus according to claim 2 wherein said second circuit means further includes resettable circuit means responsive only to the first output signal of said perforation sensing means following generation of an output signal by said splice sensing means for maintaining the drive means in a disenabled state after the film segment containing the predetermined number of frames and the splice frame has been severed.

4. The apparatus according to claim 3 wherein the film cutter has an exit port in which the severed film segments are stacked, said apparatus additionally comprising automatic start sensing means coupled to said resettable circuit means and positioned near the exit port for detecting removal of the severed film segments therefrom and for generating an output signal indicative thereof, said automatic start sensing means output signal resetting said resettable circuit means when generated to enable the film drive means.

5. The apparatus according to claim 4 which additionally comprises a second splice sensing means for detecting the passage of the splice frames when the film is driven thereby and for generating an output signal in response to the passage of each splice frame, said second splice sensing means being located alongside said perforation sensing means and connected to said first circuit means to cause it to blank any spurious output signal generated by said perforation sensing means in response to an improper splice of two successive customer orders.

6. Apparatus for automating the operation of a film cutter of the type having a continuously energized film drive means for driving film from a large, continuous roll made up of smaller customer orders spliced together, the film having regularly spaced edge perforations each of which corresponds to one of the exposed frames thereon and the splice frame which trails each customer order having an edge perforation substantially in pitch with the film edge perforations, to a cutter blade for the severance of each customer order into a number of segments each of which contains an equal predetermined number of frames, one segment of which additionally contains the splice frame, the film cutter also having a pivotally mounted pawl therein biased towards the film for engagement with a film perforation and movable to a disengaged position, said apparatus comprising:

a. perforation sensing means for detecting the passage of the film and splice edge perforations when the film is driven thereby and for generating an output signal in response to the passage of each perforation;

b. splice sensing means for detecting the passage of the splice frames when the film is driven thereby and for generating an output signal in response to the passage of each splice frame, said splice sensing means being located ahead of said perforation sensing means by a distance which insures that the detection of a splice frame, when present, will occur simultaneously with the detection of the edge perforation corresponding to the last of the predetermined number of frames;

c. first circuit means responsive to said output signals of said perforation sensing means and said splice sensing means for counting said perforation sensing means output signals and for generating an output signal when the predetermined number of perforation sensing means output signals have been counted, said first circuit means including circuit means for blanking a perforation sensing means output signal occurring simultaneously with an output signal from said splice sensing means to thereby delay the generation of an output signal by said first circuit means until the following output signal from the perforation sensing means is received;

d. second circuit means responsive to output signals generated by said first circuit means cooperatively connected to the pawl for holding it in its disengaged position in the absence of output signals from said first circuit means and for allowing the pawl to be biased towards engagement with a film perforation in response to generation of an output signal by said first circuit means; and

e. third circuit means responsive to output signals generated by said first circuit means and to the position of the pawl cooperatively connected to the film drive means, said first circuit means and the cutter blade for sequentially disabling the film drive means and actuating the cutter blade in response to the generation of an output signal by said first circuit means only if the pawl has engaged a film edge perforation, for resetting said first circuit means to count the next series of perforation sensing means output signals and for enabling the film drive means in the absence of said first circuit means output signals only if the pawl has been moved to its disengaged position.

7. The apparatus according to claim 6 wherein said second circuit means includes delay means for preventing said second circuit means from enabling the film drive means in the absence of said first circuit means output signals until after the cutter blade has completed its cutting cycle.

8. The apparatus according to claim 7 wherein said third circuit means includes resettable circuit means responsive only to the first output signal of said perforation sensing means following generation of an output signal by said splice sensing means for allowing the pawl to be biased towards engagement with a film perforation and for maintaining the drive means in a disabled state after the film segment containing the predetermined number of frames and the splice frame has been severed.

9. The apparatus according to claim 8 wherein the film cutter has an exit port in which the severed film segments are stacked, said apparatus additionally comprising automatic start sensing means coupled to said resettable circuit means and positioned near the exit port for detecting removal of the severed film segments

therefrom and for generating an output signal indicative thereof, said automatic start sensing means output signal resetting said resettable circuit means when generated to move the pawl to its disengaged position and then enable the film drive means.

10. The apparatus according to claim **9** which additionally comprises a second splice sensing means for detecting the passage of the splice frames when the film is driven thereby and for generating an output signal in response to the passage of each splice frame, said second splice sensing means being located alongside said perforation sensing means and connected to said first circuit means to cause it to blank any spurious output signal generated by said perforation sensing means in response to an improper splice of two successive customer orders.

11. Apparatus for automating the operation of a film cutter of the type having a continuously energized film drive means for driving film from a large, continuous roll made up of smaller customer orders spliced together, the film having regularly spaced edge perforations each of which corresponds to one of the exposed frames thereon and the splice frame which leads each customer order having an edge perforation substantially in pitch with the film edge perforations, to a cutter blade for the severance of each customer order into a number of segments each of which contains an equal predetermined number of frames, one segment of which additionally contains the splice frame, said apparatus comprising:

a. perforation sensing means for detecting the passage of the film and splice edge perforations when the film is driven thereby and for generating an output signal in response to the passage of each perforation;

b. splice sensing means for detecting the passage of the splice frames when the film is driven thereby and for generating an output signal in response to the passage of each splice frame, said splice sensing means being located ahead of said perforation sensing means by a distance which insures that the detection of a splice frame, when present, will occur and be completed prior to the detection of the edge perforation corresponding to the last of the predetermined number of frames;

c. first circuit means responsive to said output signals of said perforation sensing means and said splice sensing means for counting said perforation sensing means output signals and for generating an output signal when the predetermined number of perforation sensing means output signals have been counted, said first circuit means including circuit means for increasing the count of said first circuit means by one only for the first segment cut from each customer order; and

d. second circuit means responsive to output signals from said first circuit means cooperatively connected to the film drive means, said first circuit means and the cutter blade for sequentially disabling the film drive means and actuating the cutter blade in response to the generation of an output signal by said first circuit means, for resetting said first circuit means to count the next series of perforation sensing means output signals and for enabling the film drive means in the absence of said first circuit means output signals.

12. The apparatus according to claim **11** wherein said second circuit means includes delay means for preventing said second circuit means from enabling the film drive means in the absence of said first circuit means output signals until after the cutter blade has completed its cutting cycle.

13. The apparatus according to claim **12** wherein said second circuit means further includes resettable circuit means responsive only to the first output signal of said perforation sensing means following generation of an output signal by said splice sensing means for maintaining the drive means in a disenabled state after the film segment containing the predetermined number of frames and the splice frame has been severed.

14. The apparatus according to claim **13** wherein the film cutter has an exit port in which the severed film segments are stacked, said apparatus additionally comprising automatic start sensing means coupled to said resettable circuit means and positioned near the exit port for detecting removal of the severed film segments therefrom and for generating an output signal indicative thereof, said automatic start sensing means output signal resetting said resettable circuit means when generated to enable the film drive means.

15. Apparatus for automating the operation of a film cutter of the type having a continuously energized film drive means for driving film from a large, continuous roll made up of smaller customer orders spliced together, the film having regularly spaced edge perforations each of which corresponds to one of the exposed frames thereon and the splice frame which leads each customer order having an edge perforation substantially in pitch with the film edge perforations, to a cutter blade for the severance of each customer order into a number of segments each of which contains an equal predetermined number of frames, one segment of which additionally contains the splice frame, the film cutter also having a pivotally mounted pawl therein biased towards the film for engagement with a film perforation and movable to a disengaged position, said apparatus comprising:

a. perforation sensing means for detecting the passage of the film and splice edge perforations when the film is driven thereby and for generating an output signal in response to the passage of each perforation;

b. splice sensing means for detecting the passage of the splice frames when the film is driven thereby and for generating an output signal in response to the passage of each splice frame, said splice sensing means being located ahead of said perforation sensing means by a distance which insures that the detection of a splice frame, when present, will occur and be completed prior to the detection of the edge perforation corresponding to the last of the predetermined number of frames;

c. first circuit means responsive to said output signals of said perforation sensing means and said splice sensing means for counting said perforation sensing means output signals and for generating an output signal when the predetermined number of perforation sensing means output signals have been counted, said first circuit means including circuit means for increasing the count of said first circuit means by one only for the first segment cut from each customer order;

d. second circuit means responsive to output signals generated by said first circuit means cooperatively connected to the pawl for holding it in its disengaged position in the absence of output signals from said first circuit means and for allowing the pawl to be biased towards engagement with a film perforation in response to generation of an output signal by said first circuit means; and

e. third circuit means responsive to output signals generated by said first circuit means and to the position of the pawl cooperatively connected to the film drive means, said first circuit means and the cutter blade for sequentially disabling the film drive means and actuating the cutter blade in response to the generation of an output signal by said first circuit means only if the pawl has engaged a film edge perforation, for resetting said first circuit means to count the next series of perforation sensing means output signals and for enabling the film drive means in the absence of said first circuit means output signals only if the pawl has been moved to its disengaged position.

16. The apparatus according to claim **15** wherein said second circuit means includes delay means for preventing said second circuit means from enabling the film drive means in the absence of said first circuit means output signals until after the cutter blade has completed its cutting cycle.

17. The apparatus according to claim **16** wherein said second circuit means further includes resettable circuit means responsive only to the first output signal of said perforation sensing means following generation of an output signal by said splice sensing means for maintaining the drive means in a disenabled state after the film segment containing the predetermined number of frames and the splice frame has been severed.

18. The apparatus according to claim **17** wherein the film cutter has an exit port in which the severed film segments are stacked, said apparatus additionally comprising automatic start sensing means coupled to said resettable circuit means and positioned near the exit port for detecting removal of the severed film segments therefrom and for generating an output signal indicative thereof, said automatic start sensing means output signal resetting said resettable circuit means when generated to enable the film drive means.

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