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SLASHER CONTROL

Filed Aug. 16, 1957

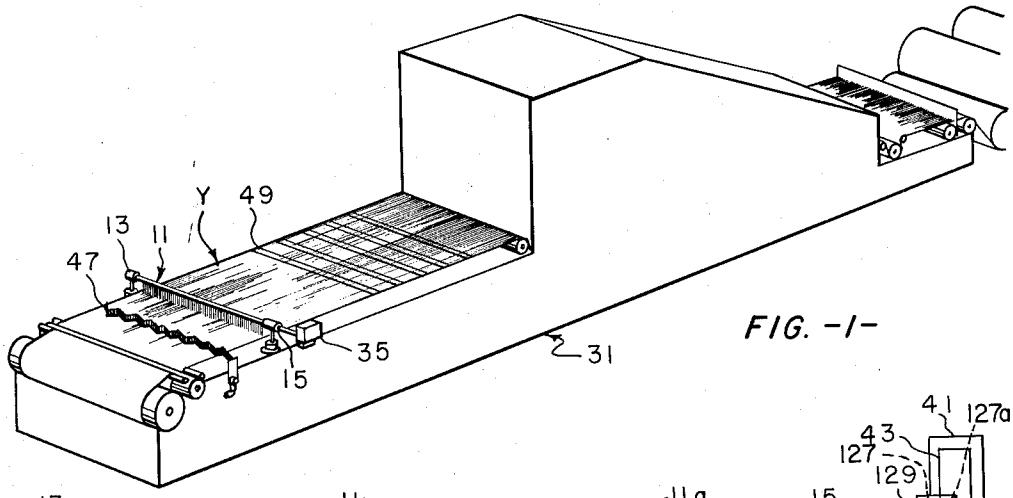
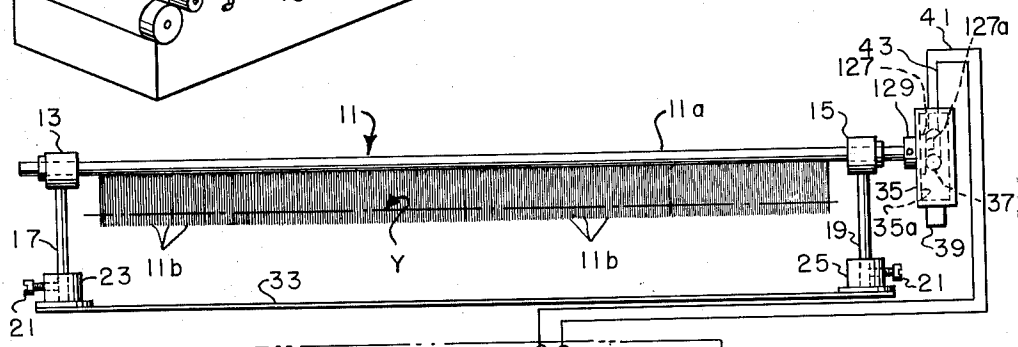


FIG. -1-



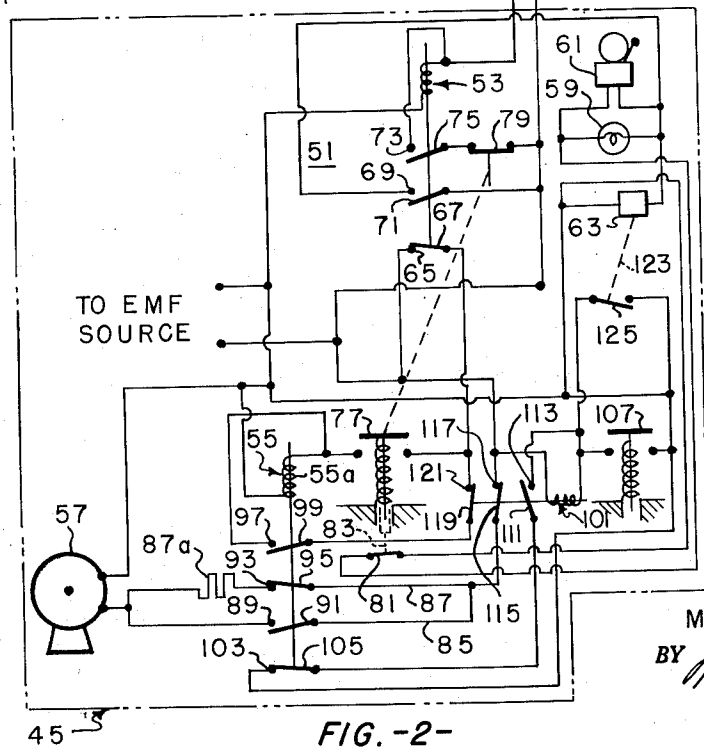


FIG. -2-

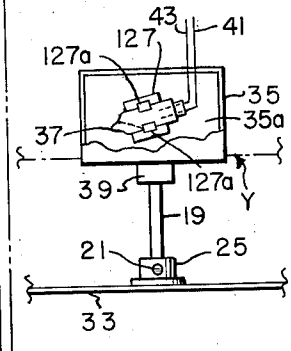


FIG. -3-

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SLASHER CONTROL

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This invention relates to a slasher apparatus, and more particularly to an improved slasher frame control and method of operation.

In the operation of slasher frames a frequent and expensive cause of substantial material and labor loss lies in the occurrence of breakouts in the slashing. As the term is normally employed in the art, a "breakout" refers to the occurrence of a break in a substantial section of the yarn ends, or "slashing" as this sheet of yarn ends is normally referred to, such that they will not pass through the expansion comb, and with the result that the slashing take-up beam will with normal conventional operation of the slasher have a large amount of yarn waste on the beam if the breakout is not immediately detected and corrected by the operator. It is a common occurrence for a breakout of slashing, if not immediately detected by an operator, to cause from 50 to 75 pounds of hard yarn waste to be formed. The loss of this waste to the mill may be of the order of 50 to 60 cents per pound. Thus each breakout at the slasher may cost the mill up to $25–$45.

Due to the possibility of occurrence of breakouts, as well as wild yarn, loose lint, ends out of lease, broken ends, etc., it is necessary for the slasher tender on conventional slashing frames to spend a considerable amount of time patrolling the front of the slasher in order to detect and remove or remedy these defects as soon as possible after their occurrence in order to minimize the loss resulting therefrom.

It is accordingly an object of this invention to provide an improved method and apparatus whereby a material reduction may be made in the amount of waste and loss resulting from breakouts, wild yarn, loose lint, ends out of lease, broken ends, and the like which may frequently occur at the output end of the slashing frame.

It is a further object of this invention to provide an improved method and apparatus for detecting the occurrence of wild yarn, loose lint, ends out of lease, broken ends, breakouts, and the like in an automatic and facile manner so as to decrease materially the slasher tender's patrol work, and thereby effect a material labor saving in the operation of slashing frames.

A still further object of the invention is the provision of an improved method for detecting breakouts, wild yarn, broken ends, and the like in order to permit the operation of the slashing frame at a higher speed and thereby increase the productivity of the slasher frame.

In carrying out the foregoing and other objects of the invention, a preferred method and physical embodiment according to the invention includes a pivotally mounted comb disposed transversely across the slashing or warp ends on the front section or output end of the slasher frame, behind the expansion comb and between the expansion comb and the front lease rod. The comb is positioned such that the comb dents or teeth extend downwardly through the sheet of warp yarn being delivered to the expansion comb. The comb dents or teeth are held in a substantially vertical position by means of a weight disposed on an arm or housing on which is mounted a mercury switch or other suitable position-sensitive switch. The comb may be supported for pivotal movement by two suitable bearings disposed at the ends of the comb shaft, and thus the comb can be swung into and out of engagement with the yarn ends of the sheet of warp yarn or slashing. When a breakout occurs or any foreign matter of substantial size comes through on the yarn as when a large piece of size, wild yarn, loose lint, etc., comes through on the yarn, and the flow of yarn through the pivoted detector comb is obstructed, the comb will be swung forward through the striking of the comb dents or teeth by the breakout material or other foreign material, size or the like carried by the moving yarn, thereby causing the mercury switch to be actuated and substantially immediately cause a decrease in speed of the slasher frame. The mercury switch is arranged in circuit relation with the speed control on the slasher frame, and the actuation of this mercury switch through the pivoting of the comb causes the slasher frame speed control to decrease the speed of the slasher drive arrangement to creep speed, which is normally of the order of 5–10 yards per minute or the like, as compared to the 70–90 yards per minute at which the slasher may be running during normal operation according to this invention. While it is most desirable for the slasher frame to be brought down to a creep speed as distinguished from a complete stop, in order to prevent the baking of the size onto the yarn during the stopped period, it will be apparent that the actuation of the position-sensitive switch could, if desired, be utilized to entirely stop the apparatus immediately. It is an important point, however, that the reduction in speed of the slasher frame substantially immediately upon the detection of the breakout or other defects in the yarn by the pivoted striking comb normally permits the operator to have a sufficient length of time to get around to eliminating the difficulty without the loss of a material amount of yarn. In one installation according to the present invention the amount of waste poundage per breakout has been reduced from a previous 50–75 pounds per breakout to a present approximately 3 pounds per breakout.

It is also preferred, though optional, according to the invention that the actuation of the mercury switch causes the operation of a signal, such as a light or buzzer or the like, whereby the operator will be informed that the particular slasher frame has a material defect in the slashing which requires attention and remedial action. Also, in order to provide for automatic complete stoppage of the slasher frame in the event that the breakout or other defect is so great as to require more time to remedy than is possible while the slasher frame is operating at creep speed, a timer or an odometer may be employed to completely stop the slasher apparatus after a predetermined time interval or the passage of a predetermined further length of slashing past the comb after the initial actuation of the mercury switch by the movement of the comb. Thus, in this optional arrangement the operator will have a predetermined length of time, or a predetermined length of material running, in which to correct any defect which may have caused the actuation of the mercury switch and the slowing down of the slasher frame, and if the correction is not made during this time interval then the slasher frame will be automatically brought to a stop and no further waste will occur in these abnormal situations which occur at intermittent intervals.

Due to the simplicity of operation according to the present invention, the slasher tender can leave the front of the slasher unattended for relatively long periods of time, with assurance that the slasher will go into creep speed when a material defect is detected by the striking or detector comb, whereupon he may then correct such defects without the loss of a material amount of yarn.

The running speed of the slasher is limited by a number of factors, one of which is the quality of the sheet of warp yarn which is desired to be delivered to the loom beam by the slasher. The application of this invention can materially assist in insuring good quality warp yarn being delivered, in that defects are detected immediately by the stop motion arrangement. In a mill where additional yarn capacity is available and size penetration is

no problem at high speeds, with the only limiting factor to higher speeds being quality, the slasher stop motion according to this invention can enable the mill to run its slashers at higher speeds, and thereby increase the productivity of the slashers.

While it is old in the art to employ combs as slub catchers or clearers for yarns or threads in warping machines and beaming machines, so far as I am aware combs have not been employed to detect the occurrence of defects in the warp yarns and to control the warp yarn conveying machinery, particularly in a slasher frame. The previously utilization of combs to act as slub catchers or clearers has to my knowledge been limited merely to the catching and removing of the slubs or thick portions or the like in the yarn which is being progressed, and while such combs may have been oscillatable or pivotable they have not been employed as detecting combs for controlling the prime motion machinery employed in moving the warp yarns, and particularly there has been no automaic speed control for slashers in which a pivoted comb extending across the warp slashing width serves to detect material defects in the warp slashing and effect a decrease in speed upon the detection of such a defect.

Still other objects and attendant advantages will become apparent to one skilled in the art from a reading of the following detailed description of a preferred embodiment constructed in accordance with the instant invention, taken in conjunction with the accompanying drawings wherein

FIGURE 1 is a schematic view in perspective of a slasher frame employing the present invention,

FIGURE 2 is a schematic view in more detail of the detector comb and mounting arrangement therefor and the control circuit associated therewith, and

FIGURE 3 is a schematic end elevation of the detector comb assembly illustrating the position and arrangement of the mercury switch on the pivotally mounted detector comb, with the cover of the switch receptacle partially broken away for clarity of illustration.

Referring now in detail to the figures of the drawings, a detector comb **11** is pivotally mounted in a pair of bearings **13** and **15** supported on shafts **17** and **19** respectively, which shafts are in turn vertically adjustably supported as by a set screw **21** in a respective one of two bearing shaft supports **23** and **25** suitably secured as by screws, welding, or the like, to the frame **33** of the slasher, generally indicated at **31**. The comb **11** includes a shaft **11***a* having a plurality of depending dents or teeth **11***b* formed or secured thereon and extending downwardly therefrom in the normal position of the comb. Suitably formed or secured on one end of the shaft **11***a* is a suitably closed receptacle **35** enclosing a mercury switch **37** and having secured thereto a weight **39** which serves to maintain the comb **11** with its dents or teeth **11***b* normally in substantially downwardly depending relation such that they will extend downwardly through the slashing or warp yarns Y. The number of yarn ends passing between each pair of teeth **11***b* may vary, as between the order of one and ten yarn ends per dent or the like, depending upon the number of teeth and the number of yarn ends in the warp set.

As will be noted from FIGURE 3, in the normal position of the comb, the receptacle **35** is positioned relative to the comb teeth such that the mercury switch **37** has its contacts open. Leads **41** and **43** from the mercury switch **37** are suitably connected to the slasher speed control **45**, which is preferably arranged such that when the mercury switch contacts are open and the leads **41** and **43** are thereby disconnected the slasher **31** will run at standard full speed, and when the mercury switch is moved to closed position through the abnormal defect-effected tilting movement of the comb **11**, the slasher speed control **45** will be actuated to cause the slasher to slow down to creep speed.

The comb **11** is mounted on the front section of the slasher **31**, preferably approximately six inches or the like behind the conventional expansion comb **47**, and between the expansion comb **47** and the front lease rod **49**. With the comb **11** thus positioned such that the comb dents or teeth **11***b* extend through the sheet of warp Y being delivered to the expansion comb **47**, when a breakout occurs or foreign matter comes through on the yarn and the flow of yarn through the comb teeth **11***b* is obstructed the comb **11** is swung forward, causing the mercury switch **37** to close, thereby substantially immediately causing the slasher apparatus to be slowed down and permitting the operator to inspect the slashing Y and remove or otherwise remedy the defect.

In effecting the speed decrease in the illustrated embodiment, the closing of mercury switch **37** causes the energization of a relay holding circuit **51**, including a relay **53**, which in turn results in the energization of a second motor control relay circuit including a relay **55** whereby the slasher drive motor or motors **57** is slowed down substantially immediately to creep speed. Also in the preferred embodiment the energization of relay **53** effects energization of a suitable signal, such as a light **59** and/or a bell **61** or other signal as may be desired, as well as a timer or time controlling device **63** which is interconnected in controlling relation with the motor **57**.

To this end the relay **53** is provided with three pairs of contacts including a normally closed pair of contacts **65**, **67** and two pairs of normally open contacts **69**, **71** and **73**, **75** and associated contacts. The normally closed contacts **65**, **67** are arranged in series with the energizing coil **55***a* of the second relay **55**. Thus, upon the energization of relay **53** the normally closed holding circuit contacts **65**, **67** will be opened thereby causing the normally energized motor control relay **55** to drop out, the starting switch **77** being normally open during operation and the motor **57** being maintained at normal high speed through the self-holding energization of the relay **55**.

Also upon the energization of relay **53** the closing of the contacts **69**, **71** closes the energizing circuit to the time controlling device **63** and signals **59** and **61**. The relay **53** is effectively held in energized state through the closing of its self-holding contacts **73**, **75** and remains in this state until the operator presses the spring biased start switch **77** which thereby effectively opens switch **79** which is mechanically or otherwise operatively interconnected with start switch control button **77**. Opening of switch **79** results in the opening of the relay **53**, provided that the mercury switch **37** has been returned to its open position. If the switch **37** has not been returned to its normal open position the pressing of the starter button **77** will not have the effect of deenergizing the relay **53**, since the switch **37** is arranged in overriding relation to the switch **79**.

A suitable manually operated switch **81** may be provided in series with the parallel or otherwise suitably connected signals **59** and/or **61** as may be desired in order to permit the operator to disconnect these signals after they have served their purpose of indicating that the slasher is operating at low or creep speed and that attention is needed immediately, without requiring deenergization of the time controlling device **63**. Preferably the switch **81** is mechanically or otherwise operatively interconnected with the start switch **77**, as shown, as by a suitable linkage connection such as a lost-motion connection **83**, such that upon pressing the start switch **77** the switch **81** will be again closed and will remain closed until the operator manually opens this switch **81**, even though the start switch **77** may be normally spring pressed to open position upon release by the operator's hand.

The motor **57** may have any suitable speed varying or adjusting means, and in the instant illustrated example the speed varying or adjusting means comprises two parallel impedance connections **85** and **87** either of which

may be selectively interconnected in operative circuit connection with the motor **57** by the relay **55**. The normal full speed impedance connection is indicated by the line **85** whereas the low or creep speed impedance connection is indicated by the line **87** including impedance **87***a*. As will be seen the normal speed connection is interconnected in operative circuit relation with the motor **57** through the energization of relay **55** and closing of contacts **89, 91**, whereas the motor will be thrown into creep speed through the deenergization of relay **55** and closing of contacts **93, 95**. To the end that the motor **57** will be normally held at normal operating speed the relay **55** is effectively held in self-holding relation through a self-holding circuit including contacts **97, 99** which are closed upon the energization of the relay by the closing of start switch **77**. Thus, the closing of start switch **77** effectively opens the holding circuit for relay **53** through the opening of switch **79**, as well as causing the closing of signal control switch **81**. The closing of start switch **77** also effectively deenergizes stop relay **101** in the event the stop relay has been actuated previously in order to stop the motor or motors **57**. The deenergization of the stop relay **101**, next to be described, is effected through the opening of contacts **103, 105** upon the energization of relay **55**, these contacts being arranged in series relation in the holding circuit for the stop relay **101**.

A suitable stop circuit may be arranged in the form of a normally open spring biased stop switch **107** which is arranged in circuit relation with a stop relay **101** having a stop relay holding circuit including normally open self-holding circuit contacts **111, 113** and normally closed motor control contacts **115, 117**. The stop relay **101** also includes a pair of normally closed contacts **119, 121** which are arranged in series circuit relation in the holding circuit of the motor start and control relay **55**. Thus upon the closing of stop switch **107** the stop relay **101** will be energized, and will also be held in self-energizing relation through the closing of contacts **111** and **113** until released by subsequent closing of start switch **77**. The energization of stop relay **101** also effectively opens the power circuit to the motor **57** through the opening of normally closed contacts **115** and **117**, and further opens the holding circuit to the normally energized start and motor control relay **55** through the opening of normally closed contacts **119, 121**.

It will be apparent that upon the subsequent closing of start switch **77** the motor control relay **55** will be energized, thereby opening the stop relay **101** and substantially immediately restoring the power to the motor **57** through closing of contacts **115, 117**, and effectively establishing the holding circuit of the relay **55** through the closing of the contacts **119, 121** and **97, 99**, provided that the mercury switch **37** is not closed at this time. This energization of the starter and motor control relay **55** thus also starts or restores the operation of the drive motor **57** to a normal operating speed through the closing of contacts **89, 91**. Also, upon the closing of start switch **77** and the consequent deenergization of relay **53**, the time controlling device **63** and the signals **59** and **61** will be deenergized, provided that the position sensitive switch **37** has been returned to its normal open position. The time controlling device **63** may be of any suitable conventional or other desired construction, as will be apparent to those skilled in the art, and is preferably of the type which is self-resetting upon deenergization. Thus it will be seen that the time controlling device **63** will in the preferred embodiment return to its initial condition upon the closing of the start switch **77** and restoring of the slasher **31** to normal speed, irrespective of whether the time controlling device has previously stopped the slasher **31** through expiration of a predetermined selected time or whether this predetermined selected time has not expired and the slasher **31** is still running at creep speed, or otherwise as may be desired, by the closing of mercury switch **37**.

To the end that the time controlling device **63** will be in controlling relation with the drive motor or motors **57** the time controlling device includes, or is operatively mechanically or otherwise interconnected as indicated at **123** with, a normally open switch **125** in parallel with stop switch **107**, such that upon the completion of a predetermined time after energization of the time controlling device **63** the switch **125** will be closed, and will remain closed until the time controlling device is reset by the closing of the start switch **77**, with the consequent opening of the energizing circuit to the time controlling device **63** (or the time control device **63** may be otherwise reset as desired as by direct manual reset, if desired).

Referring now generally to the operation of the slasher and control arrangement associated therewith according to the invention as illustrated in the illustrative embodiment, the comb **11** is normally maintained by gravity in a downwardly extending direction whereby the mercury switch **37** will be normally open. The movement of the comb **11** to a preselected abnormal angular position through the passage of defects into contact with the dents or teeth **11***b* of the comb causes the closing of mercury switch **37**, and the energization of relay **53**, thereby energizing signals **59** and **61** and time controlling device **63**. The energization of relay **53** also results in the substantially immediate change of speed of drive motor or motors **57** to creep through the deenergization of motor control relay **55** whereby the creep speed impedance **87***a* will be connected in circuit relation in the motor power circuit. The operator is informed by the signals **59** and/or **61** that the slasher needs attention and he may then manually open the switch **81** to deenergize the signals in order that they may not disturb him and interfere with his work in remedying the trouble in the slashing Y. The operator may then work on the slashing Y to remedy the defect which has caused the slasher to slow down to creep speed, and in the event that he fixes it before a preselected predetermined time has expired, he will then push the spring biased normally open start switch **77** to thereby reenergize the start relay **55** and restore the motor **57** to normal speed operation through the closing of contacts **89, 91** of relay **55**. In the event that the operator does not remedy the defect prior to the expiration of this time interval the time controlling device **63** causes closing of switch **125** to thereby stop the slasher drive motor or motors **57**. In the event that the operator may desire to stop the aparatus for any particular reason he may do so by closing the normally open spring pressed stop switch **107** which effectively deenergizes the start and control relay **55** and closes the stop relay **101** upon itself to thereby hold itself in energized relation until the subsequent closing of start switch **77**. Closing of stop switch **107** and energization of stop relay **101** opens the power circuit to the motor **57** through the opening of contacts **115, 117**, to thereby effectively stop the movement of slashing Y through the slasher **31**. Upon the subsequent closing of the start switch **77** the entire control **45** will be reset to initial operating condition, and the motor **57** will be energized to run at normal speed provided that the mercury switch **37** has been returned to its normally open position through the returning of the comb **11** to its normally downwardly extending running position.

Referring now to FIGURES 2 and 3 it will be seen that the detecting sensitivity of the comb **11** may be selectively adjusted in one or both of two ways, the first including the raising or lowering of the comb **11** to thereby set the teeth of the comb at a more shallow depth or a greater depth. As will be apparent, a more shallow depth setting of the teeth into the slashing Y will render the comb substantially more sensitive to the occurrence of defects than a deeper setting of the comb, primarily due to the increased lever arm which the comb teeth **11***b* form when they are at the more shallow setting. A second method of adjusting the sensitivity includes the adjustment of the position of mercury switch **37** about the axis of the

comb and relative to the comb teeth **11***b* such that more or less motion of the comb is required to close the switch contacts. This may obviously be accomplished either by a selectively angularly adjustable mount **127** which may have a spring clamp **127***a* of conventional construction for holding the mercury switch **37** in the receptacle **35** or a selectively angularly adjustable connection between the comb shaft **11***a* and the receptacle **35**, as by a screw set adjustable collar coupling **129** fixed to the receptacle **35** and angularly adjustable on the shaft **11***a*, or otherwise adjustable as may be desired. The mercury switch mount **127** may be mounted for selective angular adjustment on the inner wall **35***a* of the receptacle **35** as by any suitable adjustable pivot connection therebetween (not shown), such as a pin fixed on the inner face of the wall **35***a* and extending into a complementary bore formed in the adjacent face of the mount block **127**, any desired angular position of the mount block **127** with respect to the receptacle being maintained as by friction between the pin and bore or by a set screw in the mount **127**. It will be apparent that while the circuit arrangement has been illustrated with the mercury switch contacts being normally open and the closing of these contacts causing the apparatus to be slowed down, the apparatus might suitably employ an arrangement wherein the mercury switch would be normally closed and the opening of the mercury switch would cause the apparatus to slow down, if such were desired.

In accordance with the invention I have found in one preferred embodiment that the utilization of a detector comb **11** having 500 to 600 dents or teeth is quite suitable when an expansion comb is utilized which has a more or less corresponding number of dents. Also, in one preferred embodiment, a striking comb having teeth of approximately two and one-half inches length and a striking comb of 55 inch length has been found quite suitable, while a one-quarter pound weight or the like has been found to be ample to provide for suitable retention of the comb in the desired downwardly depending running position. As an example of a comb which may be employed in accordance with this invention I have found that standard counting combs may be quite suitably adapted for such use and may thus be pivotally mounted for employment as the detecting or striking comb **11**.

While I have shown only one preferred embodiment constructed according to my invention, it will be readily apparent to those skilled in the art that many modifications and other embodiments might suitably be made without departing from the scope and spirit of the invention. Accordingly, it is to be understood that the invention is not to be limited by the particular construction of the illustrated embodiment, but only by the scope of the appended claims.

I claim:

1. In a warp yarn handling frame having a drive means adapted to linearly progress a sheet of warp yarn ends therethrough, and a multiple-speed control operatively connected to said drive means, the improvement comprising support means, a detector comb having a plurality of teeth and being pivotally mounted on said support means, said comb being normally disposed with said teeth extending removably downwardly into said sheet of warp yarn ends and between said warp yarn ends for entry into and out of said sheet of warp yarn ends without requiring the moving of the sheet of warp yarn ends, and a position-sensitive switch operatively connected to said multiple speed control which is responsive to a predetermined pivotal movement of said comb to set a further new condition.

2. In a warp yarn handling frame having a drive means adapted to linearly progress a sheet of warp yarn ends therethrough, the improvement comprising support means, a detector comb having a plurality of teeth and being pivotally mounted on said support means, said comb being normally disposed with said teeth extending into said sheet of warp yarn ends and between said warp yarn ends, a position-sensitive switch operatively connected to a condition responsive device which is responsive to a predetermined pivotal movement of said comb to set a further new condition, and means for varying the sensitivity of said comb to the occurrence of comb-moving obstructions in said sheet of warp yarn ends.

3. In a warp yarn handling frame having a drive means adapted to linearly progress a sheet of warp yarn ends therethrough, the improvement comprising support means, a detector comb having a plurality of teeth and being pivotally mounted on said support means, said comb being normally disposed with said teeth extending into said sheet of warp yarn ends and between said warp yarn ends, a position-sensitive switch operatively connected to a condition responsive device which is responsive to a predetermined pivotal movement of said comb to set a further new condition, the latter device including a warning signal device, said position-sensitive switch being operatively connected to said warning signal device and responsive to said predetermined pivotal movement of said comb to thereby actuate said warning signal device, and an energizing and holding relay circuit operatively connected in controlling relation to said warning signal device and in responsive relation to said position-sensitive switch.

4. The improvement according to claim 3, the condition responsive device further including a time controlling device operatively connected in responsive relation to said position-sensitive switch and in controlling relation to said drive means; said time controlling means being actuated to begin the timing of a predetermined selected period of time in response to the actuation of said position-responsive switch upon said predetermined movement of said comb, and to stop said drive means upon the uninterrupted completion of said predetermined time interval, and a manual switch adapted to deenergize said warning signal device without deenergizing said time controlling means.

5. In a warp yarn handling frame having a drive means adapted to linearly progress a sheet of warp yarn ends therethrough, the improvement comprising support means, a detector comb having a plurality of teeth and being pivotally mounted on said support means, said comb being normally disposed with said teeth extending into said sheet of warp yarn ends and between said warp yarn ends, a position-sensitive switch operatively connected to a condition responsive device which is responsive to a predetermined pivotal movement of said comb to set a further new condition, the latter device including a time controlling device operatively connected in responsive relation to said position-sensitive switch and in controlling relation to said drive means; said time controlling means being actuated to begin the timing of a predetermined selected period of time in response to the actuation of said position-responsive switch upon said predetermined movement of said comb, and to stop said drive means upon the uninterrupted completion of said predetermined time interval.

6. The improvement according to claim 5, said condition responsive device further including a start switch, a holding relay circuit, a pair of contacts in series connection in said holding relay circuit, and means operatively connected between said start switch and said contacts and responsive to closing of said start switch to open said contacts to open said holding circuit.

7. In a warp yarn handling frame having a drive means adapted to linearly progress a sheet of warp yarn ends therethrough, the improvement comprising support means, a detector comb having a plurality of teeth and being pivotally mounted on said support means, said comb being normally disposed with said teeth extending into said sheet of warp yarn ends and between said warp yarn ends, a position-sensitive switch operatively connected to a condition responsive device which is responsive to a

predetermined pivotal movement of said comb to set a further new condition, and said detector comb being operatively connected to said condition responsive device through said switch which is angularly movable in synchronism with said detector comb, and a weight operatively connected to said detector comb and adapted to bias said detector comb by gravity to a selected downwardly depending position.

8. The combination according to claim 7 wherein said weight is angularly adjustable with respect to the pivot axis of said detector comb to thereby vary the normal downwardly depending position of said detector comb.

9. The combination according to claim 8 wherein said switch is angularly adjustable with respect to said detector comb.

10. The improvement according to claim 2 wherein said means for varying the sensitivity of said comb comprises torque exerting means, and means for varying the effective warp-travel-opposing torque on said comb when said comb is in running warp-opposing position.

11. The improvement according to claim 10 wherein said torque exerting means includes a weight operatively connected to said comb, and means for varying the position of said weight on said comb.

12. The improvement according to claim 2, wherein the pivot axis of said comb is vertically adjustable to vary the effective moment arm of said comb as it engages said warp yarn ends, and thereby vary the sensitivity of said comb to the occurrence of comb-moving obstructions in said sheet of warp yarn ends.

13. For use in a warp yarn handling frame having a drive means adapted to linearly progress a sheet of warp yarn ends therethrough, and a speed control operatively connected to said drive means, the improvement comprising a detector comb having a plurality of side-by-side teeth, means for pivotally mounting said comb about an axis disposed above and extending transversely of the linear path of movement of said sheet of warp yarn ends, said comb being normally disposed with said teeth extending removably downwardly into and for interengagement with said sheet of warp yarn ends for entry into and out of said sheet of warp yarn ends without requiring the moving of the sheet of warp yarn ends, and a position-sensitive switch adapted to be operatively connected to said comb and adapted to be connected to said speed control and being responsive to a predetermined pivotal movement of said comb to thereby actuate said speed control to effect a change in speed of said drive means.

14. The improvement according to claim 13, including means for varying the sensitivity of said comb to the occurrence of comb-moving defects in said sheet of warp yarn ends.

15. The improvement according to claim 14 wherein said means for varying the sensitivity of said comb comprises torque-exerting means operatively connected in torque-exerting relation to said comb, and means for varying the effective warp-travel-opposing torque on said comb when said comb is in running warp-opposing position.

16. The improvement according to claim 15 wherein said torque-exerting means is a weight operatively connected to said comb, and means for varying the position of said weight on said comb.

17. The improvement according to claim 14 wherein said means for varying the sensitivity of said comb includes a weight, and means for adjusting the position of said weight relative to said comb.

18. The improvement according to claim 17 wherein said weight is angularly adjustable toward and away from the effective line of said comb teeth.

19. The improvement according to claim 14 wherein said means for varying the sensitivity of said comb includes means for altering the height of said comb axis relative to said sheet of warp yarn ends to thereby vary the effective moment arm of said comb as it engages said warp yarn ends when in running position.

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