SPINNERET PUNCHING MACHINE

Raymond A. Thomann and Jean Marie G. Vincent, Besancon, France, assignors to Textile and Chemical Research Company Limited, St. Peter, Port of Guernsey, Channel Islands, a corporation of Great Britain

Application August 5, 1953, Serial No. 372,452

Claims priority, application France April 8, 1953

12 Claims. (Cl. 164—115)

This invention relates to an apparatus for perforating spinnerets which are used in the manufacture of artificial textiles from alkaline solutions by means of acid baths, and is a modification and improvement over the spinneret punching machine disclosed in the co-pending application of our Serial No. 235,164 which was filed on July 5, 1951, now U. S. Patent No. 2,709,492.

The apparatus, as disclosed herein, is especially designed for punching spinnerets used in the manufacture of rayon filaments wherein the spinnerets have such a small number of holes therein, ranging in number for instance between 25 and 300, that a spinneret can be completely punched in one quarter of a minute to three minutes. But the apparatus is equally well adapted for use in punching staple fiber spinnerets which may have from 8000 to 12000 holes thereon and take several hours to completely punch.

The principal object of the invention is to provide a new and improved spinneret punching machine of the character described which will successively automatically punch spinnerets according to a prescribed pattern, automatically remove a spinneret from the machine after it has been punched and then automatically insert a blank spinneret in the machine in position to be punched.

Another object of the invention is to provide a machine of the aforesaid character in which the sequential operations thereof are controlled by an intermittently advanced perforated tape.

Another object of the invention is to provide a machine of the aforesaid character in which the intermittent advancement of the perforated tape is effected by the upward movement of a vertically reciprocal punch slide.

Another object of the invention is to provide, in an automatic spinneret punching machine of the character described, means operative to automatically stop the operation of the entire machine in the event a punch is broken during operation.

Still another object of the invention is to provide with a machine of the aforesaid character a rotatable turret having a plurality of storage magazines mounted thereon from which blank spinnerets are withdrawn and feed into the machine, and means to automatically advance successive magazines into discharging position as each preceding magazine is emptied of spinnerets.

Other objects of the invention will be apparent from the following specification and the accompanying drawings forming a part thereof.

Fig. 1 is a front elevation of an automatic spinneret punching machine constructed according to our invention;

Fig. 2 is a sectional plan view thereof, the plane of the section being indicated by the line 2—2 of Fig. 1;

Fig. 3 is a vertical longitudinal section taken substantially on the line 3—3 of Fig. 2;

Fig. 4 is a transverse vertical section taken substantially on the line 4—4 of Fig. 3;

Fig. 5 is an enlarged fragmentary front elevation, partially in section, showing the punch slide and punch raised up beyond their normal elevated position to permit the removal of a punched spinneret from the anvil and the insertion of a blank spinneret thereinto;

Fig. 6 is a detail vertical section taken on the line 6—6 of Fig. 5;

Fig. 7 is a horizontal section taken on the line 7—7 of Fig. 1;

Fig. 8 is a fragmentary detail vertical section taken on the line 8—8 of Fig. 7 and showing the selector disc discharging a blank spinneret into the chute for delivery to the anvil;

Fig. 9 is an enlarged plan view of a spinneret having two concentric circular rows of holes punched therein;

Fig. 10 is an enlarged detail vertical section showing the manner in which the punch embeds itself in the spinneret and produces a Burr on the outer surface thereof each time the punch descends;

Fig. 11 is an enlarged detail section taken on the line 11—11 of Fig. 9 and showing how the holes are formed in the spinnerets by grinding burrs from the outer surface thereof;

Figs. 12, 13 and 14 are fragmentary diagrammatic views showing the positions of various parts of the apparatus during different operations thereof, and

Fig. 15 is a wiring diagram of the mechanism for automatically stopping the operation of the apparatus in the event a punch is broken during operation.

Referring now to the drawings by reference characters the numeral 1 indicates a base having an upwardly extending U-shaped bracket 2 rigidly secured thereto adjacent one end thereof and an upwardly extending leg 3 rigidly secured thereto adjacent the other end thereof. One end of a horizontal table 4 is pivotally secured by a pivot stud 5 to the upper end of the bracket 2, and the other end of the table 4 is slidably mounted upon the upper end of the leg 3 by a wear plate 6 which is removably secured to the underside of the table 4 by screws 7. The table 4 beyond the leg 3 is held against an eccentric cam 8 by a tension spring 9 having one end thereof connected to a pin 10 carried by the table 4 and the other end thereof connected to the upper end of a pin 11 carried by the base 1. The cam 8 is adapted to be slowly rotated a few degrees at a time by a motor 12 through suitable reduction gearing 13 as will be described hereinafter.

A relatively large spur gear 16 which is rotatably mounted upon the table 4 by a stud shaft 17 has an anvil 18 rigidly secured to the upper face thereof for rotation therewith. The anvil 18 has a cup-shaped recess 19 in the upper end thereof in which a spinneret 20 is mounted during the punching thereof. The spinnerets 20, which are usually made of pure platinum or an alloy thereof, are firmly on a disc 21 of a softer metal, preferably aluminum, disposed in the bottom of the recess 19. The gear 16 meshes with a similar gear 24 secured to the upper end of a hub 25 which is rotatably mounted in a bearing aperture 26 in the table 4. A bevel gear 27 which is keyed to the lower end of the hub 25 and with it the anvil 18 is adapted to be intermittently rotated through a few degrees at a time as for the purpose hereinafter described. A bevel pinion 36, similar to the pinion 28, is secured to one end of a short shaft 37 which has a worm gear 38 secured to the other end thereof and is rotatably mounted in a bearing bracket 39 secured to the underside of the table 4. The worm gear 38 meshes with a worm 39 carried by the armature shaft 34 of a motor 35 which is bolted to the underside of the table 4. The gear 16 and with it the anvil 18 are adapted to be intermittently rotated through a few degrees at a time as for the purpose hereinafter described. A bevel pinion 36, similar to the pinion 28, is secured to one end of a short transverse shaft 37 rotatably mounted in a bearing bracket 38 secured to the underside of the table 4, and meshes with the bevel gear 27.
and is driven thereby. The other end of the shaft 36 is connected by a pair of universal joints 39 to a squared shaft 40 which is slidable mounted in a complementary recess 41 in the hub of a spool 42 which is rotatably mounted between a pair of spaced supporting arms 45, which extend upwardly from an elongated frame 46 carried by the box 11, it will thus be seen that whenever the annulus 18 is intermittently rotated by the motor 35, the spool 42 will be simultaneously likewise rotated.

An endless perforated tape 47 is mounted upon idler rollers 48 and 49 carried by the frame 46 at opposite ends thereof. The tape 47 passes over the spool 42 and is firmly pressed into engagement therewith by spring fingers 50 and 51 carried by the frame 46 and disposed on opposite sides of the spool 42. The spool 42 has sprocket teeth 52 adjacent each end thereof which engage perforations 53 along each side of the tape 47 to advance the tape whenever the spool 42 is rotated. It now becomes apparent that whenever the annulus 18 is intermittently rotated the tape 47 is simultaneously advanced. The tape 47 has four spaced parallel longitudinal rows of perforations 56, 57, 58 and 59 therearound which are cut in accordance with the patterns of holes being punched in the spinneret. Four resilient fingers 60, 61, 62 and 63 which are disposed above the tape 47 in vertical alignment with the rows of perforations 56, 57, 58 and 59 respectively extend outwardly from a casing 66 and terminate substantially vertically above the axis of the spool 42. The fingers 60, 61, 62 and 63 carry downwardly extending feelers 67, 68, 69 and 70 respectively which ride upon the tape 47 and enter successive perforations therein as they come under the feelers, the feeler 67 carried by the finger 60 being positioned to enter successive perforations in the row 56, the feeler 68 carried by the finger 61 being positioned to enter successive perforations in the row 57, the feeler 69 carried by the finger 62 being positioned to enter successive perforations in the row 58, and the feeler 70 carried by the finger 63 being positioned to enter successive perforations in the row 59. The fingers 60 to 63 and the feelers 67 to 70 carried thereby cooperate with the rows of perforations 56 to 59 in the upper sequential operation of the apparatus in automatically punching successive spinnerets as will be explained hereinafter in connection with the sequential operation of the apparatus.

A vertical frame 73 is secured to the base 1 and extends upwardly therefrom behind the table 4 with the upper end of the same overhanging the table 4. A punch or slide 75 is slidable mounted for vertical reciprocation above the annulus 18 in a suitable guideway 76 in the overhanging upper end of the frame 73. The lower end of the slide 75 carries a punch holder 77 in which a punching tool 78 is removably secured by a set screw 79. A hopper 80 having a quantity of small weights 81, preferably lead or iron shot or discs, therein is secured to the projecting upper end of the punch slide 75. A rack 82 which is secured to the rear face of the slide 75 adjacent the upper end thereof overhangs the punch tool 78 which is pinned to a transverse shaft 84 rotatably mounted in the overhanging upper end 74 of the frame 73. A lever 87 carrying a roller 88 in the bifurcated lower end thereof is operatively connected to the shaft 84 through an overrunning clutch 89 which is mounted on one end of the shaft 84 between a collar 85 and a spring washer 86. The roller 88 is adapted to be engaged by a cam 91 which is secured to one end of a transverse shaft 92 which is rotatably mounted in the frame 73. The other end of the shaft 92 has a large spur gear 93 secured thereto which meshes with smaller gear 94 mounted on a stud 95. The gear 94 has secured thereto on a pin 96 which meshes with a small pinion gear 97 carried by the armature shaft 98 of a motor 99 which is suitably mounted upon the frame 73. The motor 99 when energized will, through the gear train just described, rotate the shaft 92 and cam 91 at a greatly reduced speed, and thereby oscillate the lever 87. The movement of the lever 87 from low position on the cam 91, as shown in Fig. 12, to high position thereon, as shown in Figs. 4 and 13, will rotate the shaft 84 and gear 83 counterclockwise (Fig. 4) which through the rack 82 will raise the punch slide 75, and partially rotate the shaft 92, as previously described whereby, up from punching position, as shown in Figs. 4 and 13, to its normal elevated position, as shown in Fig. 14. The movement of the lever 87 back from high position on the cam 91 to low position thereon will allow the slide to drop by gravity from the position shown in Fig. 12 under the influence of the weighted hopper 80. The arrangement of the overrunning clutch 89, as shown in Figs. 4 and 6, is such that if the rotation of the cam 91 is stopped in the position shown in Figs. 4 and 13 the slide 75 will be kept from descending from normal elevated position but yet is free to be raised up beyond normal elevated position to the position shown in Fig. 14 in order to permit the removal of a punched spinneret from the annulus 18 and the insertion of a blank spinneret therein. The slide 75 carries a pivoted arm 102 which is adapted to momentarily close a switch 103 mounted on the frame 73, as the slide reaches its normal elevated position as shown in Figs. 1, 3, 4 and 13. During the downward movement of the slide 75 the arm 102 is inoperative to actuate the switch 103.

The punching tool 78 comprises a shank 104 which is inserted into the holder 77, and carries the elongated cylindrical punch 105 having the hemispherical lower end 106. The punch 105 is made of any suitable material which is harder than the material of the spinneret, preferably extra hard steel. Each time the punch slide 75 descends the punch 105 is driven into the inner face of the annulus which produces a burr 108 on the outer surface thereof which is driven into the soft metal pad 21 in the annulus 18 upon which the spinneret is seated, all as shown in Fig. 10. After a spinneret has been completely punched it is automatically removed from the annulus 18 after which the burr 108 is ground off, leaving sharp edged holes 109 extending through the bottom of the spinneret as shown in Fig. 11.

Various types of mechanisms, either pneumatic or mechanical, may be used for removing a punched spinneret from the annulus. As shown herein this mechanism comprises an arm 112 which is secured to the upper end of a vertically reciprocating shaft 113 which is rotatably mounted in an axial bore 114 through the hub 25 of the gear 24. The outer end of the arm 112 terminates in a jaw 115 to which an opposing jaw 116 is pivotally secured at 117. A spring 118 yieldsly holds the jaw 116 closed as shown in full lines in Fig. 2. The lower end of the shaft 113 is rotatably connected, as shown at 119, to the upper end of a rod 120 which is slidable but non-rotationally mounted in a guide 121. The lower end of the rod 120 carries a pin 122 which rides in a cam track 123 in the periphery of a circular cam disc 124 which is rotatably mounted on the lower end of a vertical shaft 125 which is supported by a bracket 126 secured to the underside of the table 4. A bevel gear 127 is rotatably mounted on the shaft 125 adjacent the upper end thereof, and a spur gear 128 is mounted on the shaft 125 between the bevel gears 127 and the cam disc 124. The gear 127 and the cam disc 124 are all rigidly connected together to rotate in unison. The spur gear 128 meshes with a gear 131 of the same pitch diameter which is slidable keyed on the shaft 113. A compression spring 122 which is disposed about the shaft 113 between the gear 131 and the connection 119 yieldsly biases the shaft 113 downwardly and holds the gear 131 against vertical movement. The bevel gear 127 meshes with a pinion gear 133 secured to one end of a horizontal shaft 134 which is rotatably mounted in bearing brackets 135 secured to the underside of the table 4. A pinion gear 136 similar to the pinion gear 133 is secured to the opposite end of the shaft 134.
The shaft 134 is adapted to be rotated by a motor 137 through a suitable speed reducer 138, pinion gear 139 carried thereby, and bevel gear 140 which is fixed on the shaft 134 in mesh with the pinion 139. The motor 137 is mounted in a U-shaped member 141 which is secured to and extends downwardly from the underside of the table 4. Since the gears 123 and 131 have the same pitch diameter one revolution of the bevel gear 127, and with it the gear 123 and cam disc 124, will simultaneously impart one revolution to the shaft 133 and the arm 112 carried thereby.

Before a punched spinneret can be removed from the anvil 18 the slide 75 and the punch 78 carried thereby must be raised up above their normal elevated position, as shown in Figs. 5 and 13, to the position shown in Figs. 5 and 14 in order for the spinnert to clear the punch as it is being removed. For this purpose we secure a lever 144 to the end of the shaft 84 opposite the clutch 89 and provide a cam 145 which is rotated through a speed reducer 146 by a motor 147 mounted on the frame 73. After the slide 75 and punch 78 have been raised from punching position shown in Fig. 12 to their normal elevated position shown in Fig. 13 by the cam 91 as previously described, the cam 145 will engage and raise the free end of the lever 144 and rotate the shaft 84 and gear 85 still further thereby raising the slide 75 and punch up from the position shown in Figs. 5 and 13 to the position shown in Figs. 5 and 14. The arm 86 is provided to cause the lever 87 to rotate with the shaft 84 and leave the cam 91 during this further rotation of the shaft 84 and thereby put the movement of the slide 75 back and forth between the position shown in Figs. 13 and 14 entirely under the control of the cam 145.

After the last hole to be punched in a spinneret has been punched the motor 99 and cam 91 will raise the slide 75 to the position shown in Fig. 13, stop, and after which the motor 147 and cam 145 will raise the slide 75 still further to the position shown in Fig. 14 and stop thereby holding the slide in this position. The motor 137 will then rotate the cam disc 124 counterclockwise one revolution and the shaft 113 and arm 112 clockwise one revolution and then stop with the cam disc 124 and arm 112 back in their normal at rest positions. As the arm 112 rotates the jaws 115 and 116 will grasp the spinneret 20 in the war e18 between them under the arm 112 and rotate the arm 112 around the top of the spinneret. As the jaws 115 and 116 engage the spinnert 20 the pin 122 on the rod 121 will ride up the sharp incline 151 in the cam track 123 which will raise the shaft 113 and arm 112 and lift the spinnert up out of the anvil, it being understood that the jaws 115 and 116 are of sufficient length to permit the lifting of the spinnert from the anvil before the closed semi-circular end 152 of the jaws engages the spinnert. The continued movement of the arm 112 carries the removed spinnert to the position shown in dot and dash lines in Fig. 2 where a downwardly extending cam lug 153 carried by the pivotL jaw 116 engages a fixed abutment 154 which opens up the jaws and drops the spinnert being carried thereby into a discharge chute 155.

Blank spinnersets to be automatically delivered to the anvil 18 are stored in three magazines 160, 161 and 162 carried by a rotatable turret 163 secured to the upper end of a shaft 164 which extends up through a tubular shaft 165 which is rotatably mounted in a vertical post 166 secured to one end of the table 4 by feet 167. A selector disc 168 is secured to the upper end of the tubular shaft 165 for rotation therewith, and a bevel gear 169 is secured to the lower end of the tubular shaft 165 in mesh with the bevel pinion 136 carried by the shaft 134. The selector disc 168 is disposed directly under the turret 163, with the upper surface thereof lightly contact-}

with which the lower open ends of the magazines are adapted to register, and the bed plate 170 has an aperture 172 therein with which the aperture 171 in the selector disc 168 is adapted to register once each revolution of the selector disc 168. The upper end of a downwardly inclined chute 173 is secured to the bed plate 170 and extends downwardly from the underside of the table 4. Since the gears 123 and 131 have the same pitch diameter one revolution of the bevel gear 127, and with it the gear 123 and cam disc 124, will simultaneously impart one revolution to the shaft 133 and the arm 112 carried thereby.

Before a punched spinneret can be removed from the anvil 18 the slide 75 and the punch 78 carried thereby must be raised up above their normal elevated position, as shown in Figs. 5 and 13, to the position shown in Figs. 5 and 14 in order for the spinnert to clear the punch as it is being removed. For this purpose we secure a lever 144 to the end of the shaft 84 opposite the clutch 89 and provide a cam 145 which is rotated through a speed reducer 146 by a motor 147 mounted on the frame 73. After the slide 75 and punch 78 have been raised from punching position shown in Fig. 12 to their normal elevated position shown in Fig. 13 by the cam 91 as previously described, the cam 145 will engage and raise the free end of the lever 144 and rotate the shaft 84 and gear 85 still further thereby raising the slide 75 and punch up from the position shown in Figs. 5 and 13 to the position shown in Figs. 5 and 14. The arm 86 is provided to cause the lever 87 to rotate with the shaft 84 and leave the cam 91 during this further rotation of the shaft 84 and thereby put the movement of the slide 75 back and forth between the position shown in Figs. 13 and 14 entirely under the control of the cam 145.

After the last hole to be punched in a spinneret has been punched the motor 99 and cam 91 will raise the slide 75 to the position shown in Fig. 13, stop, and after which the motor 147 and cam 145 will raise the slide 75 still further to the position shown in Fig. 14 and stop thereby holding the slide in this position. The motor 137 will then rotate the cam disc 124 counterclockwise one revolution and the shaft 113 and arm 112 clockwise one revolution and then stop with the cam disc 124 and arm 112 back in their normal at rest positions. As the arm 112 rotates the jaws 115 and 116 will grasp the spinneret 20 in the war e18 between them under the arm 112 and rotate the arm 112 around the top of the spinnert. As the jaws 115 and 116 engage the spinnert 20 the pin 122 on the rod 121 will ride up the sharp incline 151 in the cam track 123 which will raise the shaft 113 and arm 112 and lift the spinnert up out of the anvil, it being understood that the jaws 115 and 116 are of sufficient length to permit the lifting of the spinnert from the anvil before the closed semi-circular end 152 of the jaws engages the spinnert. The continued movement of the arm 112 carries the removed spinnert to the position shown in dot and dash lines in Fig. 2 where a downwardly extending cam lug 153 carried by the pivotL jaw 116 engages a fixed abutment 154 which opens up the jaws and drops the spinnert being carried thereby into a discharge chute 155.

Blank spinnersets to be automatically delivered to the anvil 18 are stored in three magazines 160, 161 and 162 carried by a rotatable turret 163 secured to the upper end of a shaft 164 which extends up through a tubular shaft 165 which is rotatably mounted in a vertical post 166 secured to one end of the table 4 by feet 167. A selector disc 168 is secured to the upper end of the tubular shaft 165 for rotation therewith, and a bevel gear 169 is secured to the lower end of the tubular shaft 165 in mesh with the bevel pinion 136 carried by the shaft 134. The selector disc 168 is disposed directly under the turret 163, with the upper surface thereof lightly contact-
turret 163 with a loaded magazine in position to have spinnerets withdrawn therefrom.

The sequential operation of the apparatus will now be described in connection with the drawing, it being assumed that when last used the machine was stopped with a blank spinneret in the annul 18, the table 4 and annul 18 in position for the inner circle 190 of holes (Fig. 1) to be punched, and the slide 75 and punch 78 in normal elevated position as shown in Fig. 13. A master switch is closed which puts the machine in operation. The slide 75 and punch 78 descend under the influence of the weighted hooper 80 and punch the first hole in the circle of holes 190, as shown in Fig. 12, after which the annul 99 raises the slide and punch back to normal elevated position. As the slide reaches normal elevated position the finger 102 momentarily closes the switch 183 which through suitable relay and switching means stops the motor 99 and starts the motor 35. The motor 35 then rotates the annul 18 and spinneret therein into position for the next hole to be punched in the circle 190 and simultaneously advances the tape 47 until the finger 68 on the finder 61 drops into the next advancing perforation in the row 57 thereof, which through suitable relay and switching means effects the stopping of the motor 35 and the starting of the current 215. The side of a source of current 215 is connected to the punch 78 by a lead 216, and the other side thereof is connected to a spinneret 20, in the annul 18, through an amplifier 217 by the leads 218 and 219. The output side of the amplifier 217 is connected to the relay 204 by the leads 220 and 221. Each time the end 106 of the punch contacts the bottom 197 of the spinneret 20 a circuit is established through the amplifier 217 which energizes the relay 204 and rocks the lever 202 thereby pushing the lower end of the arm 198 outwardly from the arm 197 and separating the normally separated contacts 200 and 201 still further. During normal operation of the apparatus with an unbroken punch, the end 106 of the punch contacts the bottom of the spinneret just before the boss 196 on the disc 195 engages the spring arm 197. Therefore when the boss 196 contacts the arm 197 the arm 198 and contact 201 thereon have been already moved so far away from the arm 197 and contact 200 thereon that the boss 196 cannot flex the arm 197 sufficiently to bring the contact 200 into engagement with the contact 201. The relay 208 will therefore not be energized and the apparatus will continue to operate. But if the punch breaks at the point A, the usual breaking point, the boss 196 will engage the arm 197 and close the contacts 200 and 201 before the punch engages the bottom of the spinneret, due to the then longer travel of the punch before engaging the spinneret. The relay 208 therefore is energized which will open the switch 211 and stop the machine. After the broken punch has been replaced the switch 211 must be manually re-set before operation can be resumed.

From the foregoing it will be apparent to those skilled in this art that we have provided a relatively simple and highly efficient apparatus for accomplishing the objects of the invention.

It is to be understood that we are not limited to the specific embodiment of the invention shown and described herein as many modifications may be made in the construction thereof within the spirit of the invention.

What is claimed is:

1. A machine for punching spinneret blanks comprising a table, a vertically reciprocating punch and a vertically reciprocating punch slide disposed above said annul, a punch carried by said slide in position to engage said blank upon each downward movement thereof, a first motor operatively connected to intermittently raise and lower said slide, a second motor operatively connected by said slide during each elevation thereof, a perforated tape having a longitudinally aligned row of perforations and adapted to be intermittently advanced, a feeder mounted in po-
ation to enter successive holes in said tape as said tape is advanced, a second motor operating to simultaneously rotate said anvil and advance said tape, said switch being operative when actuated to effect the deenergization of said first motor and the energization of said second motor, said tape and feeler being operative to subsequently effect the deenergization of said second motor and the energization of said first motor.

2. A machine for automatically punching spineret blanks comprising a horizontally pivotally mounted table, an anvil rotatably mounted on said table, a vertically reciprocating punch slide disposed above said anvil, a pulch

carried by said slide in position to engage a spineret in said anvil each time said slide descends, a perforated movable tape, means operable to intermittently reciprocate said slide, means operable to rotate said anvil a predetermined amount at predetermined times, means operable to move said tape about its pivot a predetermined amount at predetermined times and thereby shift said anvil with respect to said punch, means operable to remove a punched spineret from said anvil, and means operable to withdraw a spineret blank from said magazine and deliver it to said anvil after a punched spineret has been removed from said anvil, means operable to withdraw a blank spineret from said magazine and the delivery thereof to said anvil, and the intermittent energization of said tape.

3. A machine for automatically punching spineret blanks comprising a horizontally pivotally mounted table, an anvil rotatably mounted on said table, a vertically reciprocating punch slide disposed above said anvil, a punch carried by said slide in position to engage a spineret in said anvil each time said slide descends, a storage magazine from which blank spinerets are adapted to be withdrawn, a perforated tape adapted to be intermittently advanced, means operable to intermittently reciprocate said slide, means operable to rotate said anvil a predetermined amount at predetermined times, and thereby shift said anvil with respect to said punch, means operable to remove a punched spineret from said anvil, means operable to withdraw a spineret blank from said magazine and deliver it to said anvil after a punched spineret has been removed from said anvil, means operable to withdraw a blank spineret from said magazine and the delivery thereof to said anvil, and the intermittent energization of said tape; said tape being operative as it is advanced to sequentially control the reciprocation of said slide, the rotation of said anvil, the movement of said table, the removal of a punched spineret from said anvil, the withdrawal of a blank spineret from said magazine and the delivery thereof to said anvil, and the intermittent energization of said tape; a manually operable master switch by which the operation of said machine is manually initiated and terminated, a normally closed switch disposed in series with said master switch, and means responsive to said punch and operable to automatically open said normally closed switch upon the breaking of said punch.

4. A machine for automatically punching spineret blanks comprising a horizontally pivotally mounted table, an anvil rotatably mounted on said table, a vertically reciprocating punch slide disposed above said anvil, a punch carried by said slide in position to engage a spineret in said anvil each time said slide descends, a storage magazine from which blank spinerets are adapted to be withdrawn, a perforated tape adapted to be intermittently advanced, means operable to intermittently reciprocate said slide, means operable to rotate said anvil a predetermined amount at predetermined times, and thereby shift said anvil with respect to said punch, means operable to remove a punched spineret from said anvil, means operable to withdraw a spineret blank from said magazine and deliver it to said anvil after a punched spineret has been removed from said anvil, means operable to withdraw a blank spineret from said magazine and the delivery thereof to said anvil, and the intermittent energization of said tape; said tape being operative as it is advanced to sequentially control the reciprocation of said slide, the rotation of said anvil, the movement of said table, the removal of a punched spineret from said anvil, the withdrawal of a blank spineret from said magazine and the delivery thereof to said anvil, and the intermittent energization of said tape.
9. A machine for automatically punching spinneret blanks as defined in claim 8 in which the reciprocation of said slide the rotation of said anvil and the advancement of said tape are controlled by one of said rows of perforations and the associated feeder, the movement of said table is controlled by another of said rows of perforations of the associated feeder, and the removal of a punched spinneret from said anvil and the withdrawal of a blank spinneret from said storage means are controlled by still another of said rows of perforations and the associated feeder.

10. A machine for punching spinneret blanks comprising a horizontal pivotally mounted table, an anvil rotatably mounted upon said table and adapted to hold a spinneret blank during punching a vertically reciprocal punch slide disposed above said anvil, a punch carried by said slide in position to engage said blank each downward movement thereof, a first motor operative to intermittently raise and lower said slide, a switch adapted to be actuated by said slide during each elevation thereof, a tape having a plurality of perforations therein and adapted to be intermittently advanced, means associated with said tape in position to register with successive perforations in said tape as said tape is advanced, a second motor operative to simultaneously rotate said anvil and advance said tape, a third motor operative to move said table about its pivot to shift said anvil with respect to said punch, means including a fourth motor operative to remove a punched spinneret from said anvil, said switch being operative when actuated to effect the energization of said first motor and the energization of said second motor, said tape and said first means being operative to subsequently effect the energization of said second motor and the energization of said first motor, and to control the energization of said third and fourth motors.

11. A machine for punching spinneret blanks comprising a rotatably mounted anvil adapted to hold a spinneret blank during punching, a vertically reciprocal punch slide disposed above said anvil, a punch carried by said slide in position to engage said blank upon each downward movement thereof, means operative to intermittently raise and lower said slide, a perforated tape having a longitudinally aligned row of perforations and adapted to be intermittently advanced, a feeder mounted in position to enter successive holes in said tape as said tape is advanced, and means controlled by said tape and feeder operative to simultaneously rotate said anvil and advance said tape.

12. A machine for automatically punching spinneret blanks comprising a horizontal rotatable anvil, a vertically reciprocal punch slide disposed above said anvil, a punch carried by said slide in position to engage a spinneret in said anvil each time said slide descends, a perforated movable tape, means operative to intermittently reciprocate said slide, means operative to rotate said anvil a predetermined amount at predetermined times, means operative to shift said anvil laterally with respect to said punch a predetermined amount at predetermined times, means operative to remove a punched spinneret from said anvil, and means operative to move said tape, said tape being operative as it is moved to sequentially control the reciprocation of said slide, the rotation of said anvil, the lateral shifting of said anvil, and the removal of a punched spinneret from said anvil.

References Cited in the file of this patent

UNITED STATES PATENTS

318,049 Smith .......................... May 19, 1885
944,799 De Kleist ........................ Dec. 28, 1909
2,148,221 Schneider ........................ Feb. 21, 1939