April 14, 1959 J. J. BARRETT ET AL 2,882,523

MISSING ELEMENT DETECTION IN A STEM MAKING MACHINE

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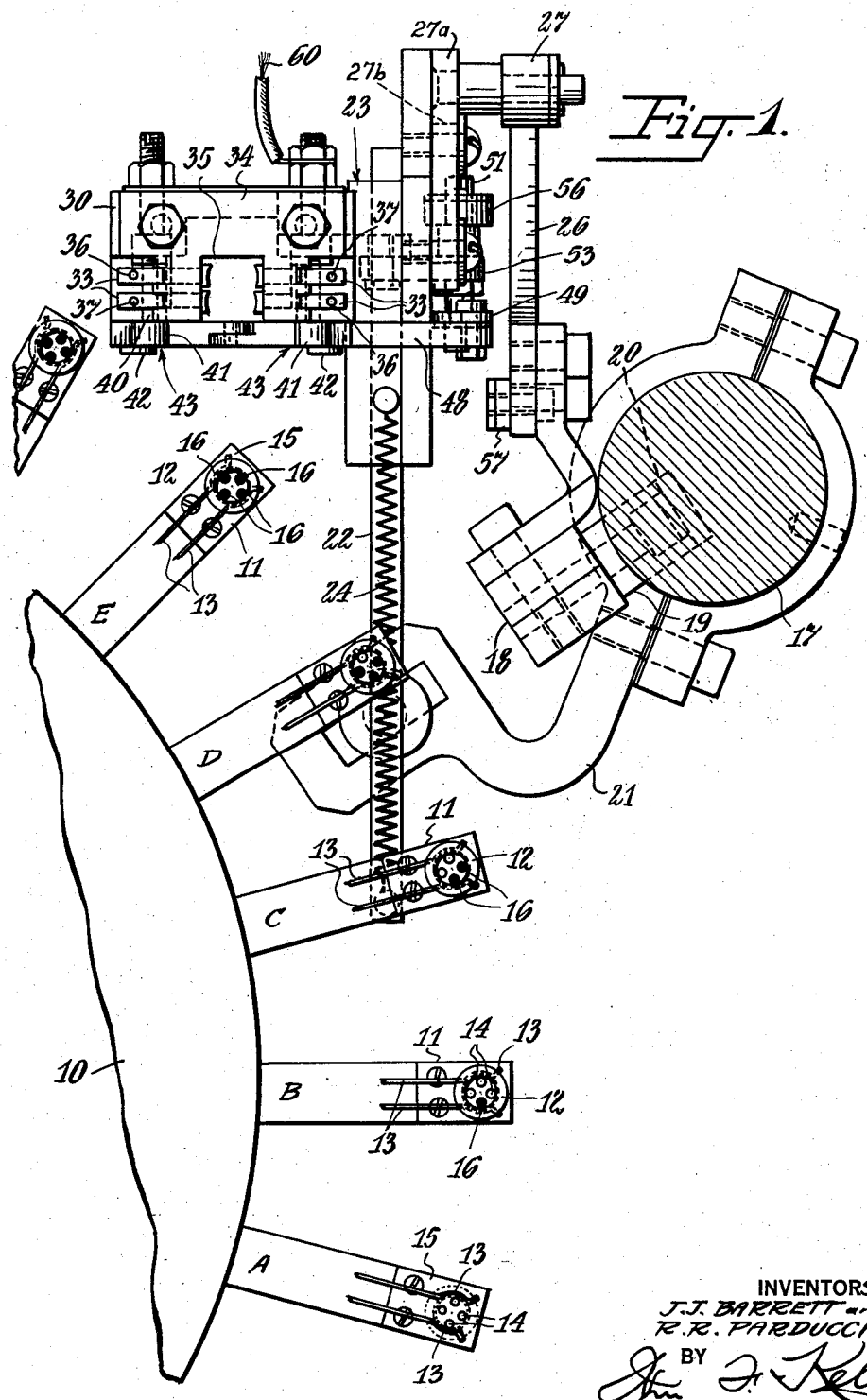


Fig. 1.

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Fig. 2.

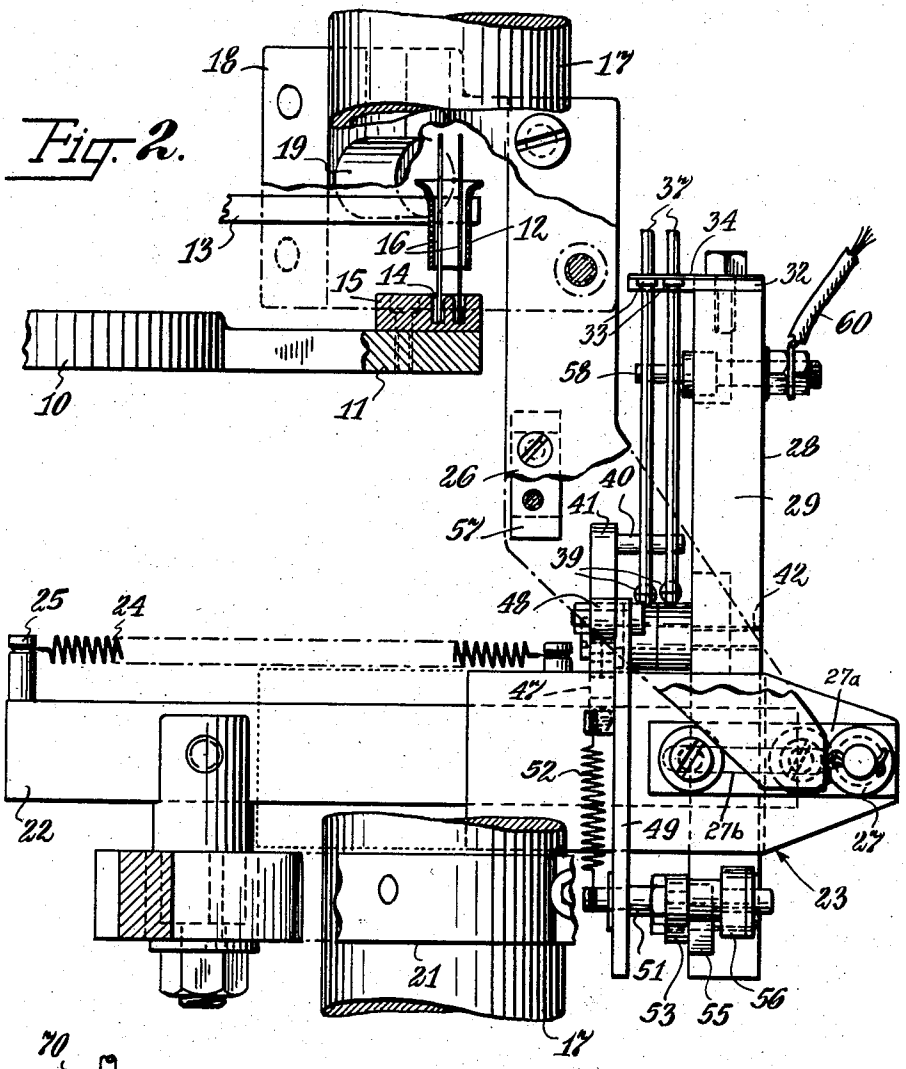
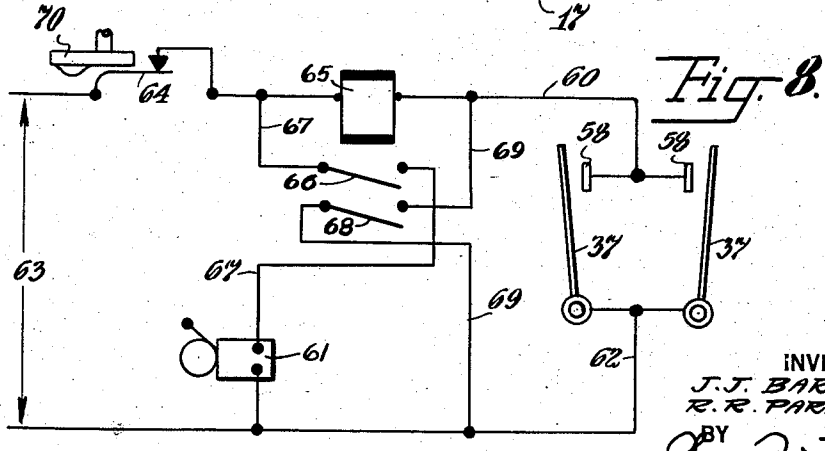


Fig. 8.



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Fig. 3.

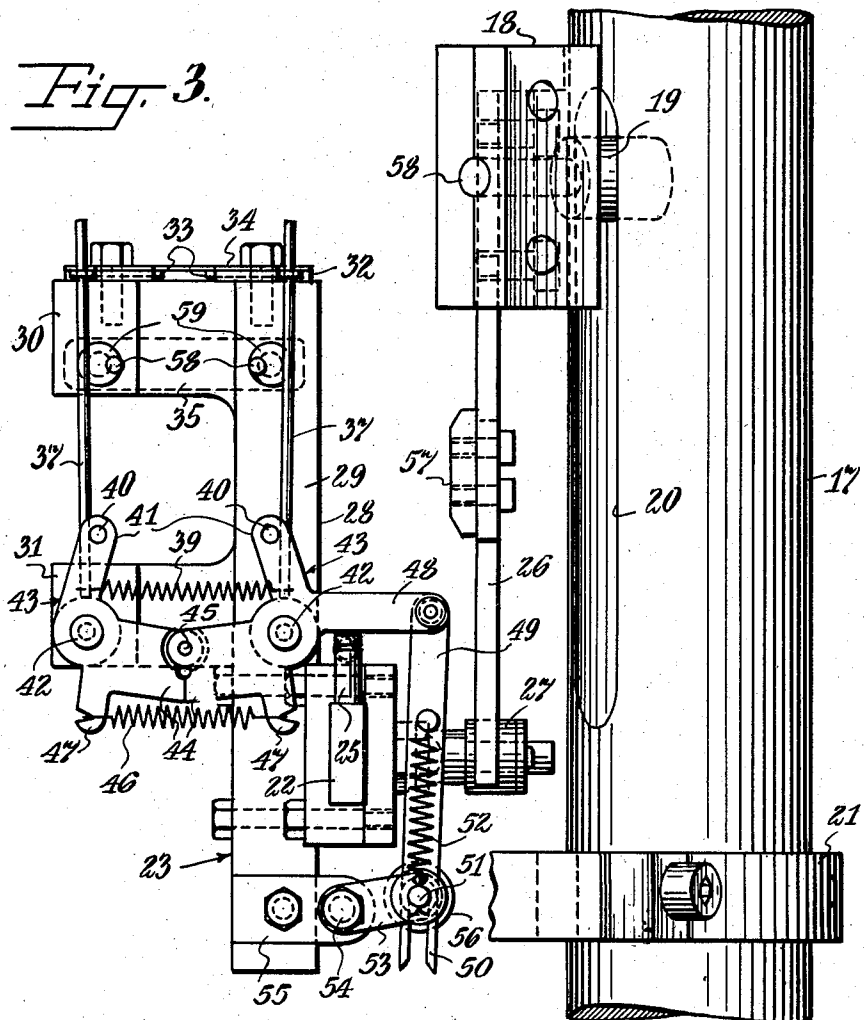
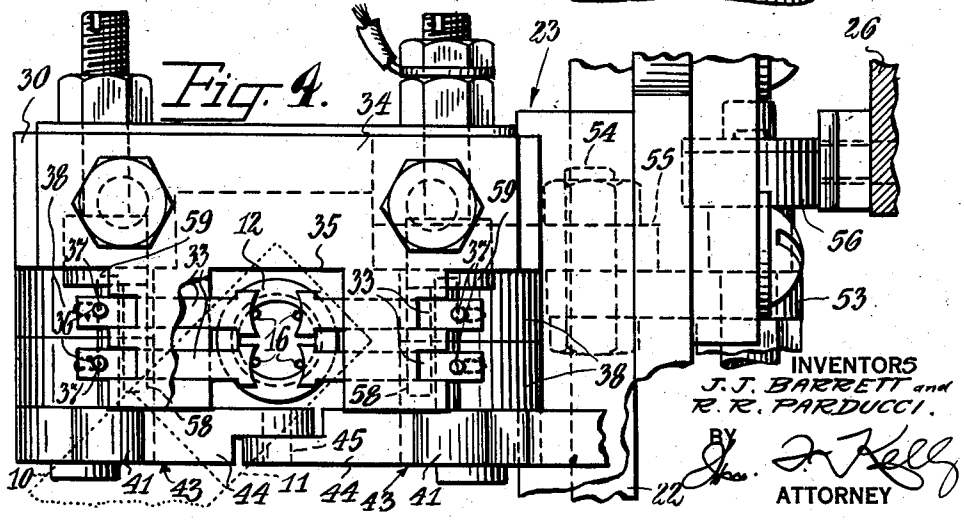


Fig. 4.



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Fig. 5.

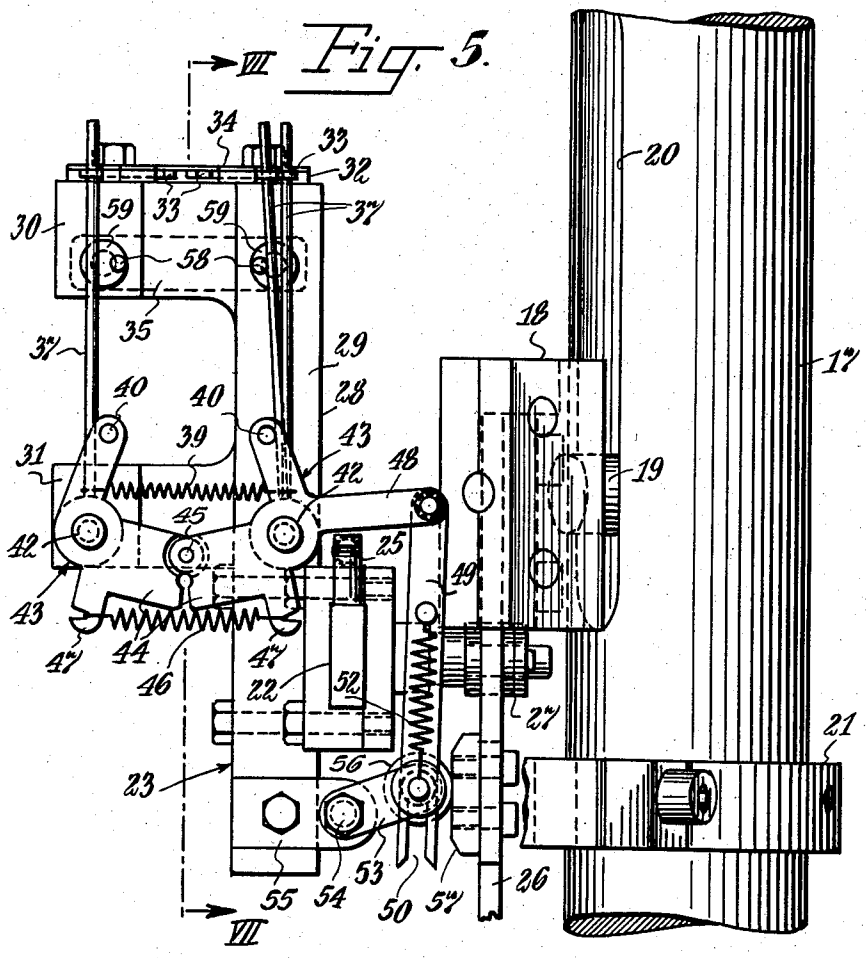
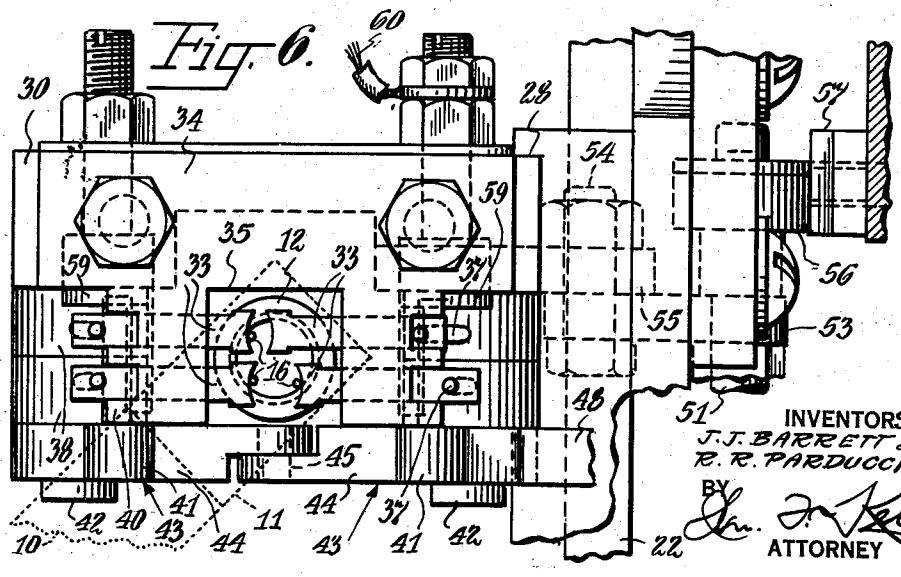


Fig. 6.



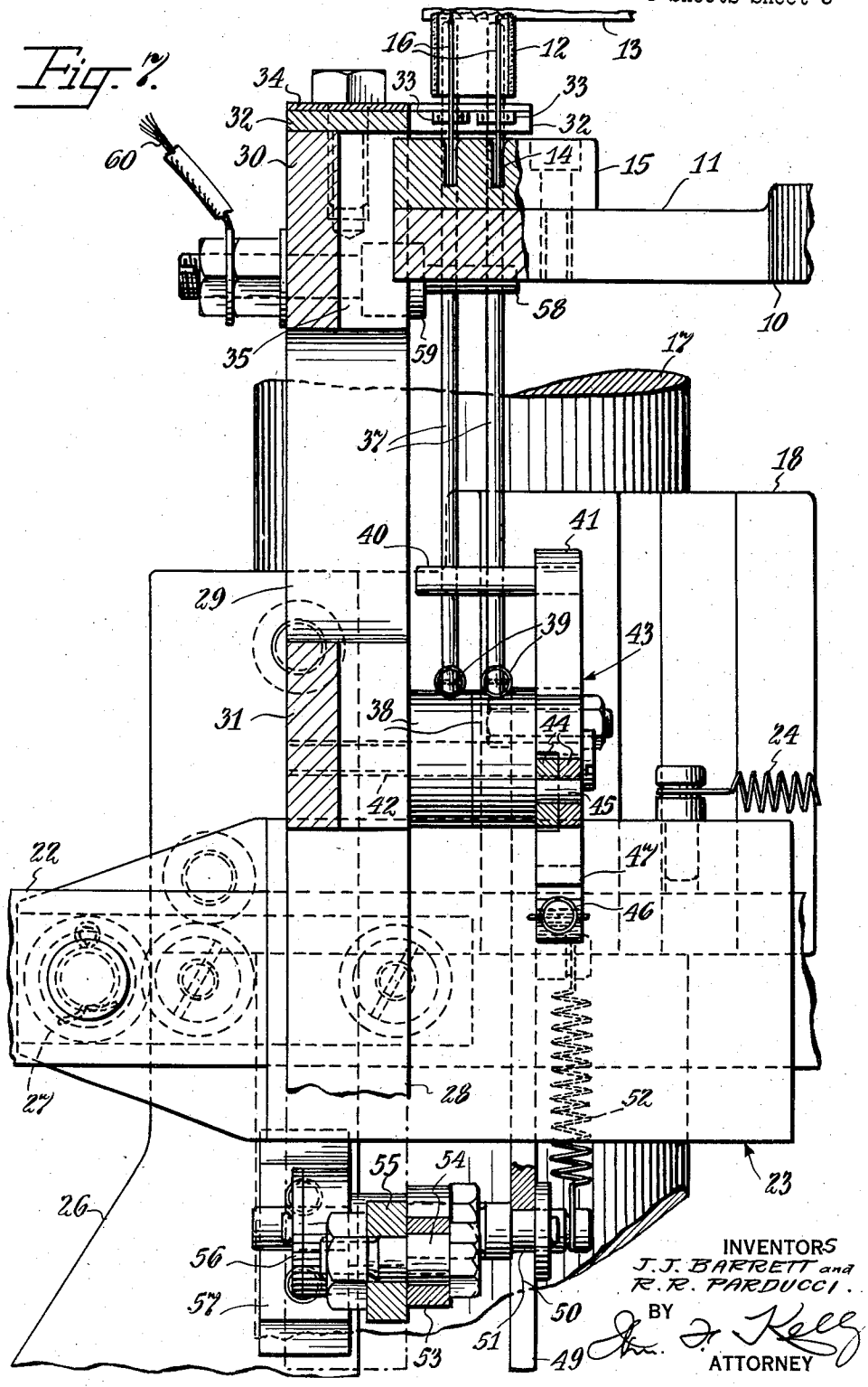
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Fig. 7.



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2,882,523

MISSING ELEMENT DETECTION IN A STEM MAKING MACHINE

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Application June 1, 1953, Serial No. 358,752

2 Claims. (Cl. 340—259)

This invention relates to automatic stem-making machines and, more particularly, to a mechanism for detecting, before performing further operations which would result in fabrication of an imperfect product, missing lead-in wires in the stem assembly.

Present-day high-speed automatic stem-making machines usually provide a rotor which indexes from station-to-station and has a plurality of stem-receiving and fabricating heads corresponding in spacing peripherally of the rotor to the several stations. Certain operations are performed at the successive stations and those of interest to the present invention are at the beginning of the cycle where a flare is first introduced into a head and held by jaws thereat, and then at successive stations lead-in wires are fed, one at each station, through the flare into a holder constituting a part of the head and located beneath the flare. A subsequent operation seals the glass at the lower end of the flare around the lead-in wires, and the present invention contemplates detection in an assembly of stem and lead-in wires wherein one or more of the wires may be missing before the sealing operation is performed.

According to the present showing, the stem assembly has four lead-in wires when correctly fabricated, but the inventive concept is equally applicable to assemblies intended to each have more or less lead-in wires in completed condition. Reference herein to four lead-in wires accordingly is to be understood as explanatory only of the arbitrarily selected embodiment and not in a restrictive sense.

In its broad aspect, the invention proposes individual feelers for each of the predetermined number of lead-in wires.

Also of generic character, an objective is to close an electric utilization circuit to a supplemental instrumentality each time any feeler fails to contact a lead-in wire at the place where said wire should be.

More specifically, an object of the invention is to avoid scraping contact of the lead-in wires by the detecting means and to avoid use of the lead-in wires as electrical conductors in operation of said detecting means or in the utilization circuit thereof.

A further object of the invention is to apply light pressure only upon the lead-in wires by the feelers and of short duration.

Another object of the invention is provision of mechanism affording positive retention of the feelers away from the lead-in wires except for the momentary circuit closing interval and then under influence of spring loading for the feelers exerting insignificant bending moment on any lead-in wires present.

Yet another object of the invention is to incorporate the invention in existing stem-making machines and operable at a regular indexed station previously established in the operation of such machines, thereby avoiding an additional indexed stop specifically for detecting purposes.

Other objects of the invention will appear to persons skilled in the art to which it appertains as the description

proceeds, both by direct recitation thereof 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 plan of our improved missing lead-wire detector, in assembled location with the rotor of a stem-making machine, and shown in its retracted position;

Figure 2 is an elevation thereof looking in a direction from right to left in Fig. 1;

Figure 3 is an elevation of said detector looking from the bottom toward the top of the sheet containing Fig. 1 and omitting the rotor;

Figure 4 is a plan, on increased scale, of the detector with the feelers advanced to engagement with lead-in wires of a stem assembly;

Figure 5 is an elevation similar to Fig. 3 showing operation of the feelers in connection with a stem having a missing lead-in wire;

Figure 6 is a plan, on increased scale, of Fig. 5;

Figure 7 is an elevation looking in a direction opposite from Fig. 2; and

Figure 8 is a diagrammatic representation of the utilization circuit involved with our invention.

In the specific embodiment of the invention illustrated in said drawings, and first considering its general relation to an existing stem-making machine, it is to be observed that it is general practice to provide a rotor **10** (Figs. 1, 2, 4, 6 and 7) which indexes to a definite number and location of stations, designated sequentially herein by letters of the alphabet, A, B, C, D and E for the first several stations of the cycle of operation. For each station on the rotor there is provided a head **11** constructed and operated to receive and hold the constitutent elements of the stem assembly during fabrication. No attempt has been made to show the complete head construction as it is well known in the art. Indicative of essential steps pertinent to the present invention station A may be considered the initial station of the cycle at which a glass flare **12** is introduced into said head and held by jaws **13** above weld pockets **14** located in a holder **15** on the rotor, said pockets being equal in number and spacing to the intended number and spacing of lead-in wires **16** in the stem assembly. At the four successive stations, B, C, D and E, for the specific four-wire assembly arbitrarily selected for the present showing, the lead-in wires **16** are fed, one at a time, into the said pockets so that the fourth wire is fed at station E. All of said wires extend through the flare **12** and have their ends projecting therefrom. It is here called to attention that there is a space (Fig. 2) between the top of holder **15** and bottom of flare **12** thereby permitting hereinafter described feelers to enter that space and make contact with the wires **16** close to the weld pocket **14**.

At the same station E at which the fourth or last wire is positioned, we provide for detecting whether one or more may be missing by the device constituting the subject matter of the present invention of which the following is a more detailed description.

Conveniently located in proximity to the rotor and station E is an upright fixed post **17** (Figs. 1–3, 5 and 7) next to which is a vertically reciprocating member **18** having a roller **19** thereon riding in and guided by a longitudinal slot **20** in the post. The said member **18** is a part of the lead-in wire feeding mechanism shown in U.S. Patent No. 2,042,520, issued June 2, 1936 to J. Flaws, Jr. and accordingly is synchronized with the indexing of the machine. We make use of the post **17** as a support for the subject invention and utilize said member **18** to furnish the actuation therefor.

At an appropriate elevation on said post **17** we clamp

a bracket **21** (Figs. 1–3, 5 and 7) to maintain a fixed position, the end portion of the bracket away from the post being shown as protruding under the lowest level of the heads **11**, well below the same. Bolted or otherwise fixed on said end portion of the bracket **21** is a stationary rail **22** (Figs. 1–7) extending horizontally outward approximately in a direction tangential of the rotor **10** and in a plane parallel to the nearest pair of wires **16**, or pockets **14** therefor, located at rest at station E. On said rail **22** is a slidable carriage **23** which is drawn normally inward toward the rotor by a spring **24** (Figs. 1, 2 and 7) attached to and extending from a forward end portion of the carriage to a fixed knob **25** next the bracket supported end of the rail. Said carriage **23** is adapted to be retracted or moved to its outward position by a reciprocating cam **26** (Figs. 1–5 and 7) attached to and depending from aforesaid member **18**, said carriage having a laterally protruding roller **27** adjustably mounted on a plate **27***a* provided with a slot **27***b* (Figs. 1 and 2) for non-frictional drive between said cam **26** and carriage **23**. The adjustment for said roller enables the carriage to be made to register at its inward position at the correct position to bring the feelers **33** (Figs. 1–7) exactly opposite the lead-in wires **16**. When the cam **26** is in its uppermost position, the carriage **23** is fully retracted as in Figures 1, 2 and 3, and when the cam is in its lowermost position, as in Figures 4, 5, 6 and 7, the carriage is in its most advanced position toward the rotor **10**, being actuated thereto by spring **24**.

At the side of said carriage **23** away from the cam **26** and post **17** and constituted as part of said carriage is a chassis **28** with an upright leg **29** at the top of which is a lateral or upper horizontal shelf **30**. Further down on the leg **29** but at an elevation above that of the rail **22**, and, like the upper shelf **30**, on the opposite side of the leg from the post, is a lower horizontal shelf **31**. The locations and indexing are such that when the head **11** at station E of Fig. 1 is at a position of rest thereat, carriage **23** moves inward toward that head with the upper shelf **30** at a level below the flare **12** and flare gripping jaws **13** at a level above said shelf such that the space between the holder **15** and flare is just above the said upper shelf.

Secured on the top of upper shelf **30** (Figs. 2, 3, 5 and 7) is a horizontally grooved guide plate **32**, the direction of the grooves being perpendicular to the direction of sliding of the carriage **23**. In said grooves are slidable feelers **33** held therein by an overlying top plate **34**. Said upper shelf **30**, guide plate **32** and top plate **34** are shaped to provide a cut-out or alcove **35** at the side toward the rotor head **11** (Fig. 1) at station E such that when the carriage moves inward the cutout or alcove **35** admits the end of the holder **15** and lead-in wires **16** to be received laterally therein and at that time the respective lead-in wires in the space between the top of the holder and bottom of the flare **12** will be directly in the path of sliding of the feelers **33**. Each feeler is here shown as having a wide and concave T-end (Figs. 4 and 6) directed transversely of the cut-out **35** so as to assure engagement with the lead-in wire **16** protruding from the flare **12** even though the wire may not be standing prefectly upright, since the weld pockets **14** provide considerable clearance for receiving said wires. At the time when the carriage **23** moves to align the feelers **23** opposite to the lead-in wires, said feelers are fully retracted with the T-ends thereof drawn back into engagement with the alcove walls which may conveniently act as limiting stops for retraction of said feelers. The opposite or stem ends of the feelers project from the opposite edges of the guide plate **32** and have rod-receiving holes **36** (Figs. 1 and 4) near the said ends.

Sliding of the feelers is under control of rods **37** (Figs. 1–7), one for each feeler, located in front of the shelves **30**, **31** and which extend upwardly from the lower shelf **31** past the upper shelf **30** and through the respective

holes **36** of the feelers. The lower ends of the rods **37** are each secured in a hub **38** (Figs. 4, 6 and 7) individual to each rod as a single spoke therefrom. Spiral springs **39** (Figs. 2, 3, 5 and 7) extend between opposite rods tending to swing said rods toward each other. Opposed to the inward pull of said springs **39** is a pair of crank pins **40** which cross in front of the rods **37** above the hubs **38** and springs **39**, said pins protruding laterally from crank arms **41** pivoted on the same axles **42** as the hubs **38**. Said crank arms **41** are integral parts of bell-crank levers **43** (Figs. 1–6) providing coordinating arms **44** directed toward each other and which overlap with an operative pivotal connection **45**. The arrangement is such that both crank arms **41** will be caused to swing simultaneously toward each other or simultaneously away from each other the effect of which is to enable all of the feelers **33** to move inward simultaneously under influence of spiral springs **39** or to be retracted outwardly simultaneously by crank pins **40**. A tension spring **46** connected to depending lugs **47** on the bell crank levers maintains resilient impetus tending to keep the crank pins **40** in engagement with rods **37** and tending to swing said rods outward with a force exceeding the inward swinging force applied by the pair of spiral springs **39** on the rods. However, the outwardly swinging force applied to the rods **37** by the tension spring **46** is released at an appropriate moment in the operative cycle by a positive operating means, at which time the spiral springs **39** between the rods becomes effective.

The positive operating means for releasing the retractive force applied by spring **46** comprises a laterally extending arm **48** (Figs. 1–3, and 5–6) on one bell crank lever **43** said arm having a link **49** pivoted thereto, said link extending down to, and having a slot **50** receiving (Figs. 1, 3 and 4), a stud **51** which is held seated normally in the upper end of the slot by a spring **52** carried by the link. Said stud is fixed in and projects at opposite sides of a rocker **53** which is pivoted at **54** to a bracket **55** carried next to the bottom of leg **29**. The outer end of said stud carries a roller **56** the periphery of which projects toward the side of carriage-operating cam **26** (Figs. 1, 3 and 4), and on that side is a cam protuberance **57** properly located to engage said roller when the cam **26** approaches its lowermost position and the carriage **23** is at its innermost position toward the rotor **10**. As spring **52** holds rocker **53** at only a slight upward inclination toward the roller-carrying end thereof, engagement of the protuberance **57** with the roller causes the rocker to first swing down, as viewed in Figs. 3, 5 and 7, by virtue of slot **50** and spring **52**, and then when protuberance **57** passes below the roller and starts its up stroke, the rocker is swung outward momentarily, thereby lifting the link **49** which thereupon swings the bell crank levers **43** in a direction moving crank pins **40** closer together. This movement inward of crank pins **40** removes retention of the rods **37** which then respond to impetus of springs **39** to swing inwardly and slide the feelers **33** as far inward as they are permitted to go. Since the carriage **23** is at its inward position, the feelers are directly opposed to the upwardly projecting lead-in wires **16** of the stem assembly and if all said wires are present, as in Fig. 4, the feelers are stopped thereby and do not move as far as they might if the wires were not present. But if any lead-in wire is missing, the corresponding feeler may move further inward, as shown in Figs. 5 and 6, and, of course, the actuating rod **37** for that particular feeler likewise swings further inward.

Electrical contacts, here shown as pins **58** (Figs. 2–5 and 7–8), carried by but insulated from chassis **28** are interposed in the path of swing of said rods **37**. Said contacts **58** are preferably eccentrically protruding from a stud **59** enabling said pins **58** to be adjusted to only be engaged by the rods **37** which make the extra amplitude of swing resulting from a lead-in wire **16** not being present. For normal operation, therefore, with all lead-

in wires present, the rods do not swing far enough to engage said contacts, but, as shown in Fig. 5, where a lead-in wire is missing, the corresponding rod continues its swing until stopped by engagement with said contact. With the machine constituting ground for a utilization electric circuit and a connection **60** (Figs. 2, 6–8) leading to said circuit from said contact **58** and a supplemental instrumentality, such as buzzer **61**, said instrumentality is electrically actuated. It is to be understood, however, that this buzzer is only indicative of any desired instrumentality to be operated by closing of the electrical circuit.

Since a buzzer and associated devices have been arbitrarily selected for illustrative purposes, as instrumentalities of the utilization circuit, a specific description thereof, as shown in Fig. 8, may accordingly be given as follows: Line **62** is representative of above-mentioned ground connection through the machine from rods **37** to one side of an input source **63**, the other side of which connects through a micro switch **64** and relay **65** to aforementioned connection **60** to the contacts **58**. The relay, when caused to function by the closing of the circuit from a rod **37** to a contact **58**, closes two contacts of the relay **65**, one a buzzer contact **66** which is in a cross line **67** to the grounded source, and another contact **68**, called an interlock contact, which shunts across, by line **69**, between lines **60** and **62** and keeps current flowing through the relay even through the circuit through rods **37** and contacts **58** opens. The interlock contact **68** is held closed as long as the relay is excited and the relay **65** continues to be excited as long as the interlock contact is closed. And at the same time, the buzzer contact **66** is kept closed by functioning of the relay. A cam **70** is provided in conjunction with the indexing mechanism, timed to open micro switch **64** for a long enough period to interrupt the current flow to the relay after the buzzer or other instrumentality has served its purpose at the particular indexed position of the rotor, said micro switch being again closed ready to pass current to the relay **65** when the next succeeding head **11** (Fig. 1) comes to the same indexed position. It will be appreciated that when the micro switch **64** opens the circuit, the relay is no longer excited and both the interlock contact **68** and buzzer contact **66** thereupon are opened. The arrangement accordingly obtains an extended period of current flow to the buzzer **61** or other instrumentality, but requires only a momentary closing of the circuit by rods **37** engaging contacts **58**. Consequently the feelers **33** are capable of functioning quickly and withdrawing to be out of the way and permit the carriage **23** to withdraw promptly, thus enabling the detecting mechanism to be applied at the same station at which the lead lead-in wire **16** is introduced and therefore avoiding the provision of an extra station just for detecting purposes. Furthermore the construction advantageously avoids utilization of the lead-in wires **16** as electrical conductors for missing wire detecting purposes.

While in accordance with the patent statutes one best known embodiment of the present invention has been illustrated and described in detail, it is to be particularly understood that the invention is not limited thereto or thereby.

We claim:

1. A missing lead-in wire detector comprising a pair of rods spring loaded to tend to move toward each other, means normally holding said rods swung away from each other, means for releasing said rod holding means and for permitting momentary inward swing of said rods, feelers having operative engagement with said rods whereby movement of the rods toward each other obtains movement of said feelers toward each other, said feelers having a normal amplitude of movement for engagement with lead-in wires opposed thereto and having an excess amplitude of movement beyond normal in event a lead-in wire is missing, and an electrical contact in an electrical utilization circuit and forming a stop terminating the said excess amplitude of movement of the feelers, said circuit being closed by the termination of the excess amplitude of movement of said feeler passing the normal location of a lead-in wire and a signal instrumentality actuated by the closing of said circuit.

2. A missing lead-in wire detector comprising a carriage slidably mounted for reciprocable movement in one direction, feelers slidably mounted in said carriage and reciprocable in a direction transverse to direction of reciprocable movement of the carriage, said feelers having a normal amplitude of movement for engagement with lead-in wires opposed thereto and having an excess amplitude of movement beyond normal in event a lead-in wire is missing, an electric circuit, stop means in such electric circuit for terminating the excess amplitude of movement of said feelers and operable to close said circuit by engagement of a feeler with such stop means, a signal instrumentality activated by said termination and resultant closure of said circuit, a reciprocable bar cam controlling reciprocation of both the said carriage and the said feelers, said cam having a direction of reciprocation transverse to both of the aforesaid directions of reciprocation of the carriage and feelers, means responsive to the reciprocation of said cam to reciprocate said carriage and means responsive to the reciprocation of said cam to reciprocate said feelers.

References Cited in the file of this patent

UNITED STATES PATENTS

1,547,393	Higgins	July 28, 1925
1,682,464	Arelt et al.	Aug. 28, 1928
2,329,599	Flaws	Sept. 14, 1943
2,549,296	Dilts	Apr. 17, 1951
2,700,154	Dilts	Jan. 18, 1955

FOREIGN PATENTS

674,459	Great Britain	June 25, 1952