Jan. 16, 1962 R. K. MILLER 3,017,060

AUTOMATIC FEED CONTROL MECHANISM

Filed Dec. 6, 1960 4 Sheets-Sheet 1

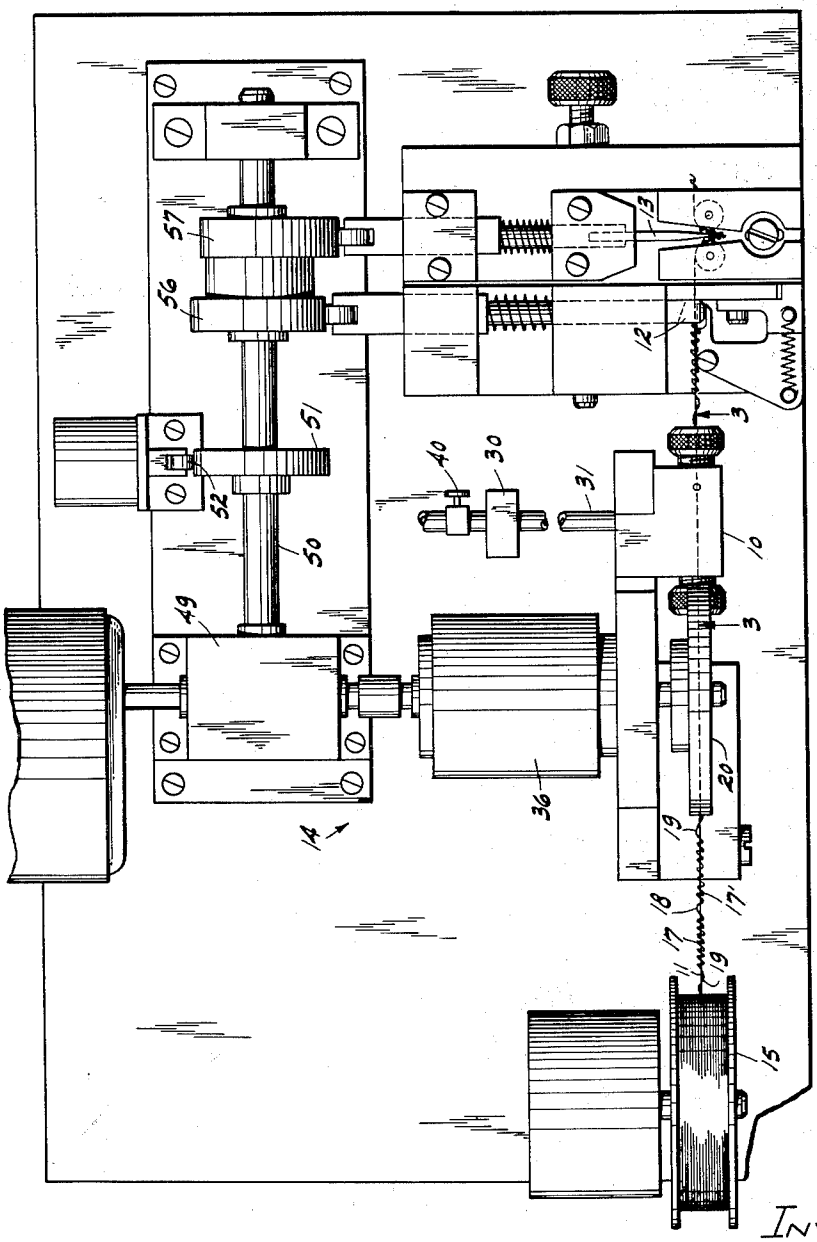


FIG. 1

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AUTOMATIC FEED CONTROL MECHANISM

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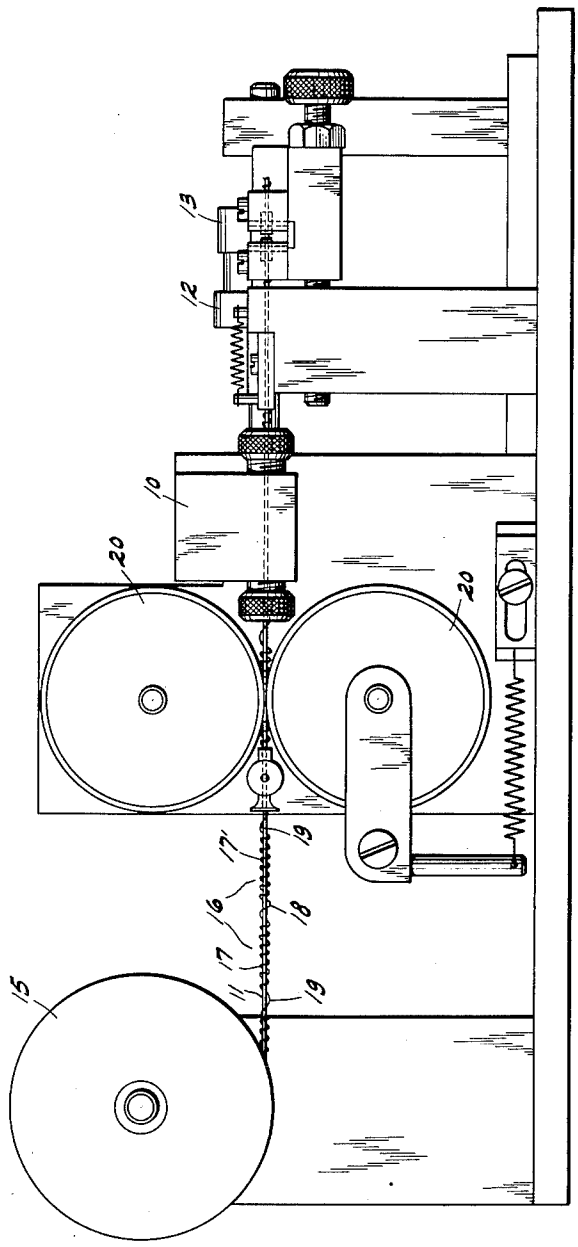


FIG. 2

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AUTOMATIC FEED CONTROL MECHANISM

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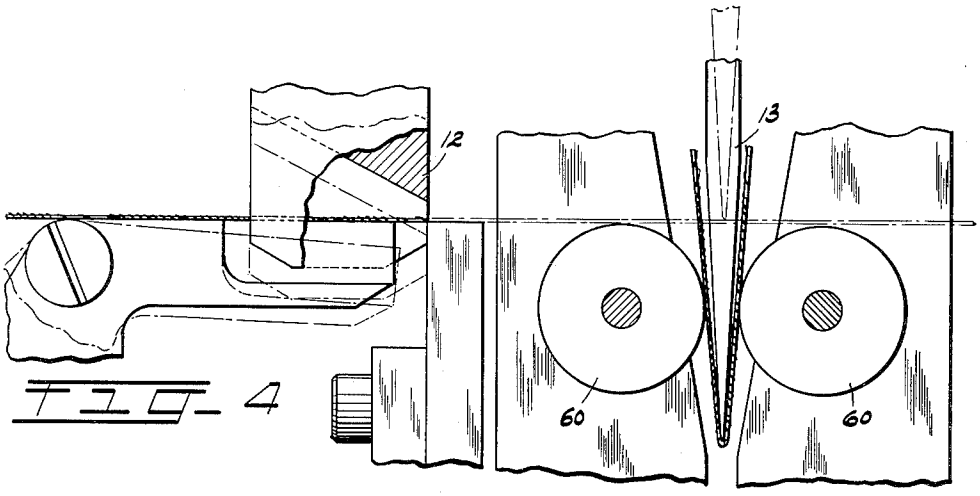


FIG. 4

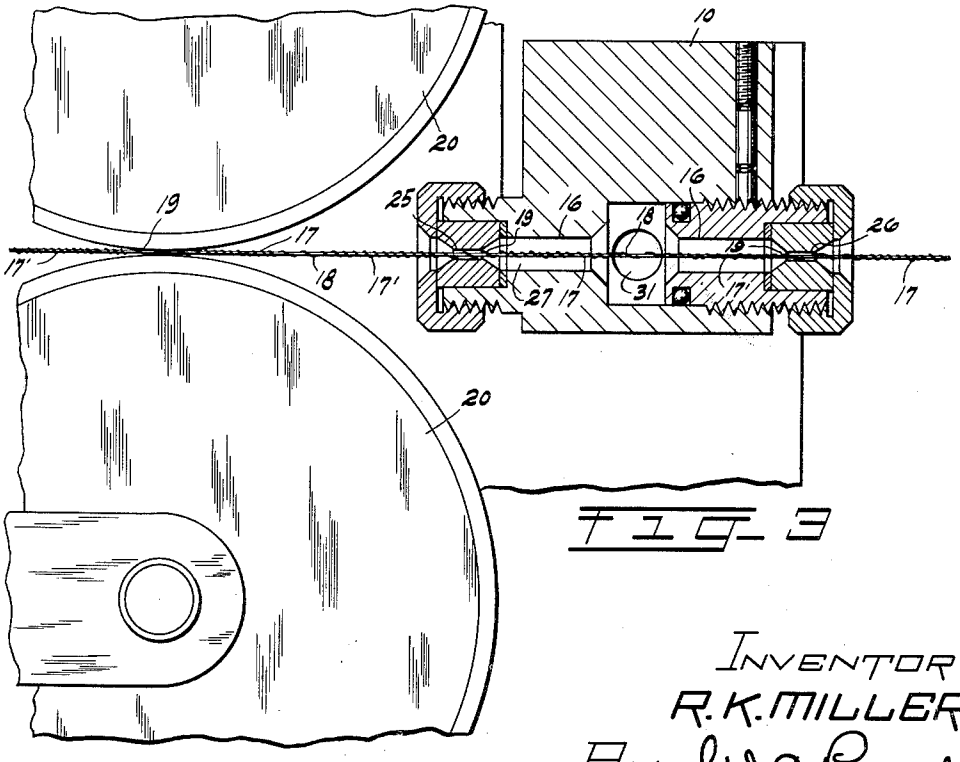


FIG. 3

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AUTOMATIC FEED CONTROL MECHANISM

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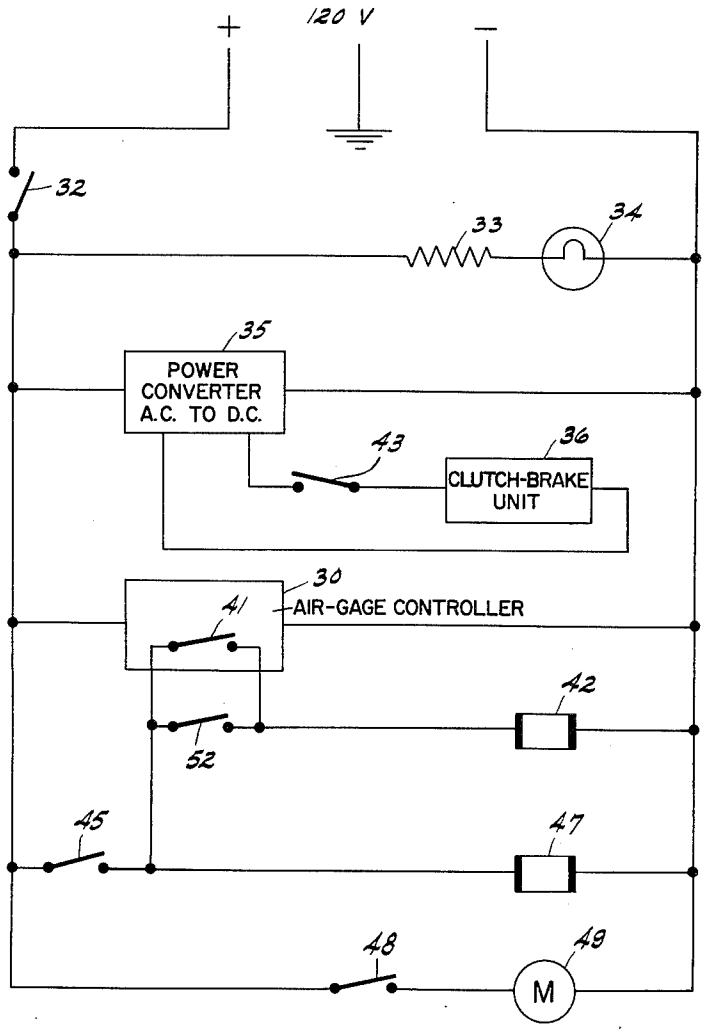


FIG. 5

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3,017,060

AUTOMATIC FEED CONTROL MECHANISM

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8 Claims. (Cl. 226—10)

This invention relates to feed control mechanisms and particularly to a feed control mechanism utilized for feeding an elongated element, such as wire, strand, rod strip, etc., having varied cross-sectional area portions.

There are many applications in industry where it is necessary to handle elongated elements having varied cross-sectional area portions and to advance them to certain tooling stations. For example, in the fabrication of wire filaments for electron tubes, a continuous molybdenum wire prewound with successive enlarged coil portions, two coil portions being separated by a reduced skip or long straight portion, is fed intermittently to stations for cutting and forming the wire to a desired filament configuration. Heretofore, the wire feed was manually controlled by an operator who stopped the feed each time a small skip portion, located between the coils of a pair, was positioned in a fixed relationship to the forming tool. It was necessary for the operator to utilize a microscopic lens for positioning the wire due to its very small size, for example, the wire having a .006-inch diameter and the enlarged coil portion having an .008-inch diameter. This not only required a skillful operator for accurately controlling the wire feed but also resulted in the consumption of much time and eye fatigue to the operator.

The object of this invention is a mechanism for automatically controlling the intermittent feed of an elongated element having a succession of varied cross-sectional area portions.

According to the general features of the invention, the wire or other element is passed through a chamber containing pressurized fluid, the varied cross-sectional area portions of the wire controlling the fluid pressure within the chamber for energizing a circuit to control the feeding means.

In one embodiment, a filament wire feeding mechanism is controlled by an air gage switching device in accordance with the location of the enlarged coil and reduced skip portions of the wire as the wire passes through an air pressure chamber. Upon a passing of the enlarged coil portions through the entrance and exit orifices of the chamber, the air pressure within the chamber increases to energize a circuit to maintain movement of the wire feeding means. As the reduced skip portions pass through the entrance and exit orifices, air escapes from the chamber through the orifices causing a pressure decrease within the chamber and a de-energizing of the circuit to stop the wire feed. Conversely, if desired, the pressure decrease caused by the passing of the reduced skip portions through the orifices can be utilized to energize the wire feeding means circuit and the pressure increase can be utilized to de-energize said circuit.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims taken in conjunction with the accompanying drawings in which:

FIG. 1 is a plan view of an apparatus embodying the feed control mechanism;

FIG. 2 is a front elevational view of an apparatus embodying the feed control mechanism;

FIG. 3 is a view taken along lines 3—3 of FIG. 1;

FIG. 4 is a fragmentary view of cutting and forming units utilized for forming a wire filament; and

FIG. 5 is a schematic wiring diagram for controlling the wire feeding means.

With respect to the drawing, the invention is incorporated in an air pressure sensing unit **10** for automatically controlling the feed to wire **11** to a cutting tool **12** and forming tool **13** of a machine **14**. The wire has a succession of prewound pairs **16** of enlarged coiled portions, each pair **16** including two coil windings **17**—**17'** which are separated by a reduced small skip **18** and each pair **16** being separated by a reduced large skip **19** in the winding. The wire **11** is fed from a reel **15** by a pair of drive feed rollers **20**, hereinafter described in more detail, through the air pressure sensing unit **10** to the cutting and forming stations **12** and **13**, respectively.

Regarding the pressure sensing unit **10**, the diameters of the entrance orifice **25** and exit orifice **26** are slightly larger than the winding of each enlarged coil pair **16** passing therethrough. The distance in the pressure chamber **27** between the entrance and exit orifices **25** and **26** preferably is slightly larger than one coiled pair **16** so that when a single pair is located within the chamber, the large skip portions **19** of the wire are located in the entrance and exit orifices **25** and **26**, respectively. However, it is noted that the distance between the orifices **25** and **26** can be such to accommodate any multiple of the lengths of the different diameter portions of wire. Further, the length of each different diameter portion of wire can be alternately varied, if desired.

Compressed air is admitted from a source (not shown) through a commerical air gaging unit or controller **30** and through tube **31** leading into the chamber **27**. It is noted that the invention is not limited to the use of compressed air as the fluid supplied under pressure to the chamber may be in either a gaseous or liquid state. However, it is pointed out that compressed air, which is generally conveniently obtainable, is best suited for this purpose.

As seen in FIG. 5, upon the actuation of power switch **32**, current passes through resistor **33** and pilot light **34** is illuminated to indicate that power is on. Power is supplied to a converter **35** which converts 120 v. A.C. to 28 v. D.C. for operation of an electric clutch-brake unit **36**. Power also is supplied to the air controller unit **30** and to the rest of the circuit.

At the commencement of a cycle (as seen in FIG. 3), a coiled pair **16** is located within the chamber **27** so that the large skip portions **19** are located in the entrance and exit orifices **25**—**26**, respectively. Air valve **40** is opened to admit air through the controller unit **30** and into the chamber **27**. A switch **45**, as seen in FIG. 5, is turned to the "on" position energizing motor relay **47**. The motor switch contacts **48** are closed through motor relay **47** for starting motor **49** which drives a cam shaft **50**. A cam **51** connected to the shaft **50**, strikes and momentarily closes a microswitch **52** upon each complete revolution. When switch **52** is closed, the clutch of the clutch-brake unit **36** is engaged through relay **42** and

the closing of contacts 43 to drive the feed rollers 20 to feed the wire.

From the time switch 52 is closed and the wire is being fed through sensing unit 10, the air pressure within the sensing chamber 27 builds up as the entrance and exit orifices 25 and 26 become substantially blocked due to the coil winding 17 of one pair passing through the exit orifice 26 and the coil winding 17' of a succeeding pair passing through the entrance orifice 25. When cam 51 rotates out of contact from and opens microswitch 52, the feed continues due to the pressure build-up within the chamber 27 causing pressure-sensitive switch 41 to close to maintain current through the clutch-brake relay 42 for keeping the clutch in the engaged positions.

When a coiled pair is completely located within the chamber so that the large skip winding portions 19 are disposed in the entrance and exit orifices 25 and 26, the air within the chamber is permitted to escape through the now unblocked entrance and exit orifices. This causes the air pressure within the chamber to be reduced to a low value. Upon the reduction of the air pressure in chamber 27, pressure-sensitive switch 41 opens to de-energize relay 42 to release the clutch and activate the brake to stop the feeding of the wire. In other words, as the unwound portions or large skips in the winding pass through the pressure chamber 27, more air escapes and thereby reduces the air pressure within the chamber which causes an electric impulse to be produced to disengage the clutch and stop the wire feed.

During the feeding of the wire, cutter cam 56 and forming tool cam 57, connected to the continually rotating shaft 50, are sequentially operated. As seen in FIG. 4, cutting tool 12 cuts the wire at the large skip portions 19 and the forming tool 13 passes between forming rollers 60 to engage the small skip portion 18 to form a substantially V-shaped filament. After the cutting and forming operations, cam 51 contacts microswitch 52 which closes to energize the clutch-brake relay 42 which causes the brake to release and the clutch to engage and feed the wire. The mechanism is now ready to commence a new cycle.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. A feed control for an elongate element having a succession of portions each consisting of a length of relatively large cross-sectional area and a length of relatively small cross-sectional area, which comprises, a chamber in the path of the element having entrance and exit orifices spaced apart by a multiple of the length of the element portions, means for admitting fluid under pressure to the chamber, means for advancing the element through the chamber, and means responsive to a change of pressure in the chamber as the element passes therethrough for controlling the feed of the element.

2. A feed control for an elongate element having a succession of portions each consisting of a length of relatively large cross-sectional area and a length of relatively small cross-sectional area, which comprises, a chamber in the path of the element having entrance and exit orifices spaced apart by a multiple of the length of the element portions, the orifices being slightly larger than the cross-sectional areas, means for admitting fluid under pressure to the chamber, means for advancing the element through the chamber, means for activating the advancing means periodically, and means responsive to a change of pressure in the chamber as the element passes therethrough for controlling the feed of the element.

3. A feed control for an elongate element having a succession of portions each consisting of a length of relatively large cross-sectional area and a length of relatively small cross-sectional area, which comprises, a chamber in the path of the element having entrance and exit orifices spaced apart by a multiple of the length of the element portions, the orifices being slightly larger than the cross-sectional areas, means for admitting fluid under pressure to the chamber, means for advancing the element through the chamber, means for activating the advancing means periodically, and switching means cooperating with the activating means in response to a change of pressure in the chamber as the element passes therethrough for controlling the feed of the element.

4. An automatic control for the intermittent feed of an elongated element having a succession of substantially identical portions each consisting of a length of relatively large cross-sectional area and a length of relatively small cross-sectional area, which comprises, a chamber in the path of the element having element entrance and exit orifices, the diameter of the orifices being slightly larger than the cross-sectional areas, means for admitting fluid under pressure to the chamber, means for moving the element through the chamber, means for momentarily activating the moving means periodically, and switching means cooperating with the activating means for maintaining movement of the moving means upon a fluid pressure increase within the chamber as the large cross-sectional areas pass through at least one orifice, and for stopping the moving means upon a fluid pressure decrease as the small cross-sectional areas pass through said orifice.

5. A feed control according to claim 4 in which the switching means comprises a fluid gaging unit through which the fluid passes to the chamber, and a pressure-sensitive switch within the unit operated by a fluid pressure increase within the chamber as the large cross-sectional areas pass through the chamber orifice to maintain the element feed.

6. A feed control according to claim 4 in which the activating means comprises a shaft, means for driving the shaft, a switch for controlling the moving means, and a cam on the shaft for operating the switch.

7. An automatic control mechanism for the intermittent feed of an elongated element having successive first and second diameter portions, the first diameter portion being larger than the second diameter portion, which comprises, a chamber in the path of the element having entrance and exit orifices, the diameter of the orifices being slightly larger than the first diameter portions, means for admitting fluid under pressure to the chamber, means for moving the element through the chamber, a first switch for controlling the moving means, a shaft, means for driving the shaft, a cam on the shaft to momentarily operate the first switch for driving the moving means to feed the element, a fluid gaging unit through which the fluid passes to the chamber, a pressure-sensitive switch within the unit, the pressure-sensitive switch being operative to maintain movement of the moving means under a fluid pressure increase within the chamber as the first diameter portions pass through the chamber orifices, and being inoperative upon a fluid pressure decrease as the second diameter portions pass through said orifices.

8. An automatic control for the intermittent feed of an elongated element having a plurality of successively prewound enlarged coil portions, each portion being separated by a reduced skip in the winding, which comprises, a chamber in the path of the element having axially aligned entrance and exit ends, the diameter of the ends being slightly larger than the enlarged coil portions, means for admitting air under pressure to the chamber, an air gaging unit through which the air passes to the chamber, a pressure-sensitive switch within the unit having feed and non-feed positions, the switch being normally open in the non-feed position, means for moving the element through the chamber, a normally open second

switch for controlling the moving means, a common relay energized through the pressure-sensitive and second switches for controlling the moving means, a shaft, means for driving the shaft, a cam on the shaft to momentarily close the second switch to energize the relay to actuate the moving means to feed the element, the second switch opening and the pressure-sensitive switch closing to the feed position and to maintain movement of the moving means upon an air pressure increase within the chamber as the enlarged coil portions pass through the chamber ends to substantially block the air within the chamber

from escaping, and the pressure-sensitive switch opening to stop the moving means upon a fluid pressure decrease within the chamber as the reduced skip portions pass through the chamber ends to permit the air to escape from the chamber.

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