April 22, 1930. B. ERBER ET AL 1,755,983

METHOD AND APPARATUS OF INTRODUCING AND FUSING IN THE LEADING-IN WIRES INTO THE TUBULAR FOOT OF AN ELECTRIC GLOW LAMP

Filed July 26, 1926 2 Sheets-Sheet 1

Fig. 1

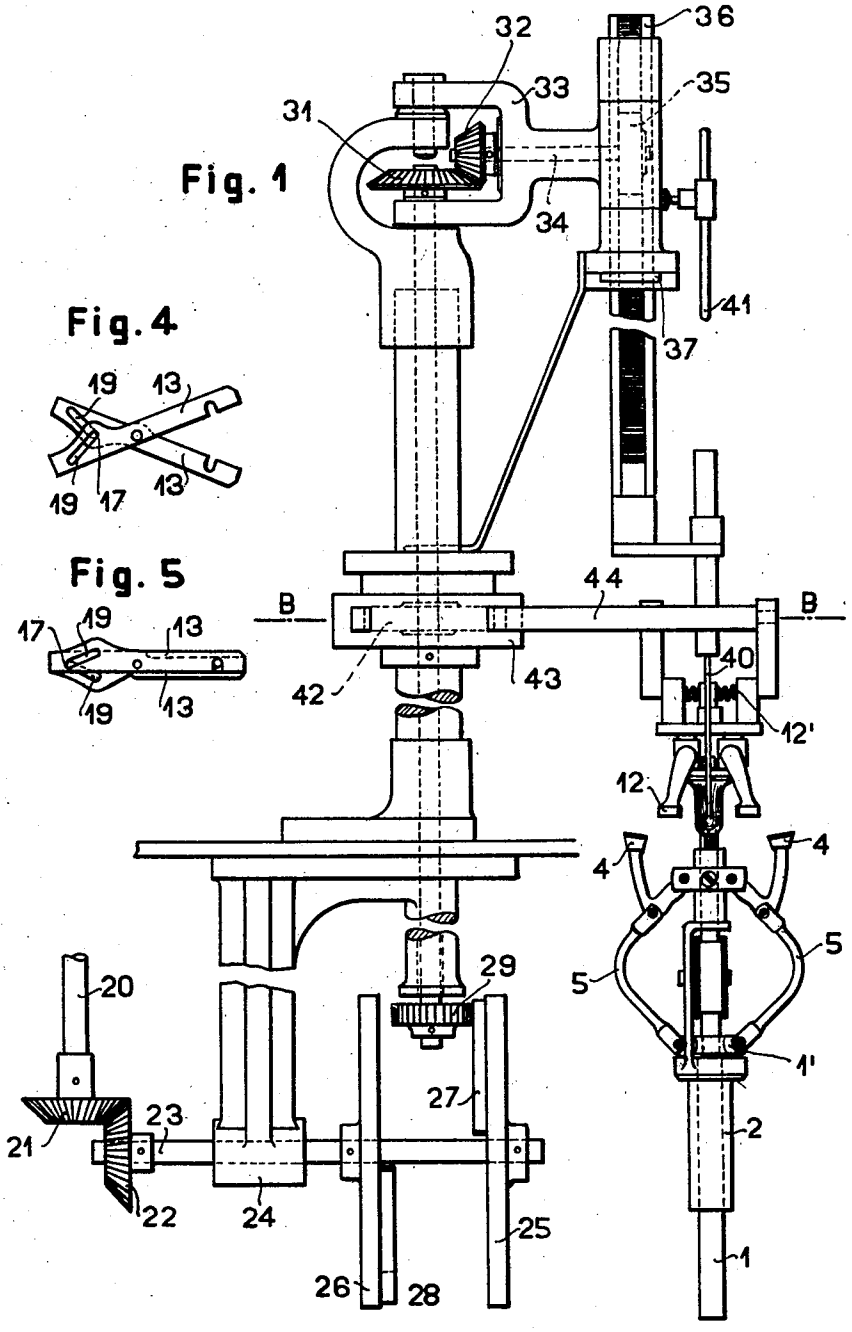


Fig. 4

Fig. 5

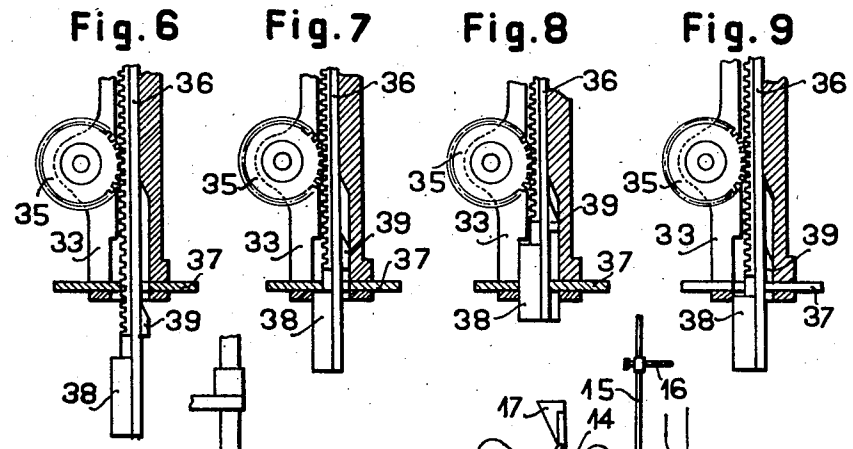
Bernhard Erber and
F. Gantner inventors

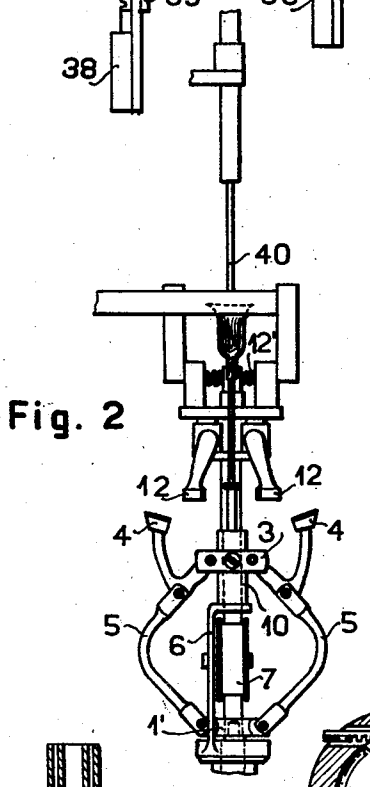
Attys: Marks & Clark

April 22, 1930. B. ERBER ET AL 1,755,983

METHOD AND APPARATUS OF INTRODUCING AND FUSING IN THE LEADING-IN WIRES INTO THE TUBULAR FOOT OF AN ELECTRIC GLOW LAMP

Filed July 26, 1926 2 Sheets-Sheet 2





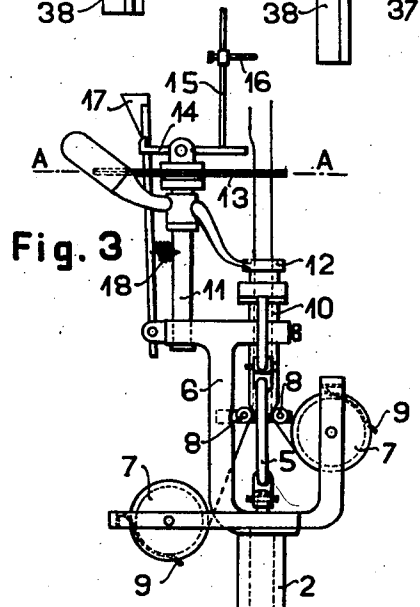


Fig. 11

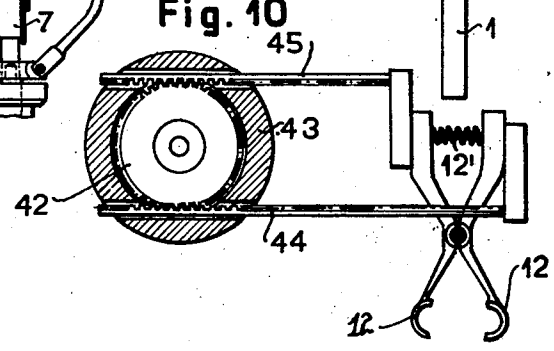


Fig. 12.

Bernhard Erber and
F. Gantner inventors
Attys: Marks & Clark
Attys

Patented Apr. 22, 1930 1,755,983

UNITED STATES PATENT OFFICE

BERNHARD ERBER, OF VIENNA, AND FERDINAND GANTNER, OF MODLING, AUSTRIA, ASSIGNORS TO THE FIRM OF GUSTAV GANZ & CO., OF VIENNA, AUSTRIA, A CORPORATION OF AUSTRIA

METHOD AND APPARATUS OF INTRODUCING AND FUSING IN THE LEADING-IN WIRES INTO THE TUBULAR FOOT OF AN ELECTRIC GLOWLAMP

Application filed July 26, 1926, Serial No. 125,085, and in Austria July 31, 1925.

Hitherto it has been necessary when making the supports for the filaments of electric glow lamps first to cut the leading-in wires to the requisite length and thereupon before nipping them to introduce them separately by hand into the small glass tubes (feet), which is a slow operation, even when well organized. In many cases it has been difficult to prevent these wires being introduced incorrectly or not at the right moment, so that there was a certain amount of wastage from this cause in the manufacture of the filament support. Hence in the manufacure of glow lamps as a typical case of manufacturing on a large scale there is great need for doing away with this manual work and substituting for it automatic operations. Nevertheless manufacturers have so far not been successful in carrying through entirely automatically the insertion, squeezing in and cutting off of the leading-in wires, and the lifting out of the filament supports, completed all but the insertion of the supporting wires and their delivery to the apparatus for the subsequent operations.

Especially when metal wires consisting of pieces of different kinds of metals as generally used are to be employed, difficulties were experienced in bringing the piece of that kind of metal which has the same coefficient of expansion as glass (platinum, chrome-iron, copperclad etc.) at the point where it is to be fused in and to cut the wires protruding into the interior of the lamp which consists of another metal to the requisite length.

According to the present invention all operations required for the manufacture of the filament supporting piece, with the exception of the insertion of the supporting wires, to which the invention does not relate, may be carried through automatically, the unseparated leading-in wires inserted in the glass tube being drawn out along the latter when the foot is lifted out after being squeezed together and thereupon cut off to an accurately predetermined length, while the ends of the unused wires remain in position and are introduced by a simple axial relative motion into the interior of the next glass tube, whereupon the cycle of operations recommences.

In the following an apparatus for carrying out the method is described, but the invention relates to the method as such and is not limited to any special constructional form of the apparatus.

In the accompanying drawings,

Figure 1 shows in elevation the whole apparatus for inserting, squeezing in and cutting off the leading-in wires and for lifting out and delivering the finished filament support.

Figure 2 shows the part of this apparatus, referred to below as "foot gripper", for carrying out the three first mentioned operations, also in the same elevation, but in a different phase of the operation.

Figure 3 is a side elevation corresponding to Figure 2.

Figures 4 and 5 show a detail of Figure 3 in plan view, being a section on line A—A of Figure 3, in two different operative positions.

Figures 6 to 9 show a detail of Figure 1 in side elevation and partly in section and in different working positions.

Figure 10 is the plan view of a detail of Figure 1, being a section on line B—B.

Figure 11 is an enlarged vertical sectional view of the adjustable bar, and

Figure 12 is a top plan view thereof.

A number of different foot grippers (Figs. 1–3) are mounted on the usual conveying device, for instance a turn table. The part which lifts out and delivers the finished filament supports (referred to below as "delivering device", see Fig. 1), is mounted in the stationary frame of the machine, only one such device being provided for each machine. It coacts successively with all the foot grippers, moving past it as the turn table rotates. The latter is intermittently driven by a Maltese cross gear or some equivalent device in the usual manner and, in the constructional example shown, remains stationary during the coaction of the foot grippers mounted on it with the delivering device mounted on the frame of the machine.

In the constructional example shown the

root grippers on the turn table perform besides the intermittent revolving motion a continuous rotary motion about their axes which are parallel to the axis of the turn table. They each consist of an axially slidable bar 1 with a sleeve 1′, the axially stationary sleeve 2 and the collar 3, the squeezing jaws 4 which are pivoted to the collar 3 and are pivotally connected to the arms 5, which have their other ends pivoted to the sleeve 1′ on the bar 1. To the sleeve 2 and the collar 3 is fixed a U-shaped frame 6, in which the two drums 7 carrying the wire and the wire guiding rollers 8 are journalled. The drums 7 are prevented from turning unintentionally by the braking springs 9. Within the collar 3 a sleeve 10 is fixed, which is provided with a large central bore and two small axial bores or slots lying at opposite sides of the sleeve, in a plane lying at right angles to that of the squeezing jaws 4. The central bore of the sleeve is closed at the bottom by an adjustable bar 10′, see Fig. 11 and through the lateral bores or slots the leading-in wires coming from the drums 7 over the rollers 8 are guided.

On the frame 6 a column 11 is screwed, which supports gripping members 12 which a spring 12′ seeks to close (see Fig. 10). Above the grippers 12 is a wire cutter 13 (see Figs. 4 and 5) and a releasing pawl 14 which is provided with a rod 15 and a stop pin 16 mounted adjustably thereon. The pawl 14 keeps back a lever 17 which is pivoted to the frame 6 and seeks to swing outwardly under the action of a spring 18. The lever 17 extends through the oblique slots 19 in the wire cutter 13 and closes the latter as soon as it is released by the pawl 14.

This mechanism acts in the following manner: As the turn table rotates the glass rod, the foot and, in the case of tipless lamps, the evacuating tube are inserted and are brought up to the welding temperature of the glass step, while the apparatus continues to rotate. The glass rod, which has already been provided with the glass beads, is placed upside down in the sleeve 10. The closing bar of the sleeve 10 is adjusted in accordance with the length of the glass rod, so that the end of the glass rod, to which the foot is to be fused, comes exactly opposite the squeezing jaws 4. The glass rods are inserted by any known device. The foot is also placed with the disc upwards in the gripper 12 in a known manner. The tubular end of the foot surrounds the end of the glass rod projecting out of the sleeve 10 just opposite the squeezing jaws 4. The wires coming from the drums 7 over the rollers 8 and through the longitudinal bores in the sleeve 10 are embraced by the foot. The vacuum tube used in connection with tipless lamps must be introduced inside the foot in such a manner that the lower end of the vacuum tube is opposite the squeezing jaws 4. The bar 1 is thereupon raised by means not shown in the drawing causing the levers 5 to close the squeezing jaws 4. The jaws 4 squeeze the foot, the rod, the leading-in wires and the vacuum tube, where such is used, altogether and thus causes these parts to fuse together. The grippers 12 are thereupon released by means of an arrangement provided on the frame of the machine and described below, the filament support being then lifted out drawing the wires along with it, which are paid out by the drums 7. On a stop member provided on the delivery device or the foot itself striking against the stop pin 16, which is placed higher or lower on the rod 15 according to the type of lamp to be produced, the pawl 14 will rock about the pivot and release the lever 17, which will then rock about its pivot on the frame 6 under the action of the spring 18. The lever 17 will slide in the oblique slots 19 in the cutter 13 (Figs. 4 and 5) causing the cutter to close whereby the wires are cut off exactly to the required length. The delivery device will thereupon return the lever 17 into its initial position by means of a roller or rod passing vertically along the beveled part of the same. The blades of the cutter each have a recess, through which the glass rod can pass. The finished filament support continues to move upwards without drawing the wire with it and is delivered to the next operation in the manner described below. The turn table will thereupon rotate by the amount of one division and the entire cycle of operations will be repeated with the next filament support.

Figures 1 and 6 to 9 show the device on the machine-frame for lifting out and delivering the finished filament support. 20 is a shaft rotating proportionally to the number of revolutions of the turn table. A bevel wheel 21 mounted on the said shaft meshes with a bevel wheel 22 which is keyed on the shaft 23 journalled at 24 in the frame of the machine. The speed of revolution of the shaft 20 and the gearing ratio of the toothed wheels 21 and 22 is made such that for each motion of the turntable by one division the shaft 23 makes a complete revolution. On the shaft 23 is mounted a reversing gear for intermittent motion, consisting for instance of two friction wheels or toothed wheels 25, 26 facing one another, having only a portion of their periphery 27, 28 provided with a friction surface or with teeth. Between the two discs 25, 26 a pinion 29 is mounted, which engages alternately with the disc 25 and the disc 26 with intermittent periods of rest. The pinion 29 is mounted on a vertical shaft 30 journalled in the machine frame, at the upper end of which is a bevel wheel 31 which meshes with a bevel wheel 32 keyed on the horizontal shaft 34 which is journalled in the frame 33. At the

other end of the shaft 34 is a spur wheel 35 which meshes with a vertical rack 36.

The rack 36 is connected to an arrangement 40 for gripping the finished filament support, the delivery device proper, and is guided in the frame 33, on which is provided an adjustable stop 41 for ejecting the filament support.

The delivery device consists in a hollow tubular member 40 fitted with a fastening device of any suitable spring type attaching itself to the stem introduced into the interior of the member 40. The fastening device is suitable to exert a pressure sufficient to hold the foot of light weight during its transport to another apparatus or the like.

The release of the pawl 14 and the return of the lever 17 into its initial position may also be effected by the rack 36. Below the spur wheel 35 in the frame 33 is a horizontal sliding member 37, through which the rack 36 passes. On the latter are the stops 38, 39 which coact in the following manner with the sliding member 37: In Fig. 6 the rack 36 is in the course of its upward motion, the finished filament support has already been gripped by the device 40 and is lifted out, the cutters 13 have cut off the wires and the filament support is ready to be passed on to the next operation. During the continued upward motion of the rack 36, the stop 38 will strike against the sliding member 37 (Fig. 7) whereby the rack 36 and the spur wheel 35 are locked together. This causes the bevel wheels 32 and 31 also to be locked together and the frame 33 is forced to perform a swinging motion, the filament support passing out of reach of the grippers 12 and being delivered to another apparatus (cooling oven or the like) for the next operation. During this swinging motion the right hand end of the sliding member 37 (Figs. 6 to 9) strikes against a stop member, not shown in the drawing, and is brought into the position shown in Figure 8. This releases the stop member 38 on the rack 36, so that the latter can continue its upward movement, the rack and the spur wheel 35 being no longer locked and the bevel wheels 32, 31 also being released, so that the frame 33 ceases to swing. On the rack 36 continuing its upward movement within the frame 33 moved aside, the finished filament support held by the device 40 will strike against the stop 41 and will thereby be released from the device 40 and delivered to the apparatus for the next operation (cooling oven or the like). In the meantime the toothed or friction sector 27 on the disc 25 will have run past the pinion 29 which will thus come to rest and with it the shafts 30 and 34 and the upward motion of the rack 36.

In the meantime the turn table will have continued to revolve intermittently through one division and a fresh filament support will have moved into the reach of the device mounted on the frame of the machine. The shaft 23 will also in the meantime have continued to rotate, until the toothed or friction sector 28 of the disc 26 engages with the pinion 29, so that the shaft 30 will be caused to rotate in the opposite direction. Consequently by means of the bevel wheels 31, 32 and the spur wheel 35 the rack 36 is moved downwards, but after it has moved a short distance the stop 39 will strike against the sliding member 37 (Fig. 9). Owing to the consequent locking of the spur wheel 35 and of the bevel wheels 32, 31, the frame 33 will be swung backwards, until the sliding member 37 is brought into its right hand extreme position by a stop not shown in the drawing, thereby causing the swinging motion of the frame 33 to cease and the downward motion of the rack 36 to be continued, until the gripping device 40 grips the next filament support. The pinion 29 will by this time have ceased to engage with the toothed or friction sector 28 of the disc 26 and the downward motion of the rack 36 has come to an end. On the toothed or friction sector 27 of the disc 25 engaging with the pinion 29, a fresh upward motion of the rack 36 and the lifting up of the filament support will commence, in the course of which the foot or a stop connected to the gripping device 40 will operate the releasing pin 16 of the pawl 15 causing the cutter 13 to cut off the leading-in wires which have been drawn along up till that moment by the filament support, as already described, without the filament support interrupting its upward motion, after which the cycle of operations just described is repeated.

Coaxially with the shaft 30 but independent of the same, a spur wheel 42 is mounted, which is connected to the frame 33 and takes part in the swinging motion of the latter. This spur wheel 42 is surrounded by a stationary casing 43, in which two diametrically opposed racks 44, 45 are guided, which mesh with the spur wheel 42 (Figs. 1 and 10). The ends of these racks are provided with jaws which embrace the arms of the grippers 12. On the frame 33 swinging back again the racks 44 and 45 are moved into the position shown in Figs. 1 and 10, in which they engage with the arms of the grippers 12, which, on the turn table continuing to revolve, have brought a finished filament support along with them, and press them together in opposition to the spring 12', so that the grippers 12 release this filament support, which is thereupon gripped by the gripping device 40 and lifted out. On the frame 33 being swung aside, the racks 44, 45 are moved in the opposite direction, so that the grippers 12, from which the filament support has already been removed by the upward motion of the gripping device 40, can close again.

What we claim is:—

1. A method of introducing and fusing in

the leading-in wires into the tubular foot of an electric glow lamp, consisting in nipping the heated tubular foot containing the ends of the undivided leading-in wires, drawing the nipped wires along by raising the foot by an accurately adjustable amount and cutting off the said wires, the ends of the unused wires remaining in the position into which they have been drawn, after which they can be inserted into the next tubular foot by an axial relative motion and by placing the tube over the wires, as and for the purposes set forth.

2. A method of introducing and fusing the leading-in wires into the tubular foot of an electric glow lamp, consisting in nipping the heated tubular foot containing the ends of the undivided leading-in wires composed regularly of different kinds of metals, drawing the nipped wires along by raising the foot a distance equal to a division of the wire and cutting off the said wires, the ends of the unused wires remaining in the position, into which they have been drawn, after which they can be inserted into the next tubular foot by an axial relative motion and by placing the tube over the wires, so that for a series of similar feet only a single adjustment is required of the kind of metal intended to be fused into the point on the foot which is to be nipped together, as set forth.

3. An apparatus for introducing and fusing in the leading-in wires into the tubular foot of an electric glow lamp, comprising in combination a conveying member, a device for holding the tubular foot on the said conveying member, means for nipping the tubular foot, means for cutting off the nipped in wires, means for withdrawing the finished foot from the holding device on the conveying member and for causing a relative movement between the said means for withdrawing the finished foot and the said holding device, as and for the purpose set forth.

4. An apparatus for introducing and fusing in leading-in wires into the tubular foot of an electric glow lamp, comprising in combination a conveying member, a device for holding the tubular foot on the said conveying member, a sleeve on the said device for the reception of the glass rod on the tubular foot, drums for paying out the wires, longitudinal guiding passages in the said sleeve for the wires, means for nipping the tubular foot, means for cutting off the nipped in wires, means for withdrawing the finished foot from the holding device on the conveying member and for causing a relative movement between the said means for withdrawing the finished foot and the said holding device, as and for the purpose set forth.

5. An apparatus for introducing and fusing in leading-in wires into the tubular foot of an electric glow lamp, comprising in combination a conveying member, a device for holding the tubular foot on the said conveying member, a sleeve on the said device for the reception of the glass rod on the tubular foot, drums for paying out the wires, guide pulleys for the wires, longitudinal guiding passages in the said sleeve for the wires, means for nipping the tubular foot, means for cutting off the nipped in wires, means for withdrawing the finished foot from the holding device on the conveying member and for causing a relative movement between the said means for withdrawing the finished foot and the said holding device, as and for the purpose set forth.

6. An apparatus for introducing and fusing in the leading-in wires into the tubular foot of an electric glow lamp, comprising in combination a conveying member, a device for holding the tubular foot on the said conveying member, means for nipping the tubular foot, a cutter for cutting off the nipped in wires, a recess in each blade of the cutter for the glass rod on the foot, a spring for closing the cutter, a pawl for locking the cutter in its open position, a stop member for raising the tubular foot out of the holding device and for releasing the said pawl and means for causing a relative movement between the said stop member and the said holding device, as set forth.

7. An apparatus for introducing and fusing in the leading-in wires into the tubular foot of an electric glow lamp, comprising in combination a conveying member, a gripping device for holding the tubular foot on the said conveying member, a spring for closing the gripping device, means for nipping the tubular foot, means for cutting off the nipped in wires, means for withdrawing the foot containing the nipped in wires from the gripping device on the conveying member, means for causing a relative movement between the said means for removing the finished foot and the said gripping device, means for causing a swinging motion of the said foot withdrawing means, two bars, jaws on the said bars, the bars being capable of being moved longitudinally parallel to one another by the return swinging motion for opening the gripping device by means of the said jaws and in the opposite direction for releasing the gripping device, as set forth.

8. An apparatus as claimed in claim 3 and comprising a swinging frame, a reversing gear for intermittent motion, a pair of bevel wheels, a rack guided in the swinging frame so as to be capable of sliding upwards and downwards in the same, a spur wheel connected to one of the bevel wheels and journalled with the same in the swinging frame, stop members on the said rack and a sliding member capable of coacting with the said stop members, as and for the purpose set forth.

9. An apparatus as claimed in claim 3 and

comprising a swinging frame, a reversing gear for intermittent motion, a pair of bevel wheels, a rack guided in the swinging frame so as to be capable of sliding upwards and downwards in the same, a spur wheel connected to one of the bevel wheels and journalled with the same in the swinging frame, stop members on the said rack, a sliding member capable of coacting with the said stop members, and a stop member on the swinging frame, capable of adjustment on the same, for removing the finished tubular foot from the means for withdrawing it from the gripping device on the upward motion of the rack following the swinging motion of the frame taking place, as set forth.

In testimony whereof we affix our signatures.

BERNHARD ERBER.
FERDINAND GANTNER.