

May 1, 1962

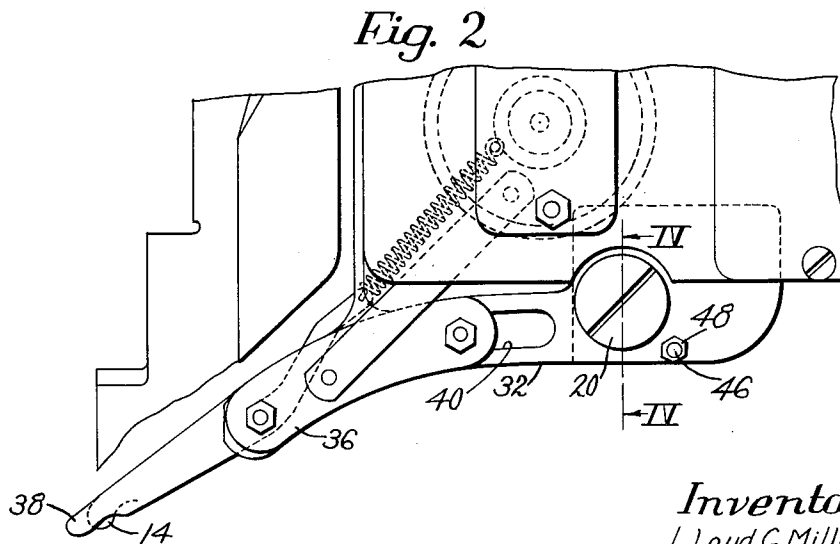
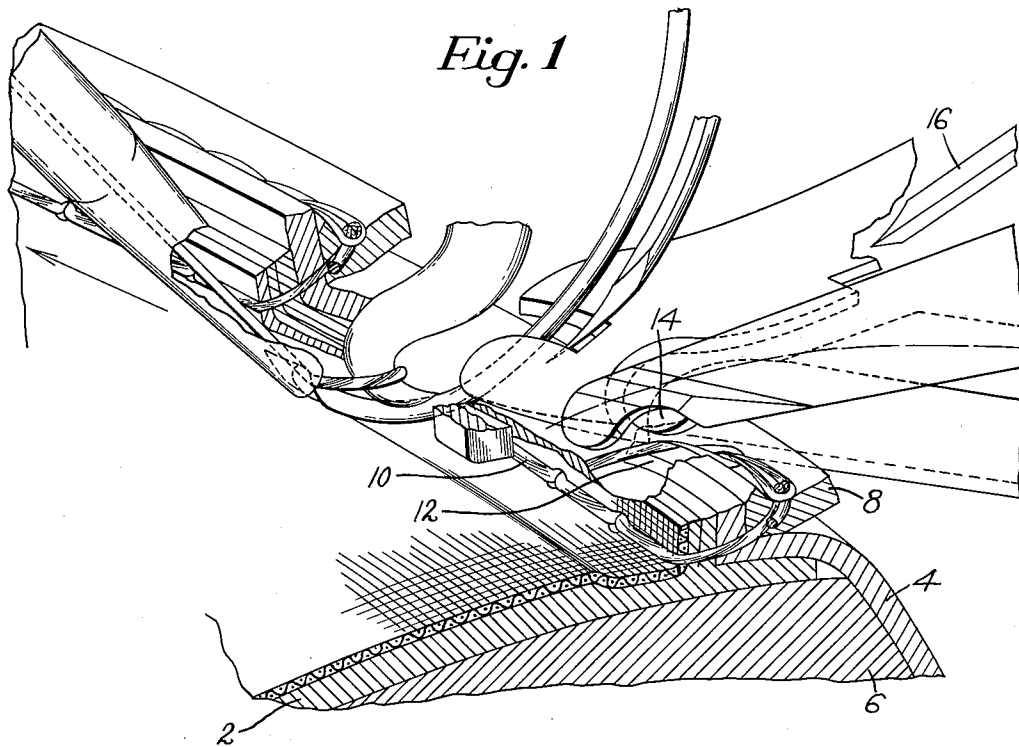
R. W. BRADLEY ET AL

3,031,986

FEELER CONTROLS FOR OPERATION PERFORMING MACHINES

Filed March 28, 1960

3 Sheets-Sheet 1



Inventors
Lloyd G. Miller
Robert W. Bradley
By their Attorney
Edward W. Fearing

May 1, 1962

R. W. BRADLEY ET AL

3,031,986

FEELER CONTROLS FOR OPERATION PERFORMING MACHINES

Filed March 28, 1960

3 Sheets--Sheet 2

Fig. 3

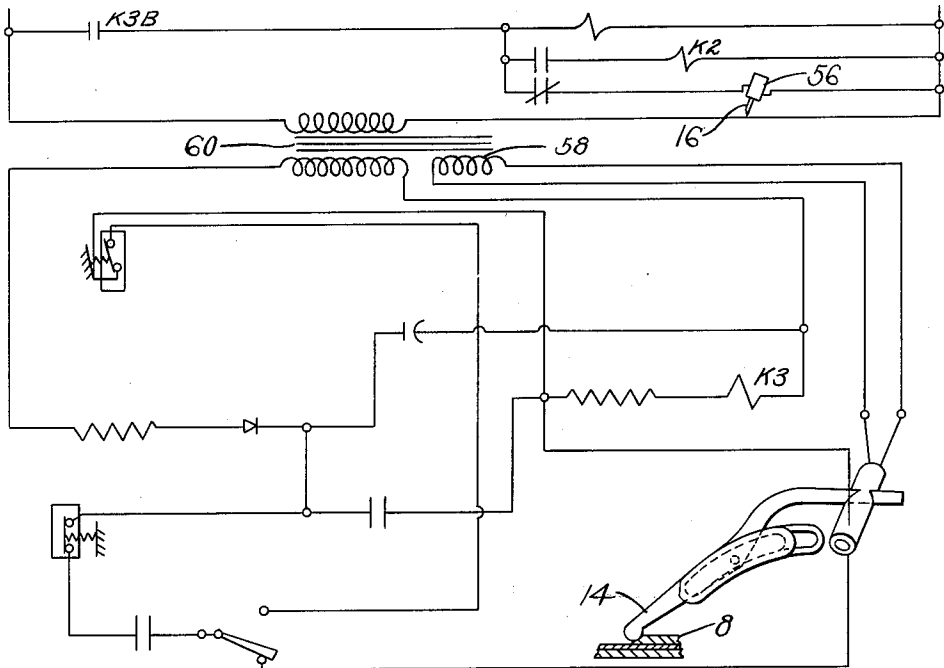


Fig. 4

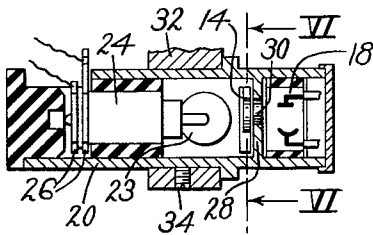
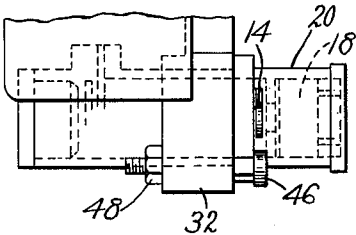


Fig. 5



May 1, 1962

R. W. BRADLEY ET AL

3,031,986

FEELER CONTROLS FOR OPERATION PERFORMING MACHINES

Filed March 28, 1960

3 Sheets-Sheet 3

Fig. 6

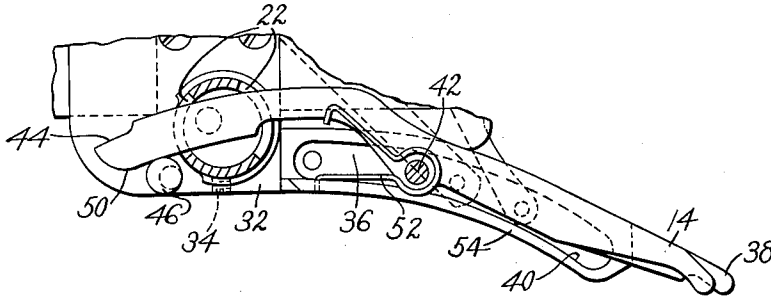


Fig. 7

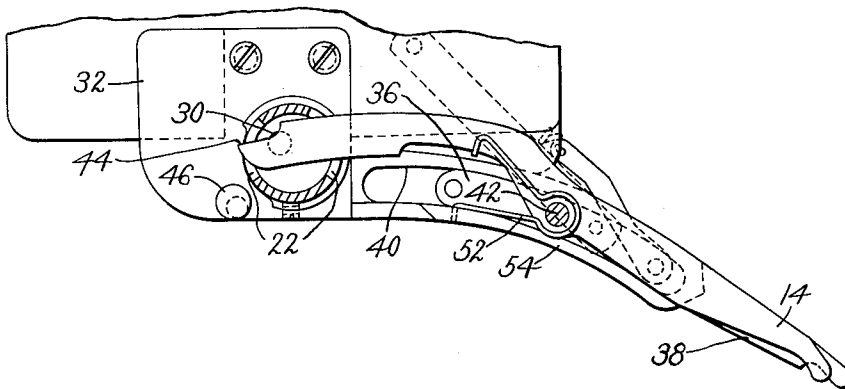


Fig. 9

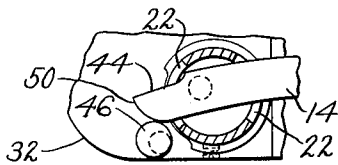
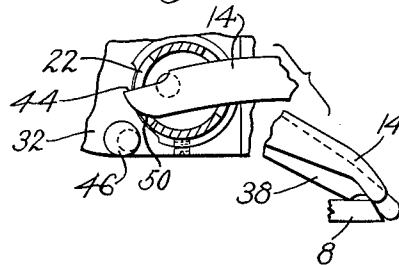


Fig. 8



1

3,031,986

FEELER CONTROLS FOR OPERATION PERFORMING MACHINES

Robert W. Bradley, Marblehead, and Lloyd G. Miller,
Beverly, Mass., assignors to United Shoe Machinery
Corporation, Boston, Mass., a corporation of New
Jersey

Filed Mar. 28, 1960, Ser. No. 18,134
7 Claims. (Cl. 112-44)

The present invention relates to improvements in feeler controls for Goodyear inseam sewing machines of the type intended for attaching welts to lasted shoe uppers and sole members, such as disclosed in an application for United States Letters Patent, Serial No. 788,555, filed January 23, 1959, in the name of Lloyd G. Miller.

In the machine of the prior application above referred to a welt is severed automatically in advance of the point of operation of stitch-forming devices in the machine through the use of a novel feeler arranged for response to a change in thickness of the material operated upon by engagement with the end of the welt first attached to the shoe at a point where it is firmly backed by the bulging last supported portion of the shoe upper, as that end of the welt is approaching the point of operation of the stitch-forming devices a second time. The feeler is held away from the shoe during the major portion of each operation on the shoe to prevent interfering with the positioning movements imparted to the shoe by the operator. For severing the welt an electromagnetic solenoid is provided and a knife is connected for actuation by the solenoid.

The feeler of the prior application carries a movable contact arranged to co-operate with two stationary contacts for closing the circuit of the solenoid whenever the feeler engages the leading end of the welt in a shoe. Whenever the feeler is held away from the shoe accidental energization of the solenoid is prevented by movement of the contact on the feeler away from the fixed contacts, so that the machine is rendered safe against accidentally completing the solenoid circuit. Such an arrangement has been found to be particularly sensitive and responsive for extremely accurate welt severing action. However, because a machine of the type referred to is utilized in dusty conditions not conducive to reliable operation of contacts, especially where their engagement is dependent upon slight movements and pressures, the arrangement of the feeler in the machine of the prior application has been found to fall short of 100% effectiveness.

It is an important object of the present invention to improve the operation of a Goodyear welt shoe inseam sewing machine having a feeler actuated welt severing knife of the type disclosed in the prior application, while providing the feeler with means for energizing an electrical circuit for a solenoid actuated welt severing knife, which feeler is not dependent upon the surface conditions of a set of contacts, but in other respects complies with all of the requirements of safety controls in the prior machine. A further object of the invention is to alleviate the necessity for applying heavy forces to a feeler intended to be actuated by a leading end of a welt attached to a shoe where the feeler initiates automatic performance of an auxiliary operation on a shoe, thus rendering the feeler more sensitive and reliable in its response to engagement with the welt or any other part of a shoe, the presence of which is to be detected by the feeler.

Consistent with the objects noted the invention resides in a machine for performing both primary and secondary operations on a work piece, in which machine there are provided main devices acting to perform the primary operation and a supplemental tool acting during opera-

2

tion of said primary operation performing devices to effect the secondary operation on the work as the operation of the main device is being completed, and also suitable mechanism for actuating the supplemental tool, including an electromagnetic solenoid, a feeler for engaging a portion of the work and an electrical circuit connected to the solenoid for energizing it, in which circuit the feeler is disposed between a light source and a light responsive cell to energize the solenoid whenever the feeler responds to a change in thickness of the work piece. The use of a light responsive cell in combination with a mechanical feeler is of primary advantage in the illustrated machine because it reduces the minimum force required to operate the feeler to a value far below that obtainable with a feeler and simple electrical contacts operated thereby. The present combination approaches satisfactorily close to a reliability of 100% effectiveness under the worst possible factory operating conditions.

With the present invention trouble free operation is assured where dust and corrosion are likely to cause rapid deterioration of efficiency of contacts with non-uniform results and relatively heavy contact pressures impossible of attainment under the existing conditions. Furthermore, the use of a feeler under these conditions is a necessity, inasmuch as it must be actuated by a change in thickness of the material rather than by the presence or absence of material, the use of a light cell to register mere change in thickness being difficult to arrange and its operation being inherently unreliable. With the present type of machine where space for operating parts is at a premium, there is little or no opportunity for installation of a light cell and its required light source at essential positions where a beam of light may be directed toward and from the work in the required manner, the feeler utilizing only a single narrow channel of the available crowded space about the operating point in the machine (see FIG. 1). In its specific embodiment the machine of the invention is in the form of a shoe inseam sewing machine, in which the primary operation is that of attaching a welt to the marginal portions of a last supported Goodyear welt shoe upper and a sole member, the operating devices being of the stitch forming, feeding, and guiding type capable of operating about the margins of the parts, and the secondary tool being in the form of a welt severing knife actuated by an electromagnetic solenoid controlled by the feeler during engagement with the leading end of the welt already attached to the shoe.

These and other features, as hereinafter described and claimed, will be apparent to those skilled in the art from the following detailed description taken in connection with the accompanying drawings, in which:

FIG. 1 is a perspective detail view on an enlarged scale, illustrating the operation on a shoe of the machine embodying the features of the present invention;

FIG. 2 is a detail view in front elevation and on a reduced scale of a mounting and actuating mechanism for a welt end feeler and guard in the machine of FIG. 1, the parts being shown with the feeler and guard in inoperative and safe positions retracted from the point of operation of the machine on a shoe;

FIG. 3 is a partial wiring diagram for the machine of the present invention showing an electrical control system;

FIG. 4 is a sectional detail view taken along the line IV-IV in FIG. 2 of a case containing a light source and a light responsive cell employed in connection with the feeler;

FIG. 5 is a side detail view, looking from the right of the light cell case shown in FIG. 2;

FIG. 6 is a rear sectional view taken along the line VI-VI of FIG. 4, illustrating the construction of the

3

light cell case, the feeler, and a guard therefor, the feeler being shown in inoperative, safe position as in FIG. 2;

FIG. 7 is a similar rear sectional view of the same parts, illustrating the feeler in its operative position ready to be engaged by the leading end of the welt first attached to a shoe;

FIG. 8 is a similar view partly broken away, with the feeler and guard contracted, illustrating the operation of the feeler as the leading end of the welt engages it; and

FIG. 9 is a similar detail view illustrating a position in the movement of the feeler to safe position after being actuated by the leading end of the welt.

The machine illustrated in the drawings is a Goodyear welt shoe in-seam sewing machine similar to that disclosed in the prior patent application above identified. The machine of that application is provided with stitch forming, feeding and guiding devices capable of performing primary attaching operations entirely around the marginal portion of a last supported shoe upper and sole member. As a secondary operation a welt severing knife is mounted to move toward and from the welt along a portion passing through its guiding device, automatic mechanism being provided for actuating the knife including an electromagnetic solenoid and a feeler mounted for engagement by the leading end of the welt first attached to the shoe as that end approaches the stitch-forming devices a second time, the prior machine being intended for operation upon the shoe after having sewn a welt thereto throughout the length of the bottom marginal portions, including the heel seat of the shoe.

As illustrated in FIGS. 1 and 3 of the drawings, the parts of a shoe being operated upon include an insole 2, an upper 4 mounted on a last 6, and a welt 8. These parts are operated upon by the usual stitch forming and feeding devices which insert an in-seam 10. The leading end of the welt, indicated at 12, first attached to the shoe is engaged by the feeler, indicated at 14, mounted for bodily movement toward and from a position where it may be engaged by the welt end 12 during feeding movement of the shoe. The feeler 14 is engaged by the welt end 12 as that end approaches the stitch-forming devices, so that accurate response to a change in thickness of the work piece is sufficient to actuate a supplemental tool. The supplemental tool comprises the knife, shown at 16, capable of being projected against the welt running from a suitable supply at a position in advance of the point of operation of the stitch-forming devices sufficiently removed therefrom to avoid danger of contact with the parts of the shoe other than the welt. After the knife is actuated the machine inserts one or more stitches overlapping the welt ends which are brought into abutting engagement with each other.

In the machine of the prior application the feeler is mounted on a shiftable carriage, on which it is moved bodily away from the sewing point during the major portion of the primary operation on the shoe and is moved toward a position where it may be engaged by the leading end of the welt under the control of the operator as he sees the welt end approaching the sewing point a second time. Movement of the feeler toward the sewing point enables a switch actuated by the feeler to be rendered operative, so that when engaged by the welt end a circuit is closed to energize the knife actuating solenoid to sever the welt without stopping the primary sewing operation. The operation of the feeler by engagement with the leading welt end requires an extremely sensitive response to increased work thickness by the feeler and applies a very light force to the contacts of the switch, so that the contacts must be kept clean for positive action regardless of dust and foreign material common in factory surroundings where the machine is utilized. For effective operation the knife must be actuated instantaneously in spite of vibration inherent in the operation of the machine. The accumulation of dust on the contacts together with machine vibration, however, tends occasionally to pro-

4

duce irregular time delay effects in the response of the feeler. The two factors of dust and vibration have additive effects in delaying build-up of sufficient contact pressure before energizing the knife actuating solenoid, especially after neglectful operation over a long period of time.

In the machine of the present invention use of electrical contacts with their attendant difficulties in avoiding more than a minimum contact pressure have been eliminated and substitute means have been provided for energizing the welt severing solenoid with certainty and reliability, regardless of operating conditions or failure of frequent inspection on the part of the operator, the sensitivity of response provided by the feeler being increased still further than is possible with the prior use of electrical contacts connected directly with the feeler. These advantages are obtained without sacrifice of the other requirements for the feeler, including a safety control to render the welt severing solenoid incapable of being energized while the feeler is retracted to an inoperative position in the machine. To these ends the switch contacts of the prior machine have been replaced by a source of light and a light responsive cell disposed at opposite sides of the feeler to energize a feeler control circuit through sharp increase of conductivity in the light cell as the light impinging on the cell increases. A light cell having these characteristics is illustrated at 18 (FIG. 4) and is of the type provided with a cadmium sulfide grid, identified as Model LDR-C-1 manufactured by the Ferrocube Corporation of America, Saugerties, New York.

The light cell is contained in one end of a cylindrical case 20 having slots 22 at opposite sides to enable one end of the feeler 14 to pass entirely through without interfering in any way with bodily movement of the feeler as it is shifted with its carriage. At the opposite end of the case is a source of light in the form of an automotive-type low-voltage incandescent lamp 23 having its socket 24 insulated from the case, and a pair of terminals 26 connected with the socket in projecting relation to the case, the feeler 14 extending transversely through the case between the lamp 23 and the light cell 18. The feeler is located in close proximity to a diaphragm 28 formed integrally with the case 20 and provided with a light conducting opening 30 disposed eccentrically to the axis of the case 20.

For mounting the case 20 for the light cell a circular opening is formed in a frame or base plate 32 with freedom of rotation for the case about its cylindrical axis. Rotation of the case 20 in the base plate 32 moves the light conducting opening 30 with relation to the portion of the feeler 14 which enters the case for the purpose of adjusting the action of the feeler in cutting off the light passing through the opening. To secure the case 20 in adjusted position the lower portion of the base plate has a threaded opening through which passes a set screw 34 (FIGS. 4 and 6) engageable with the case.

Adjustment of the light conducting opening 30 with relation to the feeler 14 is such that a small area is exposed by the feeler as shown in FIG. 7 whenever the feeler is moved toward the work into a position ready for engagement with the leading end 12 of the welt. The amount of light passing through the opening at this time is insufficient to cause energization of the severing solenoid circuit, but does produce preliminary activation of the light cell and raises its conductivity to a point in its characteristic curve just short of its critical or threshold value. The slightest movement of the feeler 14 when the light cell is activated to a condition just short of its threshold value produces an extremely sensitive arrangement capable of detecting the most easily compressible and smallest sizes of welts with great reliability. Thus, whenever the feeler moves from the position of FIG. 7 to that of FIG. 8, even though the difference in position is represented only by a few thou-

sandths of an inch, effective operation of the welt severing knife is assured.

In compliance with the requirement for bodily movement of the feeler 14 toward and away from the sewing point in the machine, the portion of the feeler passing through the light case 20 does not touch the case at any point and therefore has no effect on the movement of the feeler on its supporting carriage, indicated at 36. The carriage 36 also has mounted on it a guard 38 for the feeler, the feeler being constructed as a lever fulcrumed along its midportion on a shoulder screw 42 threaded into the feeler guard. The carriage including the guard 38 for the feeler is movable along a curved track 40 in the base plate 32 so that the ends of the feeler at opposite sides of its fulcrum are in substantial balance and thus resist the effects of vibration in the machine. To render the feeler incapable of energizing the control circuit for the welt severing solenoid after the feeler has been moved away from the sewing point on the shoe, the end of the feeler passing through the case 20 has a cut away section 44 which can register with the light conducting opening 30 only when the feeler is advanced towards the sewing point. When the feeler is retracted a wider portion thereof covers up the light conducting opening 30 and prevents any possibility of severing the welt.

To insure proper positioning of the feeler 14 to cover the light conducting opening when the feeler is in retracted position, there is mounted within a passage formed in the base plate 32 a bolt 46 having an eccentric head and a nut 48 threaded on the bolt at the side of the base plate opposite to the head. Upon loosening the nut 48 the eccentric head may be adjusted to a suitable position where it will be engaged by a curved lower surface 50 (FIG. 9) on the feeler 14 as it is being retracted away from the sewing point in the machine, thus shifting the feeler on the carriage and supporting it in a position where it will wholly cover the light conducting opening 30 (see FIG. 6).

To hold the feeler 14 stationary against the effect of vibration and to return it after being actuated by engagement with the leading end 12 of the welt, the fulcrum screw 42 for the feeler is surrounded by a loop in a light hairpin spring 52 forked at one end to surround a portion of the feeler 14 and bent at right angles along the other end to enter an opening in a flange 54 of the guard 38. By reason of the slots 22 in the light cell case 20, the feeler is even freer to move either bodily during shift of the carriage 36 or about the fulcrum screw 42 upon engagement with the welt end than the feeler of the machine in the prior application. Accordingly, the spring 52 is constructed with sufficient force only to overbalance the feeler and to retain it in a position where it covers the light conducting opening 30. To limit the movement of the feeler on the carriage 36, the flange 54 extends along the guard to a position where it is engaged by the feeler, the flange 54 forming a positioning stop to hold the feeler stationary for adjustment of the position of the light conducting opening 30 in the flange of the light cell case 20.

The circuits for controlling operation of the welt severing solenoid, indicated at 56 in FIG. 3, are substantially the same as those disclosed in inventors' application for United States Letters Patent, Serial No. 840,148, filed September 15, 1959, in which a solenoid is energized by the engagement of a pair of contacts K3B forming a part of a relay K3. The coil of relay K3 in the machine of application Serial No. 840,148 comprises a part of a control circuit energized by a set of contacts actuated by the feeler. In the machine of the present invention the effects of dust, vibration and other disturbing influences have been avoided by eliminating the use of electrical contacts in close proximity to the sewing point in the machine and by a direct electrical connection with the light responsive cell 18 in place of the switch con-

tacts in the control circuit. By the proper selection of a coil for the relay K3 it has been found possible to utilize the light cell directly without amplifiers or special relays. To provide current for the lamp 22 the terminals 26 are directly connected with a secondary coil 58 in an isolation transformer 60 corresponding in other respects to the isolation transformer disclosed in application Serial No. 840,148.

The nature and scope of the invention having been indicated and a particular embodiment having been described, what is claimed is:

1. A machine for performing primary and secondary operations on a work piece, said machine having a frame, main devices in the frame acting to perform the primary operation, a supplemental tool in the frame acting during operation of said primary operation performing devices to perform the secondary operation on the work piece as the operation of the main devices is being completed, and mechanism for actuating the supplemental tool including an electromagnetic solenoid, a feeler responsive to changes in thickness of the work piece for engaging a portion of the work piece and an electrical circuit connected to the solenoid for energizing it, in combination with a light source and a light responsive cell disposed at opposite sides of the feeler to energize the electrical circuit for the solenoid whenever the feeler is engaged with the work.

2. A shoe inseam sewing machine for attaching a welt to the marginal portions of a last-supported Goodyear welt shoe upper and a sole member, said machine having a frame, stitch-forming, feeding and guiding devices in the frame capable of operating about the margins of the shoe parts, a welt severing knife mounted for movement toward and from the welt in advance of the point of operation of the stitch forming devices, mechanism for actuating the knife including an electromagnetic solenoid, a feeler responsive to change in work thickness for engaging the leading end of the welt already attached to the shoe as that end approaches the stitch-forming devices a second time, and an electrical circuit connected with the solenoid for energizing it, in combination with a light source and a light responsive cell disposed on opposite sides of the feeler to energize the electrical circuit for the solenoid whenever the feeler is engaged by the leading end of the welt.

3. A shoe inseam sewing machine for attaching a welt to the marginal portions of a last-supported Goodyear welt shoe upper and a sole member, said machine having a frame, stitch-forming, feeding and guiding devices in the frame capable of operating about the margins of the shoe parts, a welt severing knife mounted for movement toward and from the welt in advance of the point of operation of the stitch-forming devices, mechanism for actuating the knife including an electromagnetic solenoid, a feeler responsive to change in work thickness for engaging the leading end of the welt already attached to the shoe as that end approaches the stitch-forming devices a second time, and an electrical circuit connected with the solenoid for energizing it, in combination with a case, a source of light in the case and a light responsive cell also in the case connected in the solenoid circuit, a portion of the feeler entering the case between the source of light and the light responsive cell to energize the solenoid whenever the feeler is engaged by the leading end of the welt.

4. A shoe inseam sewing machine for attaching a welt to the marginal portions of a last-supported Goodyear welt shoe upper and a sole member, said machine having a frame, stitch-forming, feeding and guiding devices in the frame capable of operating about the margins of the shoe parts, a welt severing knife mounted for movement toward and from the welt in advance of the point of operation of the stitch-forming devices, mechanism for actuating the knife including an electromagnetic solenoid, a feeler for engaging the leading end

of the welt already attached to the shoe as that end approaches the stitch-forming devices a second time, and an electrical circuit connected with the solenoid for energizing it, in combination with a cylindrical case, a source of light in the case, a light responsive cell also in the case connected in the solenoid circuit, a diaphragm in the case having an eccentrically disposed light transmitting opening through which the light from the source passes to the cell, a portion of the feeler entering the case in close proximity to the diaphragm to uncover the opening therein whenever the feeler is engaged by the leading end of the welt, and means for mounting the case in the frame with freedom of rotation about its cylindrical axis to enable adjustment of the opening in the diaphragm with relation to the portion of the feeler entering the case.

5. An inseam sewing machine for attaching a welt to the marginal portion of a last supported Goodyear welt shoe upper and a sole member, said machine having a frame, stitch-forming, feeding and guiding devices in the frame capable of operating entirely around the margins of the shoe parts, a welt severing knife mounted in the frame for movement toward and from the welt in advance of the point of operation of the stitch-forming devices, mechanism for actuating the knife including an electromagnetic solenoid, a feeler for engaging the leading end of the welt already attached to the shoe as that end approaches the stitch-forming devices a second time, a shiftable carriage in the frame on which the feeler is mounted for bodily movement toward and from the point of operation of the stitch-forming devices, and an electrical circuit connected with the solenoid for energizing it, in combination with a cylindrical case having a slot through which the feeler passes during movement of the feeler as the carriage is shifted, a source of light in the case, and a light responsive cell also in the case connected in the solenoid circuit, the portion of the feeler within the case being disposed between the source of light and the light responsive cell after being moved toward the point of operation of the stitch-forming devices, and being formed with a cut away section to enable energization of the welt severing solenoid whenever the feeler is engaged by the leading end of the welt.

6. A shoe inseam sewing machine for attaching a welt to the marginal portions of a last-supported Goodyear welt shoe upper and a sole member, said machine having a frame, stitch-forming, feeding, and guiding devices in the frame capable of operating about the margins of the shoe parts, a welt severing knife mounted for movement toward and from the welt in advance of the point of operation of the stitch-forming devices, mechanism for actuating the knife including an electromagnetic solenoid, a feeler for engaging the leading end of the welt already attached to the shoe as that end approaches the stitch-forming devices a second time, and an electrical circuit connected with the solenoid for energizing it, in combination with a cylindrical case, a source of light in the case,

a light responsive cell also in the case connected in the solenoid circuit, a diaphragm in the case having an eccentrically disposed light transmitting opening through which the light from the source passes to the cell, a portion of the feeler entering the case in close proximity to the diaphragm to uncover the opening therein whenever the feeler is engaged by the leading end of the welt, means for mounting the case in the frame with freedom of rotation about its cylindrical axis to enable adjustment of the opening in the diaphragm with relation to the portion of the feeler entering the case, and means for shifting the feeler on its carriage whenever the feeler is moved away from the point of operation of the stitch-forming devices to a position where the light transmitting opening in the diaphragm is covered to prevent energization of the welt severing solenoid.

7. An inseam sewing machine for attaching a welt to the marginal portion of a last supported Goodyear welt shoe upper and a sole member, said machine having a frame, stitch-forming, feeding and guiding devices in the frame capable of operating entirely around the margins of the shoe parts, a welt severing knife mounted in the frame for movement toward and from the welt in advance of the point of operation of the stitch-forming devices, mechanism for actuating the knife including an electromagnetic solenoid, a feeler for engaging the leading end of the welt already attached to the shoe as that end approaches the stitch-forming devices a second time, a shiftable carriage in the frame on which the feeler is mounted for bodily movement toward and from the point of operation of the stitch-forming devices, and an electrical circuit connected with the solenoid for energizing it, in combination with a cylindrical case having a slot through which the feeler passes during movement of the feeler as the carriage is shifted, a source of light in the case, a light responsive cell also in the case connected in the solenoid circuit, the portion of the feeler within the case being disposed between the source of light and the light responsive cell after being moved toward the point of operation of the stitch-forming devices, and being formed with a cut away section to enable energization of the welt severing solenoid whenever the feeler is engaged by the leading end of the welt, means for shifting the feeler relatively to its carriage whenever the feeler is moved away from the point of operation of the stitch-forming devices to prevent energization of the welt severing solenoid, and means for adjusting the position of the shifting means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,996,728	Mitchell	Apr. 2, 1935
2,061,431	McCulloh	Nov. 17, 1936
2,705,466	Sargrove et al.	Apr. 5, 1955
2,775,217	Ruhr	Dec. 25, 1956
2,900,932	Pickford et al.	Aug. 25, 1959