United States Patent [19]

Redlichs

[11] **3,831,528**

[45] **Aug. 27, 1974**

[54] **PRESSURE RELIEVED TROLLEY STOP FOR CONVEYORS**

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[73] Assignee: **Rapistan Incorporated,** Grand Rapids, Mich.

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[52] **U.S. Cl.** ..... **104/252,** 104/172 S, 104/250

[51] **Int. Cl.** **B61k 7/18**

[58] **Field of Search** ..... 104/172 R, 172 C, 172 S, 104/172 BT, 178, 249, 250, 251, 252; 293/8

[56] **References Cited**

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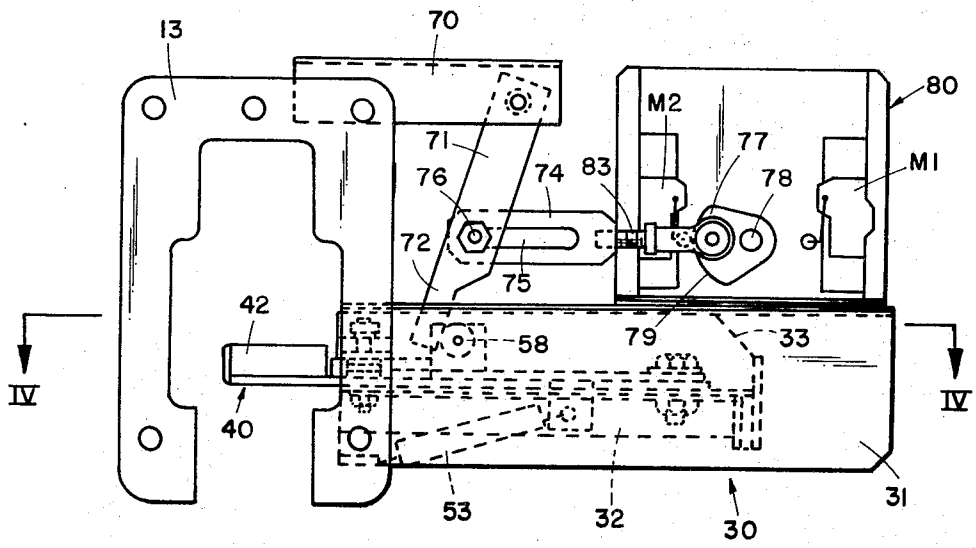
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Primary Examiner—Lloyd L. King
Assistant Examiner—Randolph A. Reese
Attorney, Agent, or Firm—Price, Heneveld, Huizenga & Cooper

[57] **ABSTRACT**

A stop for conveyors for arresting the forward movement of an article such as a trolley at the time of or after its release from the propelling mechanism of the conveyor. The stop has a member mounted for reciprocal movement into and out of the path of the article. The member includes an article engaging arm and a locking arm and a mechanism for removing the locking arm when the member is to be retracted from article interception position. Removal of the locking arm allows the article engaging arm to shift away from the article in the direction of travel of the article. The article engaging arm is then free to be retracted without interference from the article resulting from the pressure with which the article normally presses against the member.

20 Claims, 15 Drawing Figures



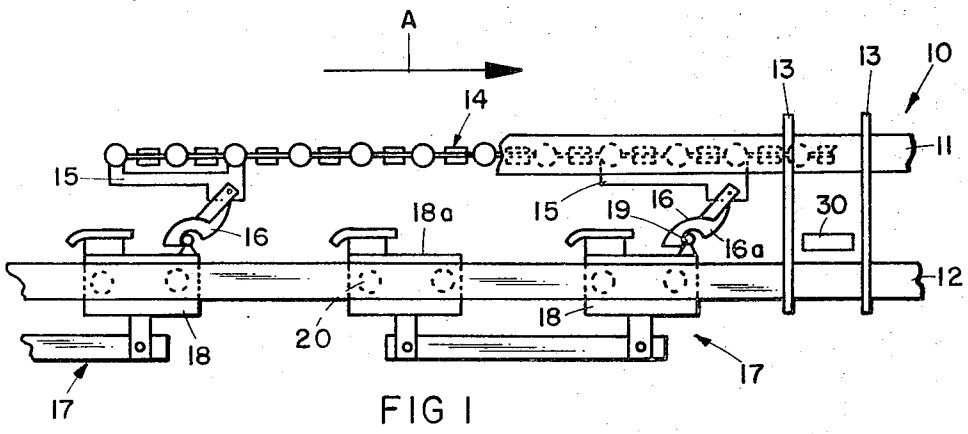


FIG 1

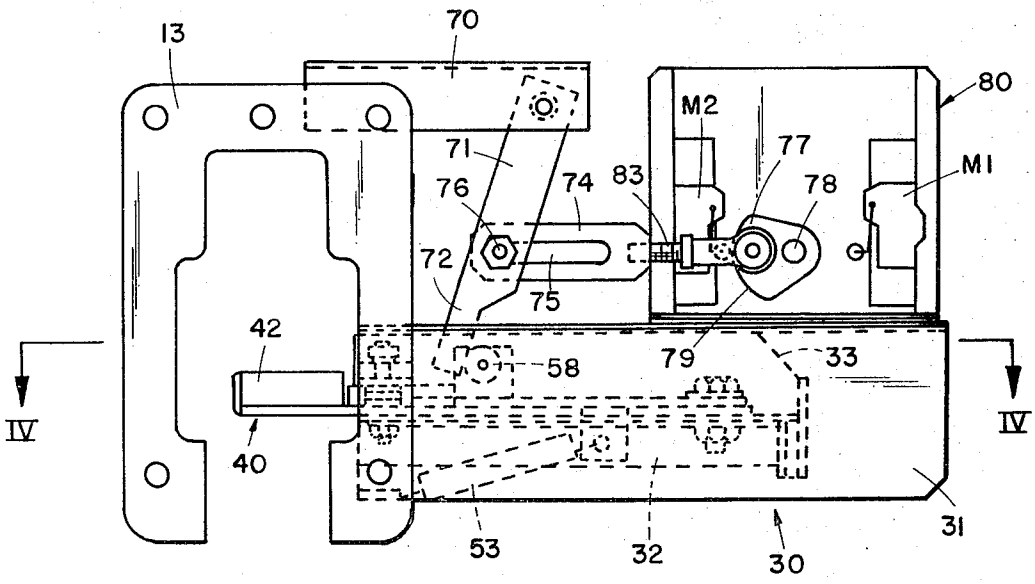


FIG 2

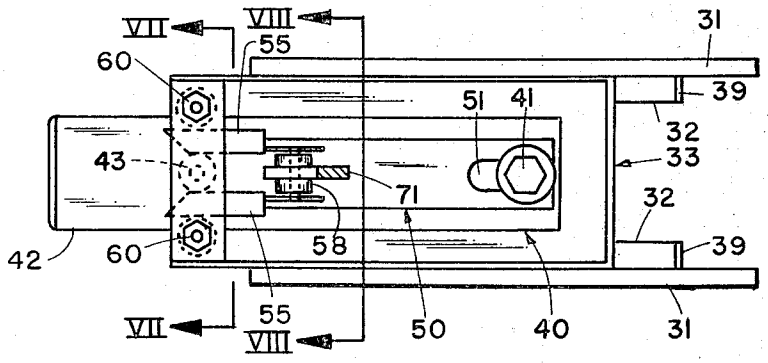


FIG 4

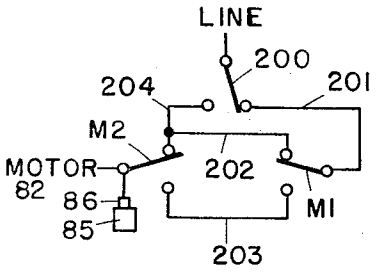


FIG 15

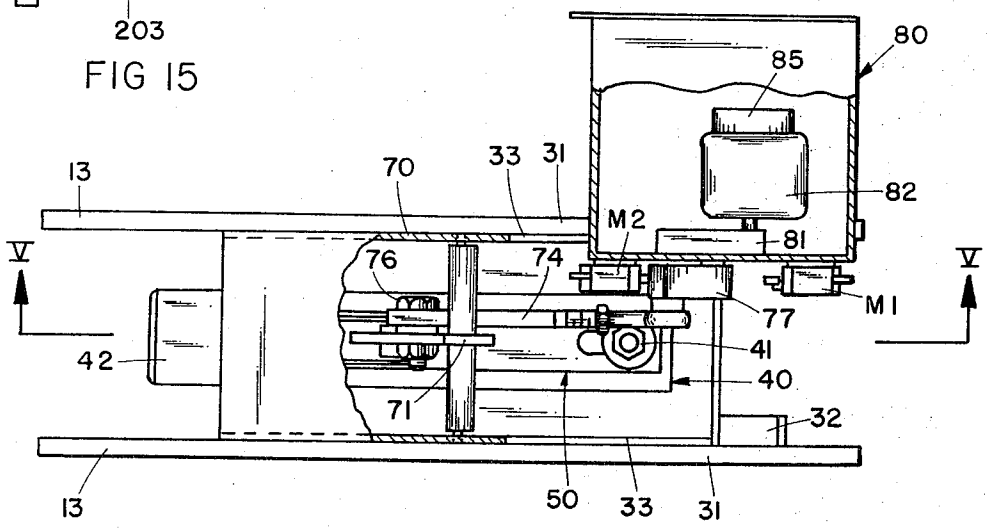


FIG 3

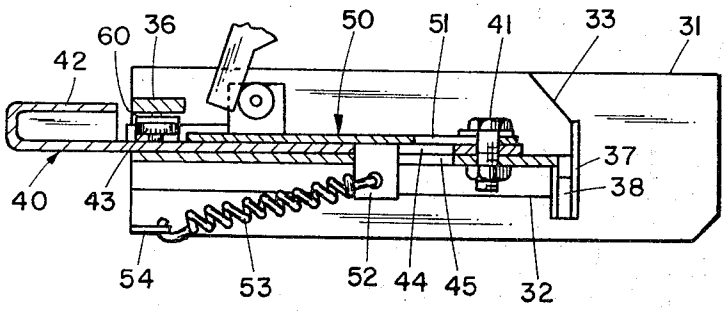


FIG 5

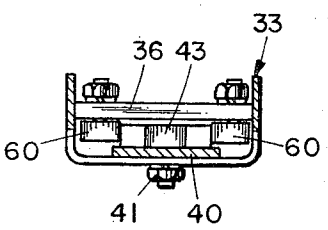


FIG 7

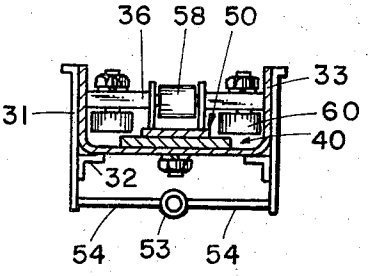


FIG 8

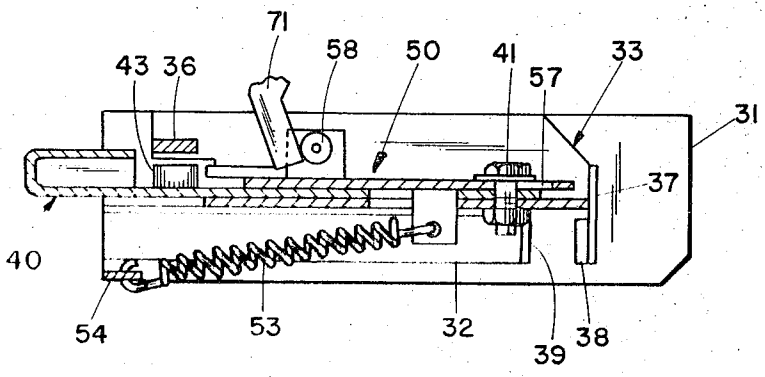


FIG 6

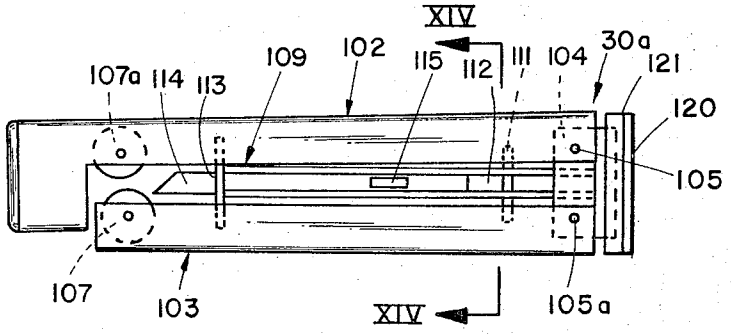


FIG 10

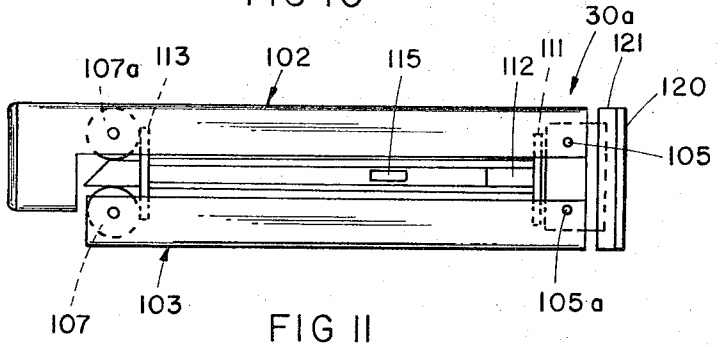


FIG 11

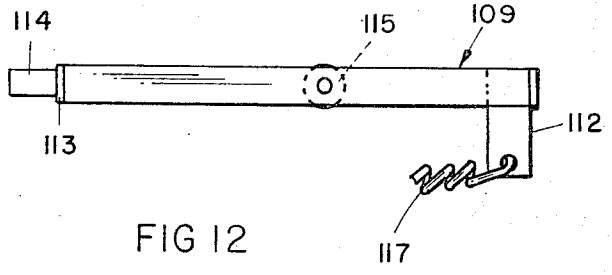


FIG 12

FIG 9

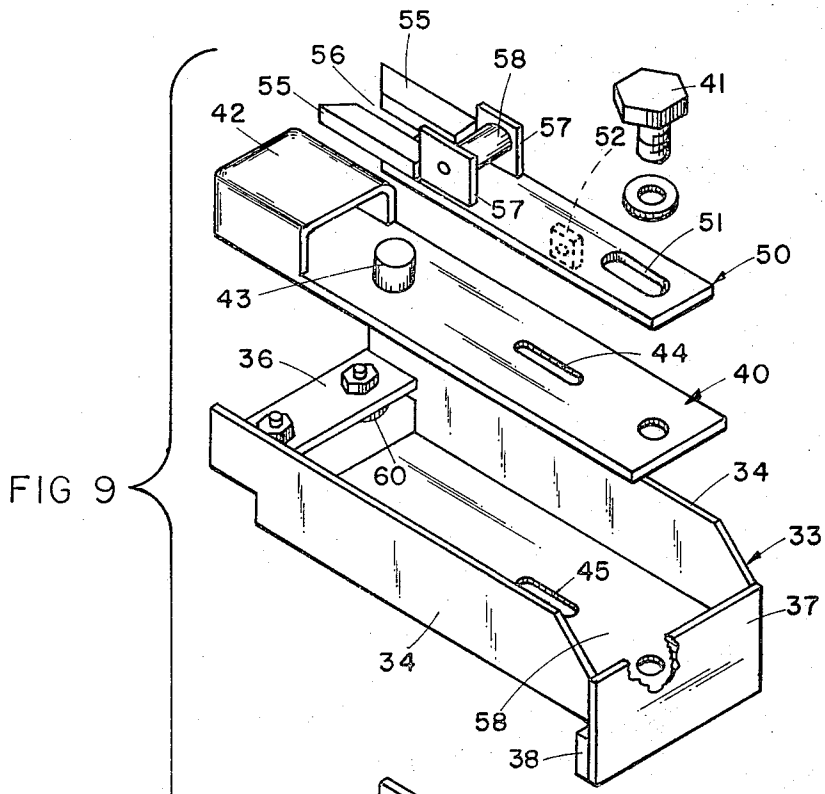


FIG 13

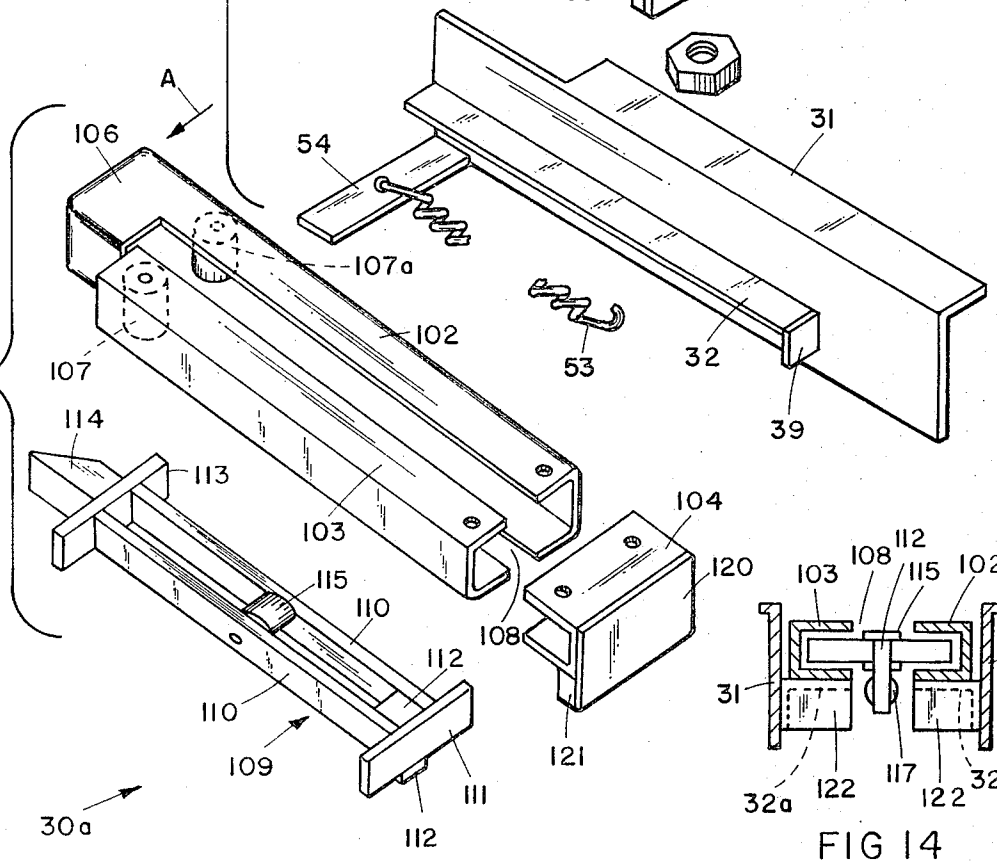


FIG 14

PRESSURE RELIEVED TROLLEY STOP FOR CONVEYORS

This invention relates to article stop for conveyors. In the following description, it is described as a stop applied to an over and under, power and free conveyor but, it will be recognized that the invention has utility and is applicable to various other types of conveyors including in-floor tow line conveyors or as an article arresting device on standard conveyors of the roller, wheel or belt-type. It constitutes an improvement over the type of conveyor stop described in U.S. Pat. No. 3,347,171 entitled CARRIER STOP AND TRACK HANGER FOR POWER AND FREE CONVEYORS issued Oct. 17, 1967 to G. A. Torrance. Conveyor stops of the type disclosed in the Torrance Patent have been known for a number of years and are widely used in the conveyor industry, particularly in the over and under, power and free conveyor systems. Stops of this type have long been recognized as unsatisfactory in that retraction of the stop from active position frequently requires the application of substantial force because the retraction of the stop is resisted by the pressure of the accumulated trolleys or articles which are pressing against it. In the case of conveyors moving large or heavy articles, this line pressure can be very substantial, requiring large and expensive prime movers to withdraw the stop. This makes the stops both expensive and bulky.

SUMMARY OF THE INVENTION

The stop of this invention has a tongue which is mounted for reciprocation into and out of the path of articles or trolleys moving along the conveyor. The stop is spring biased into extended position and a prime mover is provided for retracting it. The stop tongue is pivotally mounted at its rearward end whereby its forward or article engaging end is normally free to pivot through a small arc. When the stop reaches its extended position, a bayonet-type slide mechanism is pushed between fixed rollers. The engagement between the bayonet-type slide and the rollers secures the extended, free end of the tongue against pivotal movement about its rearward end. When the stop is to be retracted, the bayonet-type slide is retracted first, thus, releasing the stop tongue to pivot away from the article or trolley pressing against it. Once the tongue is thus freed, the tongue can be retracted with little or no resistance. This permits the use of a small prime mover. Because of the inertia of the stopped articles or trolleys and the speed with which the tongue is retracted, total retraction of the tongue takes place before sufficient forward movement of the article or trolley occurs to reestablish line pressure against the tongue. The mechanism includes lost motion connections such that as the tongue is extended, should the forward movement of the tongue be obstructed, the prime mover and the remaining mechanism can complete its cycle of operation without interference from the blocked tongue and the tongue by the spring bias will be forced to complete its extension movement as soon as the interference has been removed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a fragmentary, generally schematic, side elevation view of a power and free overhead conveyor equipped with this invention;

FIG. **2** is a side elevation view of the improved stop;

FIG. **3** is a partially broken plan view of the stop;

FIG. **4** is a sectional plan view taken along the plane IV—IV of FIG. **2** showing the stop in extended position, omitting the drive mechanism and the conveyor track;

FIG. **5** is a sectional elevation view taken along the plane V—V of FIG. **3** showing the stop in extended position;

FIG. **6** is a view similar to FIG. **5** but showing the stop in retracted position;

FIG. **7** is a sectional elevation view taken along the plane VII—VII of FIG. **4**;

FIG. **8** is a sectional elevation view taken along the plane VIII—VIII of FIG. **4**;

FIG. **9** is an exploded view of the stop illustrated in FIGS. **1** through **8**;

FIG. **10** is a plan view of a modified structure for this invention showing the stop in retracted position;

FIG. **11** is a plan view of the stop shown in FIG. **10** illustrated in extended position;

FIG. **12** is a side elevation view of the locking bayonet of the structure illustrated in FIGS. **10** and **11**;

FIG. **13** is an exploded view of the stop mechanism illustrated in FIGS. **10, 11** and **12**;

FIG. **14** is a sectional view taken along the plane XIV—XIV of FIG. **10** showing the stop seated in its housing; and

FIG. **15** is a schematic diagram of a control circuit for the stop.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring specifically to FIG. **1**, the numeral **10** indicates a power and free, over and under overhead conveyor of conventional construction having a power track **11** positioned above a trolley track **12.** The two tracks are aligned and anchored together for cooperative operation by track hangers **13.** Travelling within the power track **11** is a driven chain **14** having brackets **15** at spaced intervals. Downwardly depending from the brackets **15** are drive arms **16.** The arms **16** are pivotally connected to the brackets **15.**

The trolley track provides a guideway and support for carriages **17** which are mounted on spaced pairs of trolleys **18** and **18***a*. The lead trolley **18** of each of the carriages **17** has a drive dog **19.** Since the drive arms **16** are pivotally mounted to the brackets **15** they normally swing down to engage the drive dogs **19** and may be pivoted upwardly to disengage the drive dogs **19** when the forward movement of the carriage **17** is to be arrested.

The chain **14** is preferably equipped with wheels to facilitate its movement. In like manner, the trolleys are mounted on wheels **20** which travel in the track **12.** All of this is known structure and is described in detail in copending patent application Ser. No. 244,173 filed Feb. 2, 1972, now U.S. Pat. No. 3,765,066, entitled IMPROVED TROLLEY DRIVE FOR OVER AND UNDER CONVEYORS, both inventions being owned by a common assignee.

The stop **30** with which this invention is concerned is shown schematically in FIG. **1.** It will be noted that it is so positioned that when extended, it is in the path of the drive arm **16** and thereby pivots it upwardly to disengage the drive arm from the drive dog **19,** with the

drive dog next coming into contact with the stop, thereby halting forward motion of the carriage **17.** The direction of movement of the carriages is indicated by the arrow A in FIG. **1.**

Referring now to FIG. **2,** the stop mechanism includes a pair of spaced base members **31.** The base members **31,** on one of their ends, are securely attached to and between the track hangers **13.** As best seen in FIGS. **8** and **9,** each of the base members **31** has an angle **32** secured to it extending lengthwise of the base member and forming a pair of spaced ways. The ways **32** provide support for the generally U-shaped anchor member or channel housing **33.** The channel housing is mounted to slide on the ways between the base members **31** on the ways **32.** The base members **31,** together with the angles **32** form a base frame. As best seen in FIG. **9,** the channel housing **33** has a pair of sides **34** and a bottom plate **35.** At its forward end, the sides **34** are connected by a cross plate **36.** The cross plate **36** is spaced above the bottom **35.** The rear end of the channel housing is partially closed by a back plate **37,** the lower portion of which depends below the bottom **35** and mounts, on its forward face, a stop pad **38** which is positioned to engage the fixed stops **39** on the ends of the ways **32.**

Seated within the channel housing **33** is the stop tongue **40.** The stop tongue **40** is substantially narrower than the spacing between the sidewalls **34** of the channel housing and, at its rearward end, is pivotally secured to the channel housing by suitable means such as the fastener **41.** The forward end of the stop tongue **40** has a box structure **42.** The box structure serves as the trolley engagement means and is provided to insure an adequate area of contact between the trolley and the tongue so that the tongue will not be damaged by the impact resulting from a heavily loaded carriage being abruptly halted when the stop is extended. Mounted in the center of the stop tongue and rearwardly of the box structure **42** is a lock roller **43.** The lock roller is preferably mounted in such a way that it may freely rotate for purposes which will be discussed later, although this is not essential to the invention. The lock roller preferably has a smooth, hard surface and is rotatably mounted. Between the lock roller **43** and the opening through which the fastener **41** passes, an elongated slot **44** is provided located on the centerline of the tongue.

Slidably seated on the stop tongue is a locking means or slide **50.** The locking slide **50** is an elongated plate and, at its rearward end, has an elongated slot **51** through which the fastener or pin **41** passes. The slot **51** and the fastener **41** together provide a lost motion connection permitting limited forward and rearward movement of the locking slide with respect to the stop tongue, thus, effecting sequential timing of their operation. Depending from the locking tongue is a spring gusset **52.** When the locking tongue is seated on the stop tongue, the spring gusset **52** projects through the slot **44** and through another slot **45** in the bottom of the channel housing **33.** The lower end of the spring gusset projects well below the bottom surface of the channel housing **33.** The spring gusset **52** secures one end of tension spring **53.** The other end of spring **53** is fixed to the cross piece **54** adjacent the forward end of the base members **31.**

At the forward end of the locking slide, a pair of locking wedges **55** extend well-forward of the front end of the slide. These wedges are of a hard, indentation resistent material and are secured to the locking slide by any suitable means such as welding. The wedges are spaced apart sufficiently to form a channel **56** which will slidably receive the locking roller **43.** The forward ends of the locking wedges are chamfered toward each other to form a pair of camming surfaces to center the locking roller **43** between the wedges **55.** Thus, the wedges form a wedge-shaped cam. Immediately rearwardly of the locking wedges **55,** a pair of spaced upstanding ears **57** are provided and a control roller **58** is mounted between them. The control roller is spaced a short distance above the top surface of the locking slide.

Projecting below and mounted to the cross plate **36** are a pair of stop rollers **60** (FIGS. **7, 8** and **9**). The stop rollers **60** are similar to the lock roller **43** in that they are rotatably mounted and are made of a hard, indentation resistent material having a smooth surface. The spacing of the stop rollers **60** is such that the locking wedges **55** will pass between them and, thus, as indicated in FIG. **7,** the locking wedges will form a body bridging and occupying the space between the locking roller **43** and the stop rollers **60** as indicated in FIG. **7.**

Mounted to the track hanger **13** and extending laterally away from the conveyor above the base **31** is a mounting bracket **70.** The mounting bracket **70** is rigidly secured to the track hangers and, at its outward end, pivotally mounts the upper end of an actuating lever **71** (FIG. **2**). The lower end of the actuating lever **71** is of reduced width forming a finger **72** which engages the forward face of the control roller **58.** Spaced from both the pivotal mounting of the actuating lever and the fingers **72,** a drive bar **74** is pivotally connected to the actuating lever. The drive bar is slotted at **75** to provide a lost motion connection with the bolt **76** connecting it to the lever **71.** The length of the slot **75** is such that the lever **71** may move through its entire arc of actuating movement without the bolt **76** binding with either end of the slot **75.**

At its rearward end, the drive bar **74** is rotatably connected to the eccentric **77** which, in turn, is eccentrically mounted on the drive shaft **78.** Thus, the lever **71** and drive bar **74** form a connecting linkage between the eccentric and the locking slide. The eccentric **77,** in the preferred form, is substantially triangular in shape with the shaft mounted adjacent one apex and one side of the triangle forming a cam surface **79.** Mounted on the drive assembly **80** are a pair of microswitches M1 and M2. The actuator arms for the microswitches M1 and M2 are so spaced and positioned that each of them are actuated by the cam surface **79** as the eccentric **77** is rotated.

The eccentric **77,** shaft **78** as well as the switches M1 and M2 are mounted on the drive assembly housing **80** (FIG. **3**). Inside the housing is a speed reducer **81** connected to a prime mover **82.** The shaft **78** is connected to the speed reducer. The prime mover **82** can be a fractional horsepower electric motor, since the only energy demand upon it is that necessary to withdraw the tongue **40** from between the locking rollers when the stop is subject to line pressure from the carriages and also against the bias of the spring **53** as will be explained more fully under Operation. Other types of small prime movers can be used without departing from the principles of this invention.

A brake **85** is also provided to positively stop the movement of the eccentric. The brake, in one form can be spring biased into braking action and deactivated by a solenoid **86** connected to the circuit for the motor **82.** Various other arrangements can be used to control the actuation of the brake. Further description of the brake is not given, since brakes of this type are conventional commercial products.

Preferably, an adjustable connection **83** provides means of adjusting the exact forward and rearward position of the drive bar **74** so that it will permit full extension of the stop tongue **40** when the stop is extended.

MODIFIED CONSTRUCTION

FIGS. **10** through **14** illustrate a modified stop **30***a*. In this arrangement, the same spaced base members **31** are utilized. Ways **32***a*, similar to the ways **32** are attached to the base members forms a base frame differing only in that the horizontal flanges are longer (FIG. **14**). Seated on the ways **32***a* is a stop arm **102** and a holding arm **103.** The rearward ends of the arms **102** and **103** are received into and secured to the anchor member or channel **104** at the pivots **105** and **105***a*. The forward end of the stop arm **102** has a box-like structure **106** similar to the box **42** on the end of the stop tongue **40.** It is provided for the same purpose. The holding arm **103** is shorter than the stop arm **102** and has no box structure at its forward end. It will be noted that the box portion **106** of the stop arm **102** is generally L-shaped and the holding arm **103** fits within the pocket created by the enlarged forward end of the stop arm **102.**

Adjacent the forward end of the holding arm **103** is a locking roller **107.** A similar locking roller **107***a* is mounted on the stop arm **102** at the same spacing from the pivots **105** and **105***a*. The locking rollers **107** and **107***a* are preferably rotatably mounted and of the same material as the stop rollers **60.** Thus, they are similar both in structure and in purpose to the stop rollers **60** illustrated in FIG. **7.**

The arms **102** and **103** are channel-shaped with their open sides facing toward each other. They are spaced to form a slot **108** between them. Seated within the arms **102** and **103** and centered with respect to the slot **108** is a bayonet slide **109.** The bayonet slide consists of a pair of spaced side bars **110** joined at their rearward ends by a pusher plate **111** and a depending spring gusset **112.** The spring gusset secures a tension spring **117** (FIG. **14**), the forward end of which is attached to a cross bar extending between the base members **31** in a manner identical to that illustrated and described for the construction shown in FIGS. **1** through **9.** The spring **117** serves the same function as the spring **53.**

The forward end of the bayonet slide has a laterally extending projection bar **113** rigidly secured to the side bars **110.** Forwardly of the projection bar **113,** a bayonet cam **114** of hardened, indentation resistent material is provided. The forward end of the bayonet cam is chamfered to form a point and the cam, itself, has a maximum width equal to the spacing between the rollers **107** and **107***a* when the arms **102** and **103** are fully separated. Approximately midway between the pusher plate **111** and the projection bar **113,** a roller **115** is rotatably mounted between the side bars **110.** The roller **115** performs the same function as the control roller **58** in the construction shown in FIGS. **1** through **9.**

Mounted on the rear of the channel **104** is a depending flange **120** which projects below the channel and the arms **102** and **103** to mount a stop pad **121.** The stop pad **121** serves the same purpose as the stop pad **38** in the preferred construction and, at the limit of extension travel of the unit, it engages the stops **122** (FIG. **14**).

OPERATION

The operation of both the preferred and the modified embodiments of this invention are quite similar. The operation of the preferred embodiment shown in FIGS. **1** through **9** will be described first.

Referring to FIG. **1,** it is assumed that the conveyor is being operated in the direction of the arrow A. When the lead carriage **17** reaches the stop **30,** the stop will first engage the cam surface **16**a on the forward face of the drive arm **16** lifting it and causing it to disengage the drive dog **19.** At this point, the carriage is free and continues to move only because of its momentum. Almost immediately after the disengagement of the drive arm **16,** the drive dog **19** will engage the stop. This will stop further forward movement of the carriage **17.**

Prior to the approach of the carriage **17,** the stop will have been shifted to extended position, i.e., the position illustrated in FIGS. **2, 3, 4,** and **5.** To extend the stop to this position, a signal will have been generated from any suitable source, either automatic or manual, which will cause the circuit interrupt produced by micro-switch M1 to be bypassed, energizing the prime mover **82.** This will cause the shaft **78** to rotate along with the eccentric **77.** As the eccentric rotates from its original position in contact with the micro-switch M1 to the position illustrated in FIG. **2,** the drive bar **74** will shift forwardly or to the left, as illustrated in FIG. **2.** As the drive bar **74** shifts forwardly, the bias of the spring **53** will pull the locking slide **50** forwardly. During the initial portion of forward movement of the locking slide, only the locking slide **50** will move since the fastener **41** will have been at the forward end of the slot **51** (FIG. **6**). However, when the locking slide **50** has shifted forward sufficiently that the fastener **41** engages the rear end of the slot **51** in the locking slide, forward motion of the stop tongue and the channel housing **33** will be initiated. This motion will continue until the stop pad **38** engages the stops **39** on the rear ends of the ways **32.** At this point, the stop tongue **40** is fully extended.

During the initial forward movement of the locking slide **50,** the locking wedges **55** will be shifted forwardly and will pass between the locking roller **43** and the stop rollers **60** to create the condition illustrated in FIG. **7.** At this point, the forward end of the stop tongue **40** is firmly held against any pivotal movement with respect to the channel housing **33** and, in turn, the channel housing **33** is held against pivotal movement because it fits closely between the stationary frame members **31.** Since the lock roller **43** and the stop rollers **60** have low friction surfaces, this sliding of the wedges **55** between them will require little energy and there will be no tendency to retard the forward motion of the locking slide.

It will be seen that since the extension or forward movement of the locking tongue **40** is effected solely by the spring **53** that the drive bar **74** serves only as a re-

tarder and not as a drive for the locking tongue. Should, for any reason, the forward motion of the locking tongue be obstructed such as the unit being actuated while one of the trolleys **18** is in front of the locking tongue, the prime mover **82** and its connected drive arm **74** are free to continue through their full cycle of forward movement since all that will happen is that the actuating lever **71** and the tongue will remain stationary while the bolt **76** slides along the lost motion slot **75.** This arrangement is important in protecting from injury the drive mechanism for the eccentric **77**, permitting it to complete its operating cycle.

When the drive bar **74** has reached its fully extended position, irrespective of whether the locking tongue has been able to also reach its fully extended position, the cam surface **79** on the eccentric **77** will engage the micro-switch M2 interrupting power to the prime mover **82.** Once extended, the stop will remain in this condition until a retraction signal is given.

When the retraction signal is given, the prime mover **82** is again energized rotating the eccentric **77** 180°. The rotation of the eccentric **77** pulls the actuator lever **71** to the right against the bias of the spring **53.** The first segment of movement of the actuator arm **71** causes the locking slide **50** to shift rearwardly without moving any of the other components of the stop. This action occurs because of the lost motion connection provided by the slot **51.** This retraction or movement to the right of the locking slide (as illustrated) is sufficient to withdraw the wedges **55** from between the stop rollers **60** and from around the lock roller **43.** As soon as this happens, the stop tongue **40** is unlocked and will immediately shift away from the carriage pressing against it. Simultaneously, the fastener **41** will engage the front or left-hand end of the slot **51** and thereafter the stop tongue **40** and the housing channel **33** will also shift to the right or retract. This withdraws the stop tongue **40** from the path of the carriages. The rotatable mounting of the stop rollers **60** and the lock roller **43** greatly facilitate the extension and retraction of the wedges **55,** reducing energy requirements to a minimum. Both the wedges and these rollers must be of a hard material, preferably hardened steel to prevent indentation resulting from line pressure by the carriages.

This retraction movement is completed quickly enough that the tongue will be entirely withdrawn from the path of the carriage before the inertia of the carriage is overcome and the carriage moves forwardly on the conveyor track to a point where it would once again, engage the tongue. The retraction of the stop is terminated when the cam surface **79** of the eccentric **77** actuates the switch M1. It is obvious from this description that it is important that the length of the slot **51** be such that the wedges are first moved into fully locked position between the stop rollers **60** and about the locking roller **43** before extension or forward movement of the locking tongue **40** is initiated and that the same wedges are fully withdrawn from between the same rollers before retraction movement of the tongue **40** is initiated. This is important on the extension movement because should the wedges not be fully extended and the tongue engaged by a carriage, the side pressure resulting from impact between the carriage and the end of the tongue could cause the mechanism to jam. On retraction, failure to fully release the tongue from the locking action of the wedges **55** would frustrate the purpose of the mechanism by attempting to withdraw the tongue before it is free to pivot into carriage disengaging position.

FIG. **15** illustrates a control system suitable for regulating the operation of the prime mover **82.** The source of electrical power indicated as "line" is provided with a switch **200.** Assuming that the stop is in fully extended position, the switch **200** is shifted to the right to close the line **201** connected to the micro-switch M1. This will energize the motor **82** through line **202** since both switches M1 and M2 are closed to this line. When the eccentric **77** engages the switch M1, it will be shifted to open line **202** and energize line **203.** The operation of the prime mover **82** will cease since the M2 switch will remain closed to line **202** and not to line **203.** In this condition the stop is retracted.

The next time the stop is to be operated, the switch **200** is shifted over to close line **204** thus energizing the motor through line **202** and switch M2. This condition will continue until the eccentric **77** actuates switch M2 opening line **202** and closing the circuit to line **203.** The motor at this point will stop since the switch M1 has previously been switched to connect lines **201** and **203** but the switch **200** is open with respect to line **201.** The stop is now fully extended. It will be obvious that to initiate the next full cycle, the switch **200** is restored to its original position shown in FIG. **15** which will energize the motor through lines **201** and **203** and the switch M1.

Operation of the switch **200** may be either automatic or manual. Either system is conventional in the conveyor art and forms no part of this invention. Therefore, the means for operating switch **200** is neither illustrated nor described in further detail.

It will be recognized that in the construction shown in FIGS. **1** through **9,** it is irrelevant from which direction the carriages apply line pressure to the tongue **40.** This is true because the tongue is free to pivot either to the right or to the left, once the locking wedges **55** have been retracted. Thus, the stop may be mounted on either side of the conveyor track and, it is irrelevant from which direction the carriages **17** approach. In this manner, the stop illustrated in FIGS. **1** through **9** differs from the stop illustrated in FIGS. **10** through **14.** The stop in these later figures is effective only for carriages approaching in the direction of the arrow A, as the stop is illustrated in FIG. **13.** Thus, if the modified stop is to be used on a conveyor on which the carriages would be approaching from the opposite direction, the stop mechanism must be mounted on the other side of the conveyor.

The operation of the stop shown in FIGS. **10** through **14** is very similar to that of the stop illustrated in FIGS. **1** through **9.** When this stop is in extended position, the bayonet slide **109** is shifted to its maximum forward position. In this position, the bayonet cam is thrust between the rollers **107** and **107***a*, forcing them apart and, thus, holding the stop arm **102** in its maximum upstream position with respect to the direction of movement of the carriages along the conveyor. Carriages pressing against the stop in the direction of arrow A (FIG. **13**) force the holding arm **103** against the adjacent base member, thus, providing a positive support for the stop arm **102.** Once against the rotatable mounting of the rollers **107** and **107***a* and the fact that both the rollers and the bayonet slide **109** are of hardened material greatly facilitates the unit's actuation.

The modified stop is actuated by the same lever, drive bar, eccentric and controls as that shown and described for the preferred embodiment. The actuator lever bears against the forward face of the roller **115.** To retract the stop, the actuating lever is shifted to the right as the stop is illustrated in FIGS. **10** through **13.** It will be noted from FIG. **10** that in the extended position, the pusher plate **111** is spaced forwardly from the channel **104.** This provides a lost motion arrangement permitting the bayonet slide **109** to be withdrawn rearwardly sufficiently to retract the bayonet cam **114** from between the rollers **107** and **107***a*. At this point, the extended or free end of the stop arm **102** is free to pivot away from the carriages thus releasing it from line pressure. This shift toward the holding arm **103** is illustrated in FIG. **10.** Also, at this point, the pusher plate **111** will engage the channel **104** and continued motion of the actuating lever will now retract the entire stop assembly from the path of the carriages.

To extend the stop again, the actuating lever is caused to move to the left as the stop mechanism is illustrated in FIGS. **10** through **13.** The initial portion of this movement will force the bayonet cam **115** between the rollers **107** and **107***a* thus creating the lock between the arms **102** and **103.** Continued forward movement of the bayonet slide **109** will bring the projection bar **113** into engagement with the rollers **107** and **107***a*. Thereafter, the entire stop mechanism will be pushed into extended position until the stop pad **121** engages the stops **122** on the base members **31.** Once again, it will be recognized that the extension of the stop results from the bias of the spring **117** and thus the actuating lever **71** merely serves to regulate the rate of extension. It will also be recognized that should the extension of the stop be obstructed that this will not prevent the prime mover **82** and its connected structure from completing its cycle of movement between the switches M1 and M2. It will also be recognized that since the line pressure has been removed from the stop before retraction is initiated, the only energy demand on the prime mover **82** is that sufficient to overcome the bias of the spring **117.**

The invention provides a positive stop mechanism which has eliminated the necessity for large bulky heavy duty prime movers in order to retract the stop. It also provides a stop mechanism which will be comparatively quiet in operation and durable because it is not possible to damage the driving mechanism as a result of obstruction in the path of the extension movement of the stop. By eliminating the necessity of forcibly pulling the stop from in front of the carriages while the stop is subjected to full line pressure not only are the forces which must be overcome greatly reduced, but also the wear on the mechanism is significantly reduced and many of the operating components can be lighter in weight and less massive. The reduction in cost is quite significant in large conveyor installations since a number of these stops are frequently used, thus multiplying the savings.

It will be recognized that while this invention has been specifically described as applied to an overhead conveyor, it could as readily be applied to an in-floor conveyor or to a conventional roller or wheel conveyor as an article stop with modifications which are wholly routine and do not, in any way, depart from the principles of this invention.

While a preferred and a modified construction of this invention have been described, it will become apparent to those skilled in the art that other modifications of this stop can be made, both to the physical structure and to the control and prime mover for the stop without departing from the spirit or the scope of the present invention as defined by the hereinafter appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows.

1. A stop for conveyors, said stop having an article engaging tongue, means mounting said tongue both for lateral movement and for reciprocation between extended article engaging and retracted article disengaging positions; locking means movable between locked and unlocked positions; said locking means in locked position engaging said tongue and holding said tongue against lateral movement and in unlocked position disengaging said tongue; means for shifting said locking means into locked position as said tongue is shifted to extended position and for shifting said locking means into unlocked position before said tongue is retracted whereby said tongue may shift laterally before said tongue is retracted.

2. A stop for conveyors as described in claim **1** further characterized in that a lost motion connection is provided between said locking means and said tongue for effecting sequential shifting of said locking means and said tongue.

3. A stop for conveyors as described in claim **2** further characterized in that said means for shifting said locking means includes a spring for biasing said locking means and tongue into extended position and a prime mover for shifting said locking means and tongue into retracted position.

4. A stop for conveyors, said stop having an article engaging tongue, said tongue having a forward article engaging end and a rearward end; means mounting said tongue both for lateral pivotal movement of said forward end and for reciprocation between extended article engaging and retracted article disengaging positions; locking means movable between locked and unlocked positions; said locking means in locked position engaging said tongue and holding said forward end thereof against pivotal movement and in unlocked position disengaging said tongue; means for shifting said locking means into locked position as said tongue is shifted to extended position and for shifting said locking means into unlocked position before said tongue is retracted whereby said tongue may pivot before said tongue is retracted.

5. A stop for conveyors, said stop having a base frame and an anchor member mounted thereon for reciprocal movement, a tongue mounted on said anchor member for reciprocal movement between extended and retracted positions, the forward end of said tongue in extended position being adapted to engage and arrest articles on the conveyor, said stop characterized in that means are provided for securing the rearward end of said tongue to said anchor frame for pivotal movement laterally thereof; lock means shiftable between locked and unlocked positions; means connected to said lock means for shifting said lock means between its positions and means for reciprocating said tongue; means for sequentially timing the operation of said lock means and said tongue whereby said lock means is shifted into

locked position before said tongue is shifted to extended position and said lock means is shifted to unlocked position before said tongue is shifted to retracted position; said lock means in locked position holding said tongue against lateral pivotal movement.

6. A stop for conveyors as described in claim 5 further characterized in that a first lock means engaging member is mounted on said tongue and a second lock engaging member is fixedly secured to said anchor member; said lock means in locked position being seated between said first and second members for holding said tongue and said first member against movement toward said second member.

7. A stop for conveyors as described in claim 6 further characterized in that said lock means has a forward portion, said portion being wedge-shaped to cam said first and second members apart.

8. A stop for conveyors as described in claim 7 further characterized in that said first and second members are rotatably mounted and are of hardened, indentation resistent material having a low coeffecient of friction surface to facilitate the engagement and disengagement of said forward end of said lock means.

9. A stop for conveyors as described in claim 5 further characterized in that a first lock means engaging member is mounted on said tongue and a pair of second lock engaging members are fixedly secured to said anchor member, said second locking engaging members being spaced apart laterally of said anchor member whereby said first lock engaging member can pass between them; said lock means having a pair of arms forming a bifurcated cam portion, said arms, when said lock is in locked position receiving said first lock member between them and engaging both of said second lock members for holding said tongue and first lock member against lateral pivotal movement; said arms when said lock means is in unlocked position being disengaged from both said first and second members.

10. A stop for conveyors as described in claim 5 further characterized in that said lock means is a plate seated upon said tongue and slidable lengthwise thereof; said plate having a slot elongated lengthwise thereof for receiving therethrough said means securing the rearward end of said tongue, the length of said slot being such as to permit said plate limited movement relative to and lengthwise of said tongue; means resiliently biasing said plate forwardly toward locked position; a prime mover and means connecting said prime mover to said plate for restraining said plate against forward movement; control means for said prime mover intermittently actuating said prime mover to alternately shift said connecting means between tongue extended and tongue retracted positions.

11. A stop for conveyors as described in claim 10 further characterized in that said securing means is a pin and plate shifts said tongue into extended position after the rearward end of said slot engages said pin and said plate has shifted in locked position and said plate shifts said tongue into retracted position after the forward end of said slot engages said pin and said plate has shifted into unlocked position.

12. A stop for conveyors as described in claim 11 further characterized in that said connecting means in a linkage one end of which engages said plate; said linkage having a lost motion connection permitting said linkage to shift to tongue extended position without corresponding movement of said plate on said tongue.

13. A stop for conveyors as described in claim 12 wherein said prime mover is an electric motor; a cam operatively connected to and rotated by said motor; said linkage having a drive bar and a control link; one end of said control link being pivotally mounted and the other end thereof engaging said plate; said lost motion connection being between said drive bar and said control link.

14. A stop for conveyors as described in claim 13 wherein a pair of switches are provided in the electrical supply for said motor; said switches being mounted for alternate actuation by said cam, one when said tongue is in extended position and the other when said tongue is in retracted position.

15. A stop for conveyors, said stop having a base frame and an anchor member mounted thereon for reciprocal movement, a tongue mounted on said anchor member for reciprocal movement between extended and retracted positions, the forward end of said tongue in extended position being adapted to engage and arrest articles on the conveyor, said stop characterized in that said tongue having a stop arm and a holding arm, lock means seated between said arms; said lock means being movable lengthwise with respect to said arms between a locked position and an unlocked position, said lock means in locked position holding said stop and holding arms apart and in unlocked position releasing said stop arm for pivotal movement toward said holding arm, means for sequentially shifting said lock means into locked position and then said tongue into extended position and for sequentially shifting said lock means into unlocked position and then said tongue into retracted position.

16. A stop for conveyors as described in claim 15 wherein a lost motion connection is provided between said lock means and said tongue for effecting said sequential operation.

17. A stop for conveyors as described in claim 16 wherein a lock engaging member if fixedly secured to each of said stop and holding arms and said lock means has a bayonet portion mounted thereon for travel between and engagement of said lock engaging members; a bar on said lock means rearwardly of said bayonet portion engageable with said lock engaging means for shifting said tongue into extended position after said bayonet has engaged said lock engaging means.

18. A stop for conveyors as described in claim 17 wherein said shifting means includes a spring secured to said lock means for resiliently biasing said lock means into locked position and said tongue into extended position and a prime mover and linkage connected to said lock means for retracting both said lock means and said tongue against the bias of said spring.

19. A stop for conveyors, said stop having a tongue and means for reciprocating said tongue between extended and retracted positions, said tongue in extended position projecting into the path of articles on the conveyor and restraining their forward movement, the improvement in said stop comprising: said tongue having a forward end and a rearward end, said forward end being the article engaging portion thereof; a pivot member pivotally mounting the rearward end of said tongue whereby the forward end of said tongue can shift in the direction of movement of articles on the

conveyor; lock means for pivoting said tongue into an upstream position with respect to the direction of movement of articles on the conveyor and locking said tongue against pivotal movement when said tongue is in extended position; means for sequentially disengaging said lock means to free said tongue for pivotal movement and retracting said tongue.

20. In combination, a conveyor having an article supporting track along which articles are transported and a stop, said stop having a tongue and means for reciprocating said tongue between extended and retracted positions, said tongue in extended position projecting into the path of articles moving along said track and in retracted position being withdrawn from said track, said combination characterized in that means are secured to said conveyor for mounting said tongue both for lateral movement and for reciprocation between extended and retracted positions; locking means movable between locked and unlocked positions, said locking means in locked position engaging said tongue and holding said tongue against lateral movement in the direction of movement of articles on said track, and in unlocked position disengaging said tongue and fixing it for lateral movement; means for shifting said locking means into locked position and then shifting said tongue into extended position and for shifting said locking means into unlocked position then retracting said tongue whereby said tongue can disengage articles on said track before it is retracted.

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