Sept. 25, 1956 F. T. MAY ET AL 2,763,963

STEM MACHINE FEED CONTROL

Filed Sept. 1, 1954

4 Sheets-Sheet 1

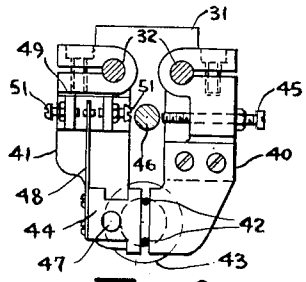

Fig. 2

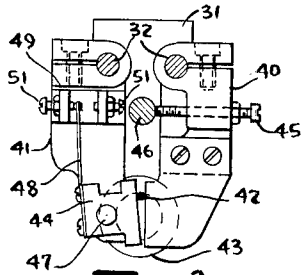

Fig. 3

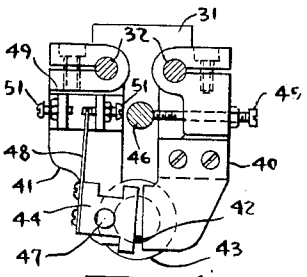

Fig. 4

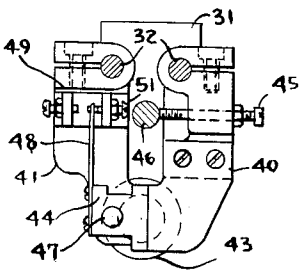

Fig. 5

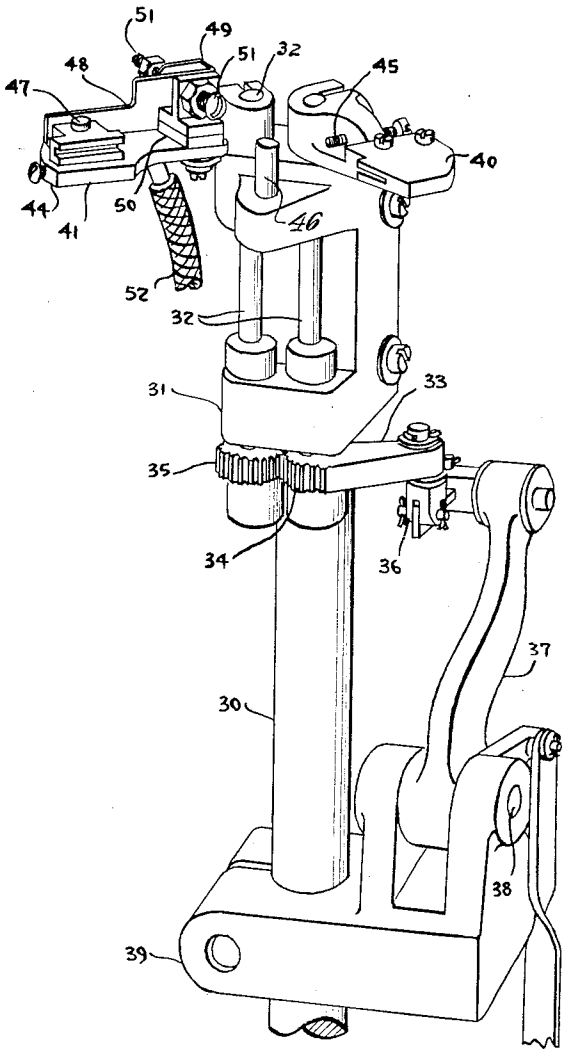

Fig. 1

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4 Sheets-Sheet 2

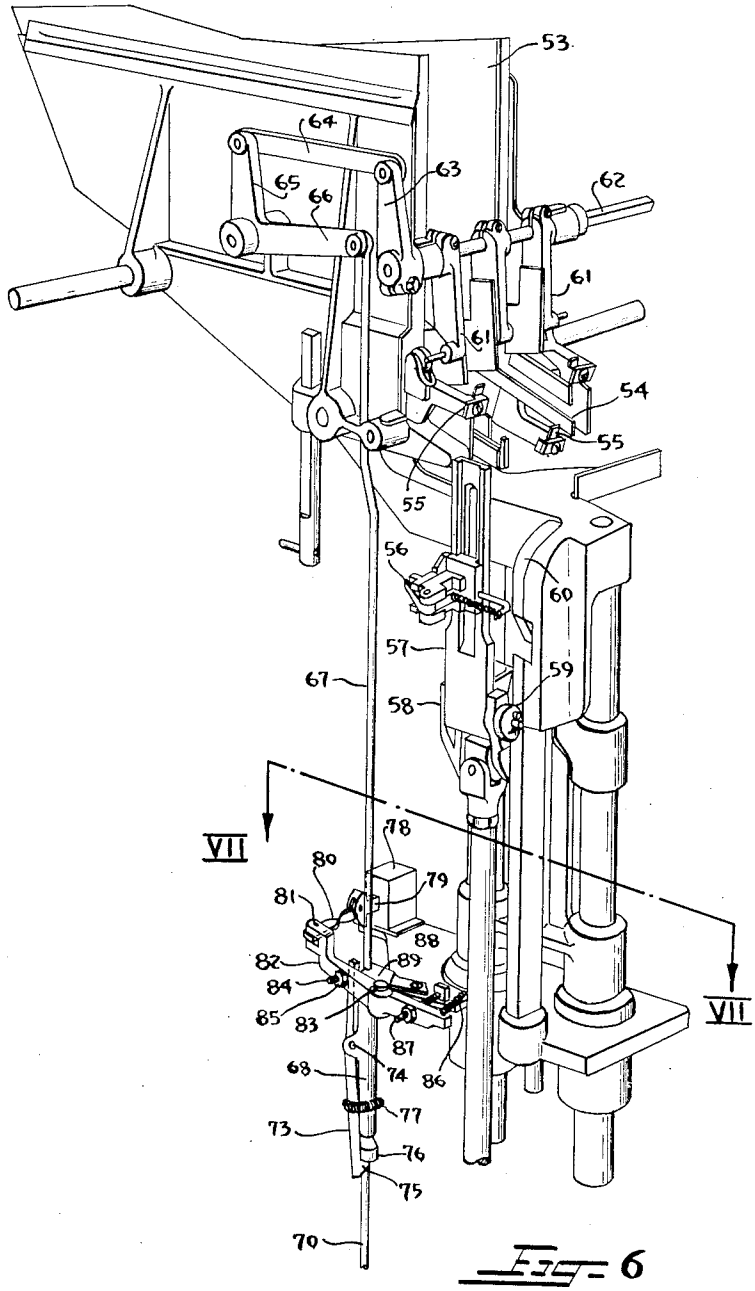

Fig. 6

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4 Sheets-Sheet 3

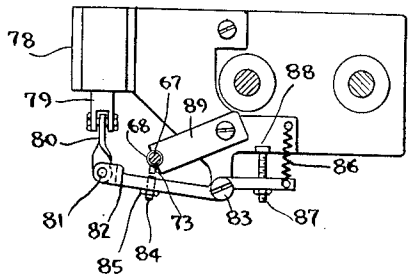


Fig. 7

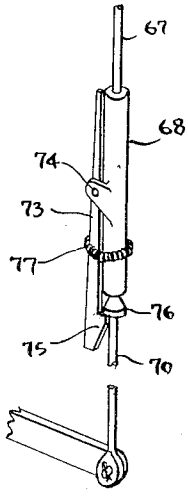
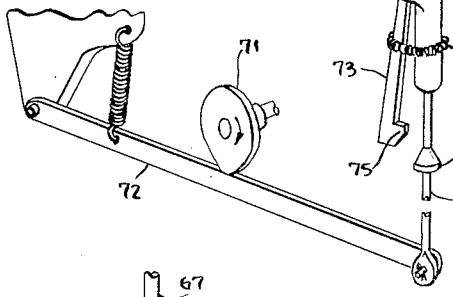


Fig. 8



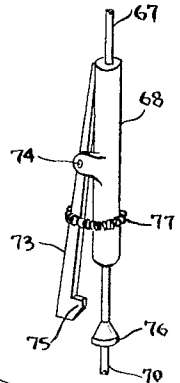


Fig. 9

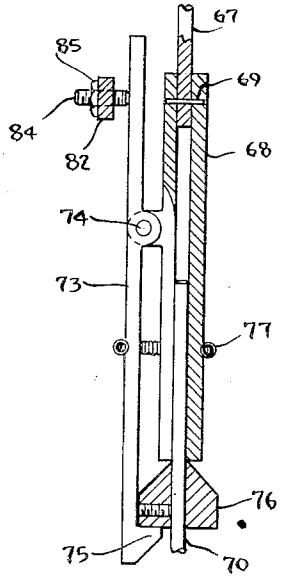


Fig. 10

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STEM MACHINE FEED CONTROL

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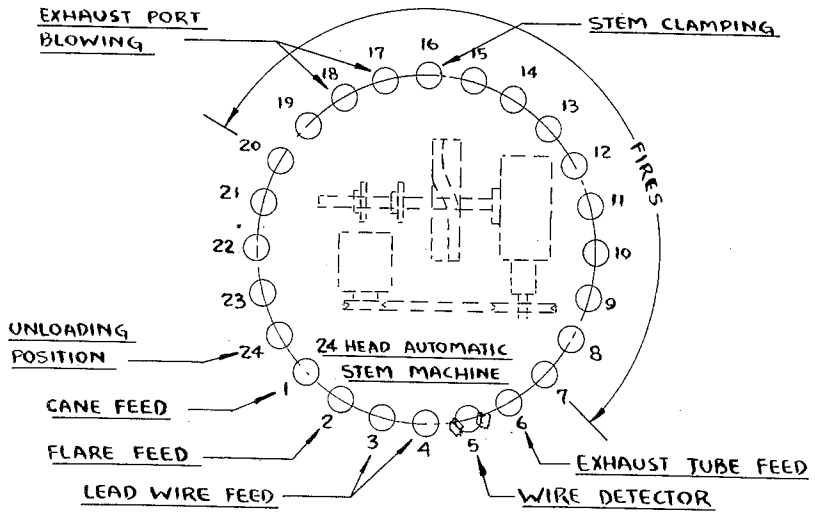

Fig. 11

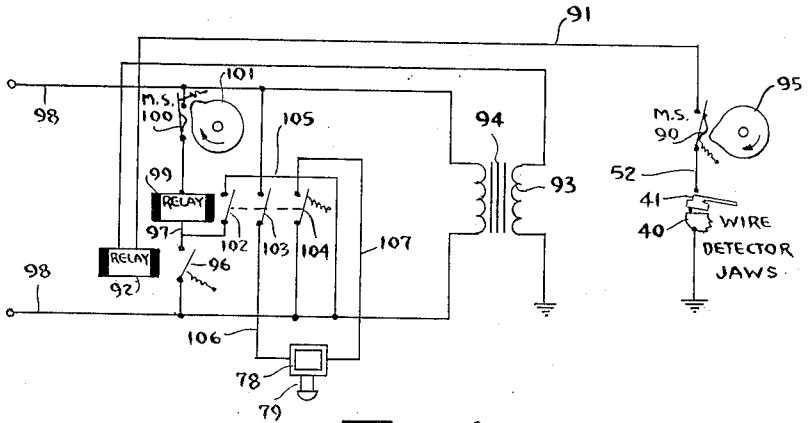

Fig. 12

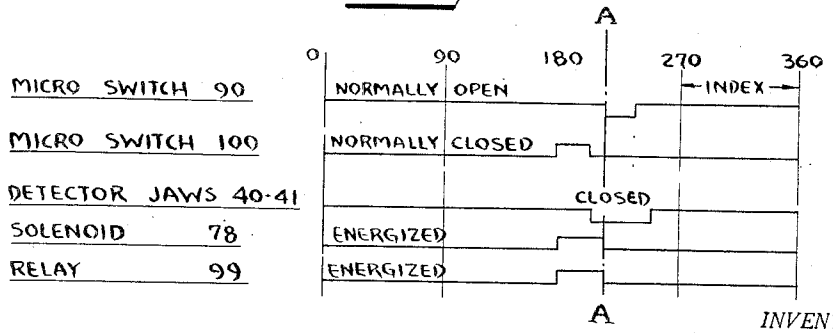

Fig. 13

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STEM MACHINE FEED CONTROL

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Application September 1, 1954, Serial No. 453,544

4 Claims. (Cl. 49—2)

It has been the practice to prevent feeding of a filament to a stem assembly during machine fabrication of lamps in instances where an exhaust tube is missing. However, it is equally important that the lead-in wires be present and that waste of a filament be avoided in the eventuality of a missing lead-in wire.

Primarily, therefore, the invention proposes means for interrupting subsequent feeding operations to a stem assembly wherein either or both lead-in wires are missing.

More specifically, the invention provides means for interrupting the feeding of an exhaust tube to a stem assembly when either or both lead-in wires are missing.

The invention also contemplates inclusion of time delay during which the feeding mechanism is interrupted.

Other objects, advantages, and distinguishing characteristics will appear to persons skilled in the art to which the invention appertains as the description proceeds, both by direct reference thereto and by implication from the context.

Referring to the accompanying drawings, in which like numerals of reference indicate similar parts throughout the several views:

Figure 1 is a perspective view of the feeler mechanism;

Figures 2 to 5 are plan views of said feeler mechanism in various positions of operation;

Figure 6 is a perspective view of a tubulation feeding portion of a stem-making machine to which is applied our trip mechanism constituting a feature of the invention;

Figure 7 is a horizontal cross-sectional view on line VII—VII of Figure 6;

Figures 8 and 9 are perspective views of a portion of the tripped mechanism in non-tripped and tripped positions respectively;

Figure 10 is a vertical section of the mechanism of Figure 8;

Figure 11 is a diagrammatic plan of a stem making machine showing the several stations of the turret in its cycle of rotation;

Figure 12 is a circuit diagram of the electrical holding or delay instrumentalities and circuit utilized with our invention; and

Figure 13 is an operational diagram showing the relation of circuit functioning.

As well understood in the lamp industry, a machine for fabricating stem assemblies, consists of a turret or rotary conveyor having a plurality of heads at the peripheral portion thereof, which are advanced by a step-by-step rotation of the turret through a cycle of stations equal to the number of heads. Therefore, by the showing of twenty-four stations in Figure 11, it will be understood that there are that many heads employed on the particular machine arbitrarily selected for utilization of our invention. The general organization of such a machine, and the various mechanisms for collating the several parts of (and unifying them as) a stem assembly, are fully shown and described in Patent 1,655,141 of January 3, 1928, so that in the most part repetitious showing and description of that known mechanism is deemed

unnecessary. The present invention is more particularly concerned with preventing introduction of parts to complete a stem wherein a part that should be present has failed to arrive at its proper place of collation. Specifically, the part to be detected whether missing, is a lead-in wire which should be present to ultimately receive the filament. As such wires are of relatively small gauge, detection thereof (whether present or not) poses a difficult problem. Ordinarily where there are a plurality of lead-in wires in a lamp or other device of similar character, it is customary to automatically drop the wires, one at a station, into sockets in the stem machine head for the purpose provided by the machine. Assuming two lead-in wires only are required, which is true for most lamps, we utilize a detecting mechanism at the station where the second wire is supposed to be dropped into place, this mechanism being illustrated in Figures 1 to 5 inclusive.

Lead-in wire detector

In the specific embodiment of the lead-in wire detecting mechanism at Station 5 (Fig. 11) shown more particularly in Figures 1 to 5, the reference numeral **30** (Fig. 1) designates an upright stanchion or mount rod constituting a fixed part of the machine. Fast upon the upper end of said stanchion is a bracket **31** (Figs. 1–5) of appropriate character providing bearings for a pair of vertical parallel oscillating shafts **32** which protrude both above and below the bracket. Secured on one of the shafts **32**, at a location immediately below the bracket, is a lever **33** providing a segmental gear or arcuate series of teeth **34** coaxial with that shaft and directed toward the other or second shaft **32**. Said second shaft **32** has a gear **35** (Fig. 1) thereon with its teeth in mesh with the aforesaid teeth **34** so that the shafts will oscillate simultaneously in opposite directions.

Toothed lever **33** is swung through the agency of a universal joint **36** (Fig. 1) connecting it with one arm of a bell-crank lever **37** pivoted at **38** on another, but lower, bracket **39** fastened to said mount rod **30**. Bell crank lever **37** is swung in proper timed relation to the indexing of the turret by a cam (not shown) or otherwise, connected with the indexing drive.

At the upper ends of shafts **32** are mounted feeler arms **40, 41** which, by virtue of the oscillatory rotation of the shafts **32**, are adapted to assume the open or divergent relationship shown in Figure 1 or to be swung into close or closed proximity to each other as shown in Figures 2–5. For convenience of reference, the edge faces of these arms **40—41** which close toward each other will hereinafter be referred to as the front sides of said arms **40—41**. One arm, here designated abutment arm **40**, has an unyielding front side, which when the arms **40—41** are closed toward each other, comes to rest where it will engage either or both of lead-in wires **42** (Figs. 2–5) present in stem **43** at the lead in wire detecting station. The other arm, designated for distinguishing purposes as the contact arm **41**, has a teeter block **44** thereon projecting beyond the front side of said contact arm **41** so that the front side of said block **44**, rather than the front side of the arm **41**, will engage either or both of said lead-in wires **42** above mentioned. Abutment arm **40** has a transverse adjusting screw **45** therein, the forward end of which is adapted to engage a fixed lug **46** as a stop for precise location of the front edge of that arm in terminating its forward swing. The adjustment is made to obtain tight engagement of the lead-in wires **42** when the teeter block **44** is brought by contact arm **41** to its forwardly swung position.

Teeter block **44** is mounted on contact arm **41** by means of a pivot or pintle **47**, the axis of which is parallel to shaft **32** and accordingly substantially parallel to the lead-in wires **42**. The arc on which the pintle **47** is

moved as the arm 41 swings is substantially midway between the lead-in wires 42 or location where the lead-in wires 42 should be. Consequently, if both lead-in wires 42 are present, the front side of the teeter block 44 will be pressed against the two wires 42 and be parallel to the front sides of both of the feeler arms 40—41, as shown to be the situation in Fig. 2. However, if either one of the lead-in wires 42 is missing, the block 44 will teeter toward the abutment arm in the direction of the missing wire 42, as shown in Figures 3 and 4. In event both wires 42 are missing, the front side of contact arm 44 has increased swing which causes it to be non-parallel to the front side of the abutment arm 40, but since the front side of the teeter block 44 then engages and is parallel to the front side of the abutment arm 40, it automatically is non-parallel to the front side of the contact arm 41 on which it is mounted. As a result, with no lead-in wires 42 present, the teeter block 44 teeters on its pivot as shown in Figure 5.

The rear side of the teeter block 44 is substantially as far in back of the pintle 47 as the front side is in front thereof, said front and rear sides preferably, but not necessarily, being parallel. Attached to the teeter block 44, and conveniently at the rear side thereof is a resilient contact blade 48 which extends from said block longitudinally above contact arm 41 toward the shaft-supported end thereof and projects into a stationary contact stall 49 the side walls of which overlap the blade 48 but are laterally spaced away from it in normal centralized position of the blade 48. The stall 49 is preferably metal and insulated electrically from the arm 41 on which it is mounted by an intervening insulating gasket 50 (Fig. 1) contact studs 51 extend through the side walls of the stall 49, are in axial alignment with each other, and are directed toward the blade. In normal position of the teeter block 44 (Fig. 2), the blade 48 will be at rest medially between and out of engagement with both of said contact studs 51. But when the teeter block 44 is teetered from its normal position (Figs. 3–5), blade 48 is swung into engagement with one or the other of said contact studs 51 and thereby completes an electric circuit from ground (the metal of the machine) to a conductor 52 (Figs. 1 and 12) common to both studs 51. Adequate friction is provided by the pivotal mounting of the teeter block 44 so it will only teeter to make contact between the blade 48 and a contact stud 51 when positively swung as explained above. However, it will be seen later herein, that the electrical circuit is also controlled by the indexing operation of the machine and contact studs 51 only have controlling current thereto during the interval when the arms 40—41 are swung toward each other in closed or close position and at such time the teeter block 44 is under positive actuation by engagement with one lead-in wire 42 or with the abutment arm 40. It should be noted that when both lead-in wires 42 are present, the teeter block 44 is positively held thereby in normal position and the electrical circuit is maintained open by the blade 48 extending medially between the contact studs 51, and it is only when the teeter block 44 is swung, by absence of one or both lead-in wires 42, that the blade 48 completes the electrical circuit to one or the other of said contact studs 51.

Tubulation feeding mechanism

An essential feature of the present invention is the trip mechanism which effects a skip in the feed for the exhaust tube or tubulation when any one of the conditions exists, described above, and shown in Figures 3, 4 and 5. This mechanism is illustrated in Figures 6 to 10 in association with a prior art tubulation feeding mechanism. In brief, this feeding mechanism provides a hopper 53 (Fig. 6) in which the tubulations are stacked with the tubulations lying horizontally. The bottom of the hopper 53 (Fig. 6) slopes downwardly forward and the tubulations roll in a single series therefrom onto a track 54 and are stopped by a gate 55 which can be swung to release one tubulation at a time. The released tubulation then rolls further down track 54 into jaws 56 located, at that period of operation, in the path of rolling of the tubulation. The jaws 56 are appropriately operated to grip the tubulation received and hold it until time to release it. The jaws are mounted on a transfer carriage 57 (Fig. 6) which can both slide and swing, being pivoted at one end to a slider 58 which reciprocates vertically. As the slider 58 is pulled down, it swings the carriage 57 to an upright position assisted by cooperation of a roller 59 on the carriage 57 and a fixed arcuate track 60. The tubulation gripped by the jaws 56 is thus transferred from the horizontal position to a vertical position; the jaws 56 are then opened and the tubulation released to assume its position in the head of the machine. The carriage 57 is then raised and swings back to horizontal position ready for another tubulation.

Aforementioned gate 55 is of pivoted-lifting type and is lifted by rearwardly swinging of arms 61 (Fig. 6) depending from a shaft 62 extending cross-wise at the front of the hopper 53. A crank 63 is fixed on one end of said shaft 62 for oscillating the shaft 62 and swinging the gate 55. A rigid link 64 connects the crank 63 to an upright arm 65 of a bell-crank lever the other arm 66 of which extends forwardly approximately below link 64. It will be seen that downward swing of the forwardly extending arm 66 obtains upward swing of the gate 55 and release of the adjacent tubulation. A pull rod 67 is pivoted at its upper end to the forward end of bell crank arm 66 so that every time the pull rod 67 is moved downward, a tubulation will be released. It is with respect to this pull rod 67 (Figs. 6–10) that the aforementioned trip mechanism is applied.

Latch mechanism

The lower end of pull rod 67 (Figs. 6–10) is shown fixed in the upper end of a sleeve 68, as by a cross-pin 69 (Fig. 10). The lower end of the sleeve 68 receives the upper end of a constantly reciprocating rod 70 which of course is driven in coordinated timed relation to the indexing of the turret of the machine, as by a cam 71 and spring loaded lever 72 (Fig. 9). The sleeve 68 has a latch 73 pivoted at 74 thereon, the latch 73 being shown extending longitudinally of the sleeve 68 and projecting therebelow and providing an inwardly projecting nose 75 at its lower end. Reciprocating rod 70 has a collar 76 adjustably fixed thereon, the under edge of which constitutes a shoulder under which the nose 75 will engage. A suitable spring 77 is applied to the latch 73 for swinging the nose end of the latch 73 normally inwardly toward the rod 70 so it will engage under said shoulder. In such position (Figs. 8 and 10) of engagement the sleeve 68 will be lowered by and with downward pull of the reciprocating rod 70 and thereby operate the above described feeding mechanism. However, when the latch 73 is tripped or swung to divert nose 75 away from the reciprocating rod 70, it will not engage the shoulder of collar 76, and therefore downward movement of the rod 70 will not then transmit any downward pull on the sleeve 68 and no tubulation will be released by the feeding mechanism.

Latch tripping mechanism

Mechanical-electrical means are provided to trip or swing the latch, and includes a solenoid 78 (Figs. 6, 7, 12 and 13) the core or operating rod 79 of which retracts when current is passed through the solenoid coil. A link 80 (Figs. 6 and 7) pivoted to said core 79 has pivot connection 81 to a latch tripping lever 82 in turn pivoted at 83 (Fig. 6) to a fixed part of the machine. Said lever 82 extends crosswise of the latch 73 near the upper end thereof and at a part of the lever 82 between pivots 81 and 83 (Fig. 6). Consequently, when said lever 82 is pulled inwardly it wil trip the latch 73. As a desirable refinement in construction, the lever 82 may be equipped with adjustable engagement with the latch 73 for which

purpose an adjusting screw **84** (Figs. 6 and 7) is shown projecting through the lever **82** toward the latch **73** and is held in place by a lock nut **85**. Furthermore, lever **82** extends beyond its pivot **83** and has a spring **86** secured thereto applying tension to hold the lever **82** normally retracted from the latch **73**. A screw **87** through the lever **82** in the direction of tension of the spring **86** is engageable with a fixed stop **88** (Figs. 6 and 7) on the machine to limit the swing of the lever **82** at the desired normal position of rest. A brace **89** may be located behind rod **70** or elsewhere as found desirable to avoid bending the rod **70** by the pressure exerted by the solenoid **78**.

As will be apparent from consideration of Fig. 11, detection of missing lead wires **42** is effected at one station, there shown at Station **5**, and substantially simultaneously a tubulation is making its entry into the stem at the next Station **6**. It is therefore a feature to provide for delay action such that when the head at Station **5** advances to Station **6** no tubulation will be fed if a wire **42** was detected as missing while the head was at Station **5**. We have consequently devised a construction and circuit, disclosed in Fig. 12 accomplishing this result.

Memory circuit

The detecting circuit wire **52** from the detector shown in Fig. 1 is in series with a normally open starting microswitch **90** (Figs. 12 and 13) and from the other contact of that switch **90** a connection **91** leads to one side of a starting relay **92** from the other side of which a return line leads to a source of power, such as to the secondary **93** of a transformer **94**. The other side of said secondary is grounded to the machine and thus makes a circuit with the wire detector which, as heretofore described, is also grounded. In the period during which the detecting jaws **40, 41** are closed, a cam **95** closes said microswitch **90** thereby causing it to function if there is a missing wire **42** in the head at Station **5**. Since a tubulation has already been released to the transfer mechanism for the head then at Station **6**, operation of relay **92** does not interfere with completion of the assembly of the stem then occupying Station **6**.

Starting relay **92**, when energized, closes a normally open switch which for convenience of reference will be designated short-duration switch **96** since it is closed only for the short time that the detector jaws **40—41** (Figs. 1–5) and cam-closed microswitch **90** complete the series circuit to the starting relay **92**. Said short duration switch **96** is in a circuit connection **97** across current supply lines **98** and in this cross connection, in sequence following location of the said switch, is a holding relay **99** and a normally closed breaking microswitch **100** with which is associated a cam **101** for opening the same in timed relation to operation of the indexing of the turret. Accordingly, when there is a lead wire **42** missing in the head at Station **5**, holding relay **99** will be energized initially by current through short duration switch **96**, the cycle of cam **101** being such that it does not then open microswitch **100** in that relay circuit.

Holding relay **99**, when energized, causes a bank of tied-together switches **102, 103** and **104** to all close. A first one of these switches, identified as shunt holding switch **102**, closes a circuit **105** at the same side of holding relay **99** with the short duration switch **96** in shunt with said short duration switch **96**, so that, as soon as holding switch **102** has been closed by actuation of holding relay **99** it will feed current to the holding relay **99** from the same side of the supply line as fed by short duration switch **96**. In this manner holding relay **99** continues to be energized after short duration switch **96** opens. The bank of switches are thus held closed by the holding relay until normally closed microswitch **100** is opened temporarily by cam **101**.

The bank of switches also includes solenoid switch **103** which completes a circuit **106** from one side of the

supply line to solenoid **78** and another switch **104** completing a circuit **107** from the other side of said solenoid to the other side of the supply line. Both of these solenoid switches **103** and **104** are closed when the shunt switch **102** is closed, and therefore as long as holding relay **99** is energized, the solenoid **78** will be energized. As a result, the trip mechanism will be held in retracted condition for a period of the cycle of the turret from prior to and during indexing from Station **5** to Station **6** and for part of the time after arriving at Station **6** so that no tubulation will be fed to the defective assembly thereat. An operation chart is shown in Fig. 13 for the cycle of operation at Station **5** to and including indexing to Station **6**. The sequence of operation given above, referring initially to closing of starting micro-switch **90**, begins the described cycle at line A—A of said chart. The chart furthermore shows only the condition of a missing lead wire **42** and no attempt is made to include a condition of both lead wires **42** being present.

We claim:

1. An exhaust tube feeding control mechanism for a stem making machine having at least a frame, a turret, and a plurality of heads thereon which are advanced about said frame through a cycle of work stations equal to the number of said heads, comprising an exhaust tube feeding mechanism for feeding an exhaust tube to said heads and having at least an operating pull rod and a reciprocating rod, a latch mechanism on said exhaust tube feeding mechanism for normally permitting the feeding of said exhaust tubes, said latch mechanism comprising a sleeve secured to said pull rod, and having said reciprocating rod received in the lower end thereof, a latch engaging collar on said reciprocating rod, and a latch pivoted on said sleeve and normally in engagement with said collar, a latch tripping mechanism on said frame for tripping said latch mechanism and preventing said feeding of said exhaust tubes, a circuit closing lead-in wire detecting mechanism for determining the presence or absence of lead-in wires in said heads and for accordingly controlling the operation of said exhaust tube feeding mechanism, and electrical means energized as a result of the closing of said detecting mechanism to operate said latch tripping mechanism.

2. An exhaust tube feeding control mechanism for a stem making machine having at least a frame, a turret, and a plurality of heads thereon which are advanced about said frame through a cycle of work stations equal to the number of said heads, comprising an exhaust tube feeding mechanism for feeding an exhaust tube to said heads, a latch mechanism on said exhaust tube feeding mechanism for normally permitting the feeding of said exhaust tubes, a latch tripping mechanism on said frame for tripping said latch mechanism and preventing said feeding of said exhaust tubes, said latch tripping mechanism comprising a latch tripping lever pivoted on said frame and in spring biased contact with said latch mechanism and a solenoid on said frame having its operating rod connected to said latch tripping lever, a circuit closing lead-in wire detecting mechanism for determining the presence or absence of lead-in wires in said heads and for accordingly controlling the operation of said exhaust tube feeding mechanism, and electrical means energized as a result of the closing of said detecting mechanism to operate said latch tripping mechanism.

3. An exhaust tube feeding control mechanism for a stem making machine having at least a frame, a turret, and a plurality of heads thereon which are advanced about said frame through a cycle of work stations equal to the number of said heads, comprising an exhaust tube feeding mechanism for feeding an exhaust tube to said heads, a latch mechanism on said exhaust tube feeding mechanism for normally permitting the feeding of said exhaust tubes, a latch tripping mechanism on said frame for tripping said latch mechanism and preventing said feeding of said exhaust tubes, a circuit closing lead-in

wire detecting mechanism for determining the presence or absence of lead-in wires in said heads and for accordingly controlling the operation of said exhaust tube feeding mechanism, said lead-in wire detecting mechanism comprising mounting means, a pair of oscillating shafts journalled in said mounting means, means for rotating said shafts, an abutment arm and contact arm on said respective shafts, a teeter block pivoted on said contact arm, a contact stall on said contact arm, a contact blade carried by said teeter block and engageable with said contact stall when one or more lead-in wires are missing from one of said heads, and electrical means energized as a result of the closing of said detecting mechanism to operate said latch tripping mechanism.

4. An exhaust tube feeding control mechanism for a stem making machine having at least a frame, a turret, and a plurality of heads thereon which are advanced about said frame through a cycle of work stations equal to the number of said heads, comprising an exhaust tube feeding mechanism for feeding an exhaust tube to said heads, a latch mechanism on said exhaust tube feeding mechanism for normally permitting the feeding of said exhaust tubes, a latch tripping mechanism on said frame for tripping said latch mechanism and preventing said feeding of said exhaust tubes and having at least a tripping solenoid, a circuit closing lead-in wire detecting mechanism for determining the presence or absence of lead-in wires in said heads and for accordingly controlling the operation of said exhaust tube feeding mechanism and having at least a pair of normally open lead-in wire detecting jaws, and electrical means energized as a result of the closing of said detecting mechanism to operate said latch tripping mechanism, said electrical means comprising said lead-in wire detecting jaws in series with a normally open starting switch, a starting relay and a source of electric power, a normally open short duration switch closable by said starting relay in series with a holding relay, a normally closed breaking switch and a source of electric power, a normally open holding switch in parallel with said short duration switch and closable by said holding relay and a normally open solenoid switch in series with said tripping solenoid and closable by said holding relay, said solenoid switch and said solenoid being in parallel with said breaking switch, holding relay and holding switch.

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