Oct. 25, 1949. E. PRAIZNER 2,486,204

TAPE SPLICING MACHINE

Filed April 30, 1947 3 Sheets-Sheet 1

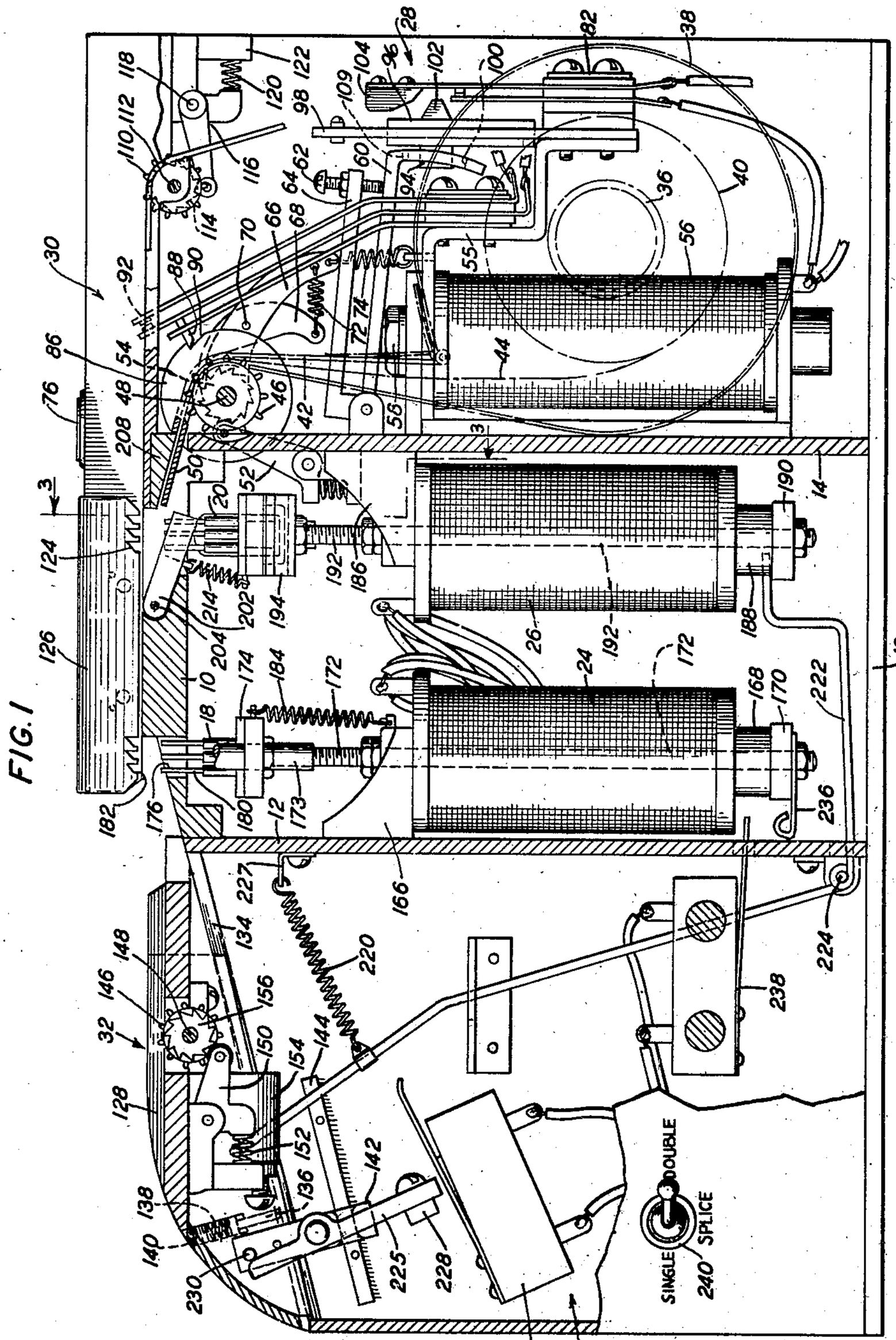

FIG. 1

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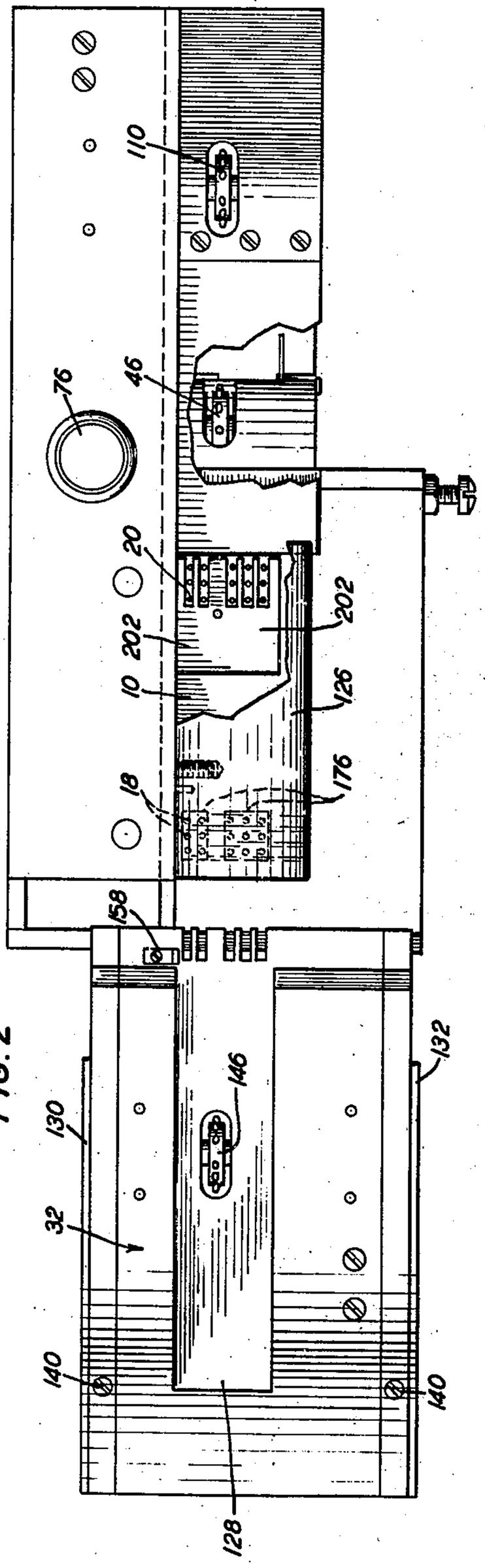

FIG. 2

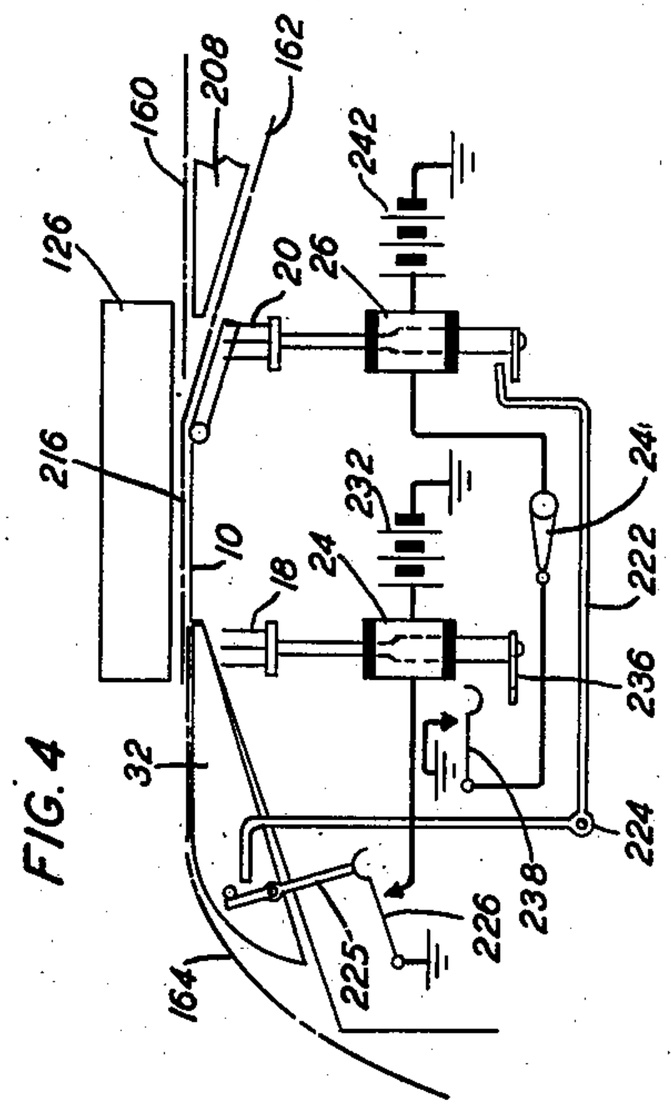

FIG. 4

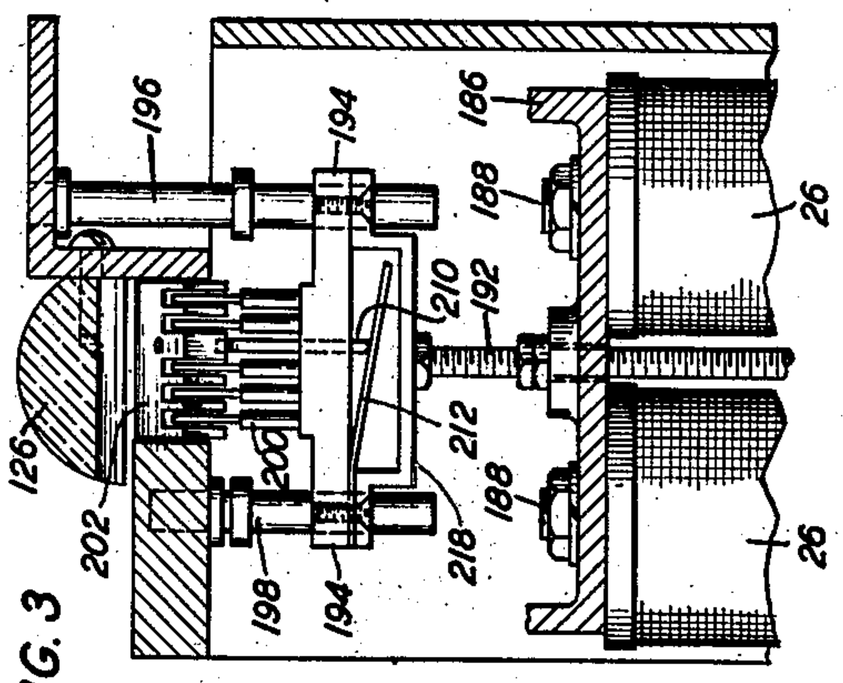

FIG. 3

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TAPE SPLICING MACHINE

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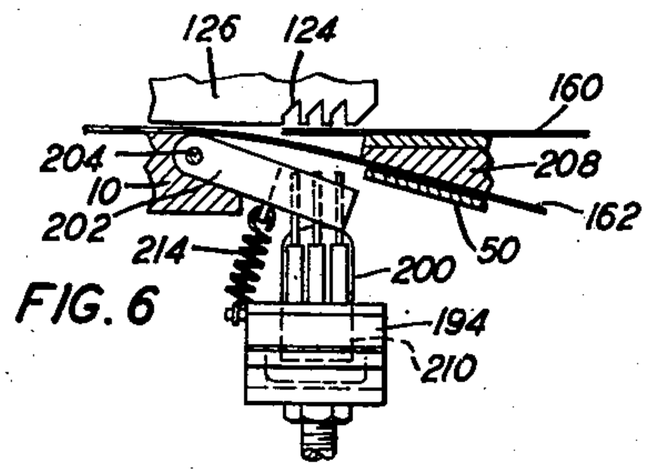


FIG. 6

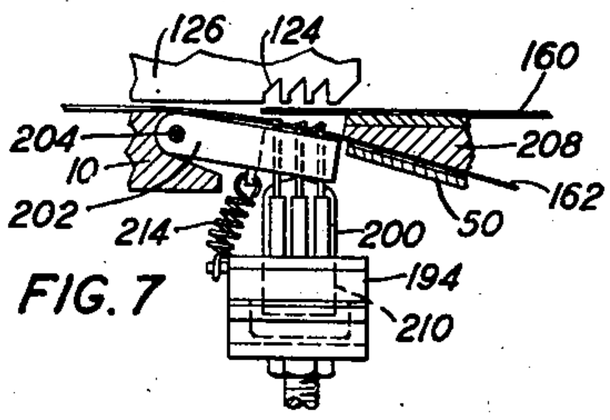


FIG. 7

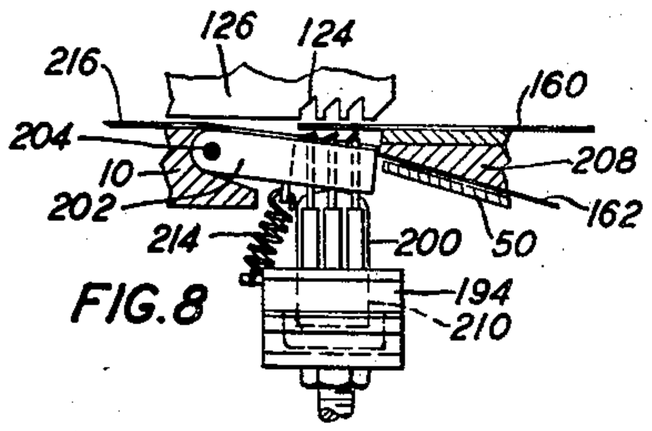


FIG. 8

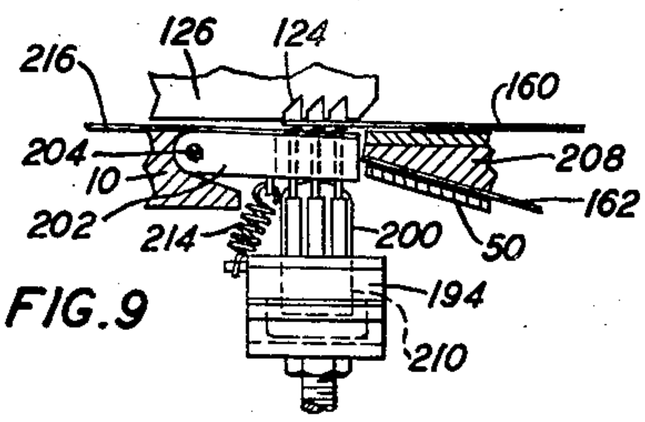


FIG. 9

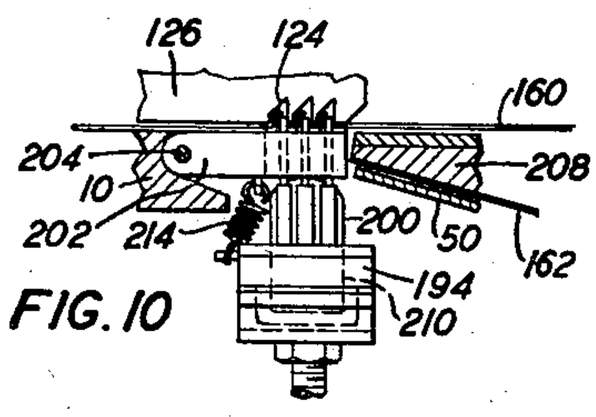


FIG. 10

FIG. 5

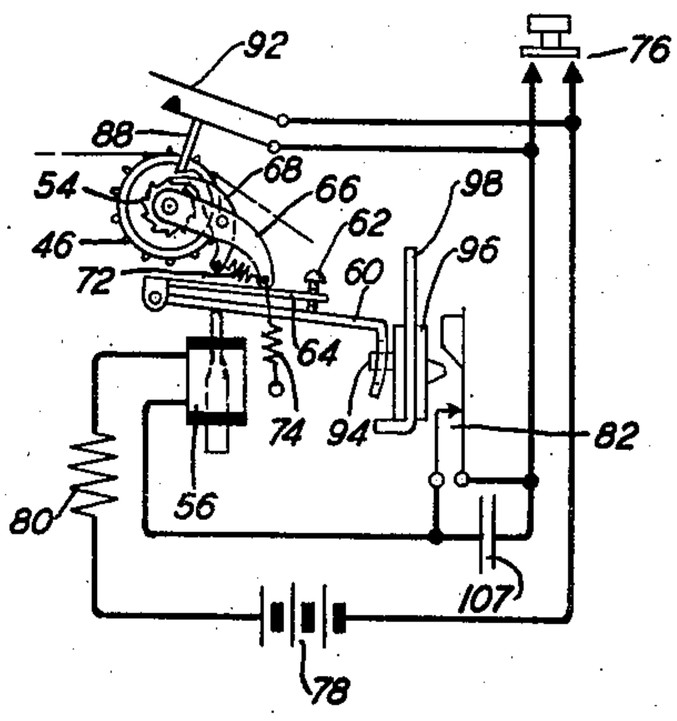


FIG. 11

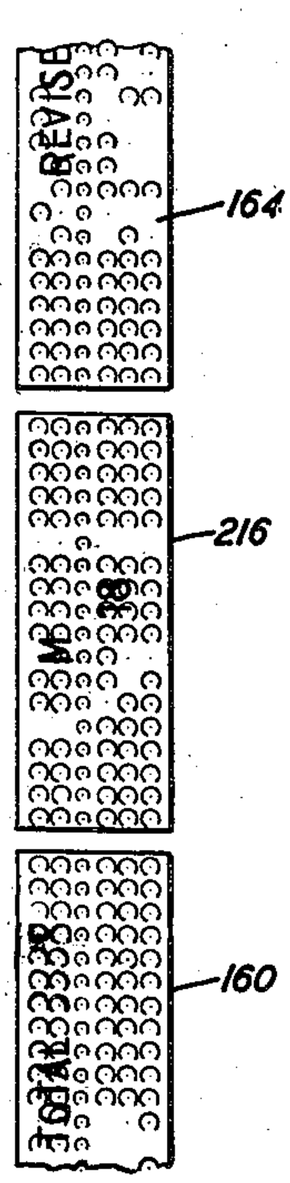
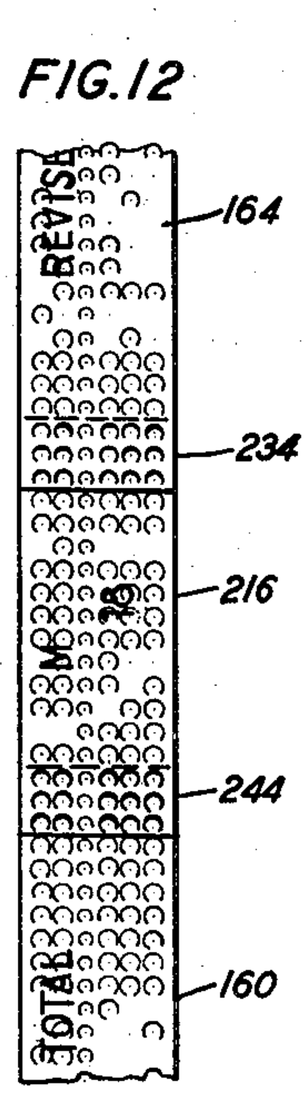


FIG. 12



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Patented Oct. 25, 1949

2,486,204

UNITED STATES PATENT OFFICE

2,486,204

TAPE SPLICING MACHINE

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Application April 30, 1947, Serial No. 745,001

14 Claims. (Cl. 93—1.1)

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This invention relates to a splicer for joining tapes and more particularly to a machine for joining sections of tape of a type frequently employed to control a telegraph tape transmitter for the transmission of telegraph or other signals in accordance with signals stored therein in the form of punches arranged in permutation code combinations.

In communication systems such as telegraph systems, messages from a local office destined for other local offices may be transmitted through one or more central offices or switching points. At such central offices, messages from a plurality of local offices to various destinations may be received on reperforators which store them on a tape in the form of punchings of the permutation code combinations representing the characters forming the message. Messages so stored and destined for a given area may then be assembled in a composite tape and the composite tape fed through a transmitter for transmission to another switching point at which the individual messages may be separated and distributed to the appropriate local stations. To this end it is sometimes desirable to insert short sections of tape bearing service or identification codes ahead of and between the messages of such a composite tape such code tapes indicating the number, the ultimate destinations, the origin or the like for each individual message.

Heretofore such identification tapes or tabs have been spliced between messages by a variety of means, as for example the tape splicer disclosed in United States Letters Patent 2,246,655 granted June 24, 1941, on an application filed in the name of Walter M. Bacon. This tape splicer is a manually operated device which without the use of adhesives or auxiliary fastening devices effectively joins two pieces of perforated tape which are preferably chadless, that is, the perforations therein are formed by a perforator which cuts out only about three-quarters of a circle leaving a lid hinged to the tape at the site of each perforation. In accordance with the above-identified patent the ends of the tapes to be joined are perforated in a predetermined pattern, as for example with "Letters" characters each of which, in the permutation code employed for telegraph purposes, is represented by a row of five perforations extending across the tape, two of such perforations being on one side of the feed hole and three on the other. The end portions of the two tapes having "Letters" characters punched therein are superimposed on a splicing table with the perforations of the two tapes in

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alignment. Thereafter, by a manual operation, a set of splicing pins is forced through the superimposed perforations in the tapes from beneath lifting the chads of the lower tape and forcing them through the openings left by the chads of the upper tape said tape being held in such fashion that the chads interlock and join the two tapes.

It is an object of the present invention to provide a machine which will facilitate the splicing of two or more tapes by the method disclosed in the patent referred to above.

It is a further object of the invention to provide means for automatically positioning message and identification tapes and for splicing such tapes together by power driven means.

It is a further object of the invention to provide means for splicing identification tapes between two message tapes in a single operation.

In view of the above objects, there is provided in accordance with one aspect of the invention, a machine for splicing a section of identification tape having service or identification characters punched therein between two message tapes, each having characters punched therein. This machine comprises a splicing table, means for locating the head end of a succeeding message tape over one end of the splicing table, means for feeding an identification tape under the splicing table beneath the head end of this message and positioning the identification tape with some of the perforations therein in alignment with some of those in the succeeding message tape, means for positioning the trailing end of a preceding message tape at the other end of the splicing table with some of the perforations in this message tape in alignment with those in the identification tape, and means for lifting splicing pin arrays normally positioned beneath the splicing table through the overlying portions of the message and identification tapes to splice the same together by interlocking the chads thereof.

In accordance with other features of the invention means are provided for storing identification tapes or tabs in a continuous roll and cutting off a tab to be spliced ahead of a message tape or between two message tapes simultaneously with the splicing thereof and means for selectively operating the splicer to make either one or two splices at the will of the operator.

The above and other objects and features of the invention will be apparent from the accompanying detailed specification, taken in connection with the drawings in which;

Fig. 1 is a front elevation of a splicing machine embodying the invention;

Fig. 2 is a plan view of the machine of Fig. 1;

Fig. 3 is a section taken along the line 3—3 of Fig. 1 showing certain details of the splicing machine of the invention;

Figs. 4 and 5 are schematic diagrams showing the electrical and mechanical connections involved in the machine of Fig. 1;

Figs. 6 through 10, inclusive, constitute a series of fragmentary views showing the successive positions taken by certain of the splicing instrumentalities during the operation of the machine of Fig. 1;

Fig. 11 shows an appropriately perforated identification tape together with the leading and trailing ends respectively of two message tapes between which it is to be spliced; and

Fig. 12 shows the appearance of the composite tape produced after the splicing operation has been completed to join the tapes shown in Fig. 11.

In general, the splicing machine of the invention includes two sets of splicing pins which are automatically controlled and power operated and are located for vertical movement beneath opposite ends of a horizontal splicing table over which the suitably perforated message and identification tabs to be joined are positioned prior to the splicing operation. The head or leading end of one of the message tapes to be joined is positioned by suitable guides directly above one set of splicing pins and thereafter an identification tape forming a portion of a continuous roll of such tabs stored in a magazine is fed out to a position such that the tab underlies the head end of the previously positioned message tape with the perforations of the two tapes in accurate alignment. In an exemplary embodiment of the invention the tab or service signal tape extends over substantially the entire length of the splicing table. Subsequently the trailing end of another message tape to be joined is positioned on a carriage which may be moved to carry the end of this type in underlying and accurately aligned relation with the leading end of the identification tape remote from the head end of the first-mentioned message. Upon closure of a switch actuated by operation of the trailing end carriage the splicing pins at the end of the splicing table nearest the trailing end of the second message tape are actuated to join this message tape to the identification tape and upon actuation of these splicing pins those at the other end of the splicing table are automatically actuated to join the head end of the first message to the identification tape. A cutter bar or knife associated with the second set of splicing pins is effective upon the operation of these pins to cut the identification tape which is being spliced between the two messages from the previously mentioned roll of such identification tapes.

An exemplary embodiment of a splicing machine in accordance with the present invention is shown in the accompanying drawings. In Fig. 1, which is a front elevation of the machine, a splicing table 10 is supported between vertical walls 12 and 14 forming a portion of the frame 16 of the machine. Two sets or arrays of splicing pins 18 and 20 are arranged for vertical motion through slots formed in splicing table 10. These splicing pin arrays, which will be described in detail hereinafter, are actuated by solenoids 24 and 26, respectively for such vertical movement. Also provided are identification

tape storage and feed mechanisms indicated at 28, message tape locating devices indicated at 30 and 32, and splicing solenoid control devices or systems indicated at 34. These elements of the machine will be considered separately and in detail hereinafter.

Identification tape storage and feed mechanism

In an exemplary embodiment of the invention described herein in detail the identification tapes to be spliced between message tapes are part of a continuous tape. This tape has suitable perforations punched therein which include for each identification tape-length a code identification, which may include any fixed number of characters, preceded and followed by a predetermined pattern of perforations as for example "Letters" characters perforations in suitable number to provide for splicing to the ends of message tapes perforated in the same predetermined pattern. A typical individual identification tape is shown at 216 in Fig. 11 as it appears after severance from a roll of identification tapes. The tape roll is stored in a magazine shown in Fig. 1 comprising a horizontal center post 36 and an outer casing 38, the position of the roll of identification tapes being shown generally at 40. A chute having a hinged lid 42 extends upwardly from the magazine to a position adjacent to the right hand (in Fig. 1) end of splicing table 10, the course of the tape through this chute being indicated in Fig. 1 by the broken line 44.

The feeding means for indexing the service or identification tapes into position over the splicing table is shown in Figs. 1 and 5 and comprises a toothed wheel 46 journaled on a shaft 48 and positioned to extend through an opening in the lower wall 50 of the feed chute. This toothed wheel is driven through a pawl and ratchet system and is equipped with a spring-operated detent 52 to cause its rotation to proceed one tooth at a time, the upper end of detent 52 engaging the teeth of ratchet 54 formed on feed wheel 46.

Ratchet 54 is driven by a solenoid 56 mounted on a bracket 55 secured to vertical wall 14. The plunger 58 of solenoid 56 engages a horizontal arm 60 pivoted on vertical wall 14. This horizontal arm engages the lower end of adjusting screw 62 mounted on a second arm 64 pivoted about the same axis as horizontal arm 60 for motion independent of the latter. Thus, as horizontal arm 60 is lifted by operation of solenoid 56 its motion is transmitted through adjusting screw 62 to operating arm 64 which is engaged by the lower end of a pawl arm 66 journaled on shaft 48. A pawl 68 is pivoted to pawl arm 66 in the usual manner at 70 and is connected thereto by a spring 72, the upper end of the pawl being formed to engage the teeth of ratchet 54. A coil spring 74 connected betwen the lower end of pawl arm 66 and bracket 55 of solenoid 56 tends to urge the horizontal arms 60 and 64 downwardly holding the solenoid in the unoperated position shown in Fig. 1.

When solenoid 56 is actuated, horizontal arm 60 is driven upwardly and this motion is transmitted by arm 64 to pawl driving arm 66 which operates pawl 68 in the usual manner to index ratchet 48 one tooth. The extent of motion of ratchet 54 may be adjusted by changing the position of adjusting screw 62 to alter the separation between horizontal driving arms 60 and operating arm 64.

The electrical and mechanical arrangements for controlling the operation of the identification tape indexing mechanisms will now be described with reference to Figs. 1 and 5. When it is desired to feed an identification tape into position on the splicing table, switch **76** is closed momentarily to complete a circuit from the positive terminal of battery **78** (Fig. 5) through series resistor **80**, the winding of solenoid **56**, normally closed contacts of switch **82** and the closed contacts of switch **76** to the negative terminal of battery **78**. Upon completion of this circuit the plunger of solenoid **56** is urged upwardly and feed wheel **46** is rotated one tooth, moving the identification tape ahead one character. At the same time a cam **86** journaled on shaft **48** and secured to feed wheel **46** is rotated from its unoperated position shown in Fig. 1 by a sufficient amount to lift a cam follower **88** out of a notch **90** in the cam surface. The resultant motion of the cam follower closes the contacts of switch **92** and thus maintains the circuit originally completed by momentary closure of switch **76**.

Horizontal arm **60** has, as shown in Figs. 1 and 5, an arcuate portion extending substantially vertically from its outer end. A projection **94** on a cross-head **96** which is slidably mounted for vertical movement between guides **98** secured to bracket **55**, extends through a hole in the arcuate portion of arm **60**. As shown in the drawings this hole is made larger than the vertical dimension of the projection on the cross-head so that there is lost motion between horizontal arm **60** and cross-head **96**. Thus as vertical arm **60** is forced upwardly upon the initial operation of solenoid **56** it travels for a substantial part of its total motion before the lower edge **100** of the hole in the arcuate portion of the horizontal arm engages the lower side of projection **94** on cross-head **96**. As solenoid **56** drives arm **60** to the upper limit of its travel, cross-head **96** is urged upwardly and cam projection **102** thereon engages the cam follower **104** secured to the movable contact of switch **82**. Thus, depending upon the relative dimensions of the hole in horizontal arm **60** and projection **94** on the cross-head, the circuit including the solenoid winding and battery **78** is opened at the time the solenoid has substantially reached the upper limit of its vertical travel. A capacitor **107**, Fig. 5, is connected across the contacts of switch **82** to reduce sparking at the contacts. When the circuit to the winding of solenoid **56** is opened, spring **74** begins to return the parts of the tape indexing apparatus to the original positions shown in Fig. 1.

As horizontal arm **60** begins its downward movement there is sufficient clearance between the upper edge **109** of the hole in the arcuate portion thereof and the upper side of projection **94** of the cross-head to permit the solenoid to return most of the way to its original position before the cross-head is engaged downwardly by the arcuate extension of the horizontal arm. As the cross-head moves downwardly to the position shown in Fig. 1, cam surface **102** leaves the surface of cam follower **104** and permits the spring contacts of switch **82** again to close.

This second closure of contacts **82** again applies the battery potential to the winding of solenoid **56** and initiates a second cycle of indexing operation of the identification tape feed mechanism. The mechanism continues to operate, recycling in the manner described above, to index the identification tape one character at a time under

control of cam **86**. The time this cam maintains contacts **92** closed is determined by the length of the identification tape to be positioned over the splicing table. In the exemplary embodiment described herein the size of the tape feed wheel **46**, cam **86**, and the relative rates of advance are such that the desired length of identification tape is positioned over the splicing table during one revolution of cam **86**. At the completion of one revolution of the cam, cam follower **88** drops into notch **90** in the cam opening contacts of switch **92** and removing battery **78** from the circuit including the winding of solenoid **56**. At the conclusion of this operation the roll of identification tapes has been fed out a sufficient amount to position one individual identification tape on the splicing table.

Message tape positioning means

As stated above, means are provided for positioning the leading or head end of the succeeding message tape and the trailing end of the preceding message tape in relation to splicing table **10**. Means indicated generally at **30** in Fig. 1 for locating the head end of a message tape over the right-hand end of splicing table **10**, comprise a guideway **108**, Figs. 1 and 2 through which extends a sprocket **110** arranged to engage the feed perforations of the tape. Sprocket **110** is journaled on a shaft **112** together with a detent wheel **114**, shaft **112** being mounted in an extension of the frame of the machine. A detent comprising bell crank **116** rotatably mounted on shaft **118** parallel to shaft **112**, is urged toward the detent wheel by a coil spring **120** which extends between one arm of the bell crank **116** and a block **122** on frame **16**. The orientation of the detent wheel on shaft **112** in relation to sprocket **110** is so adjusted that the perforations representing code characters in the message tape will fall in alignment with the individual pins of splicing pin array **20**.

In the operation of the machine, the head end of a message tape, which is to be joined to one end of an identification tape, is positioned in guideway **108** and adjusted until the teeth of sprocket **110** pass through the feed holes of the tape. The tape is then pushed forward (to the left) manually until the head end thereof is positioned just to the left (in Fig. 1) of the left-hand groove **124** in splicing table cover **126**.

The trailing end of the other message tape is positioned for splicing by a trailing end tape carriage indicated at **32** in Figs. 1 and 2. This carriage comprises a substantially horizontal tape guide plate **128** and a pair of vertical side plates **130** and **132**, Fig. 2. V-shaped grooves are formed in the bottom surfaces of these plates and extend along the entire length thereof. These grooves engage and position the carriage for sliding movement along a pair of V-shaped ways **134** (Fig. 1) secured to the frame of the machine.

For the purposes of certain control systems the rear or left-hand end of trailing end carriage **32** is urged away from the V-shaped ways by means of a pair of plungers, one of which is shown at **136** in Fig. 1. These plungers, which are located in substantially vertical holes in the side plates are urged downward by coil springs **138** which act against screws **140** threaded into the upper ends of the holes in the side plates. Vertical movement of the trailing end carriage is limited, however, by means of guide bars **142** secured to the side plates of the carriage and notched to engage guides **144** secured to frame **16** and extending parallel to the ways on which the carriage travels.

The notches in bars 142 are made somewhat wider than guides 144 to provide a limited substantially vertical movement of the trailing end carriage. Thus it will be understood that the trailing end carriage, in addition to being capable of movement along the ways, may be tipped or rotated slightly by depressing the rear or left-hand end of the carriage. This tipping or rotating motion actuates control mechanisms which will be considered hereinafter.

As has been mentioned above, the upper surface of the trailing end carriage comprises a guide plate 128 having a channel of sufficient width to accommodate a message tape formed therein. A sprocket is mounted on a horizontal shaft 148 journaled in bearings secured to the under surface of the guide plate. This shaft is so positioned that the teeth on the upper side of the sprocket extend through an opening in the guide plate channel to engage the feed perforations of the tape. A detent comprising bell crank 150 and a coil spring 152 is mounted on a bracket 154 secured to the lower surface of the guide plate, the bell crank being properly positioned to engage a detent wheel or ratchet 156 secured to shaft 148. This detent and the sprocket wheel are so positioned that the trailing end of the message tape when engaged by the sprocket may be positioned in alinement with the right-hand end of the carriage. As shown in Fig. 2 five slots are cut in the right-hand end of the carriage in lateral positions corresponding to those of the five code perforation positions of the tapes. A spring clip 158 (Fig. 2) holds the tape in position over these five slots and in alinement with the end of the carriage.

In operation the trailing end of the message tape is located in the tape channel so that the feed perforations of the tape are engaged by the teeth of sprocket 146. The tape is then moved or pushed to the right until the end thereof is in alinement with the right-hand end of the carriage and the tape is pushed under spring clip 158. The carriage is then moved as far as possible to the right along ways 134 its motion being limited by engagement of the right-hand end of the carriage with the left-hand end of splicing table 10. When the carriage is in this position as shown in Fig. 4, the trailing end of the preceding message tape is located immediately above the pins of splicing pin array 18 under the leading edge of the identification tape and under the left-hand end of splicing table lid or cover 126.

Splicing instrumentalities

After the two message tapes and the identification tape have been positioned in relation to the splicing table by the means described above, they occupy the positions shown in the diagram of Fig. 4. The head end of one message tape 160 extends above splicing pin array 20 and under the right-hand end of lid 126 while the identification tape 162 extends beneath the left-hand end of lid 126.

Each of splicing pin arrays 18 and 20 are arranged for vertical movement by double solenoids. In the case of splicing pin array 18, the solenoids 24 are mounted on a bracket 166 secured to vertical wall 12. The two solenoid plungers 168 are secured to a cross-head 170 from the center of which extends a single rod 172. A splicing pin block 174, which supports splicing pin array 18 is secured to the top of rod 172 and is guided for vertical movement by a pair of guides one of which is shown at 173 in Fig. 1. When solenoids 24 are actuated the assembly including cross-head 170, rod 172, block 174 and the splicing pin array will be forced upwardly and the splicing pins will move through the openings 176 in the left-hand end of the splicing table until the cross-head 170 on the lower end of solenoid plungers 168 strikes the lower surface of the solenoid core or engages any other suitable stop.

As shown in Fig. 2, splicing pin array 18 in the embodiment described herein comprises 15 individual pins arranged in three transverse rows of five pins each. Each of the three transverse rows corresponds to one character space of the teletypewriter or telegraph tape, the pins in each row being suitably positioned transversely to engage the perforations of a "Letters" character punch in such a tape. Thus two pins are positioned on one side of the feed holes of the tape while three pins are positioned on the other side.

When solenoids 24 are deenergized, the splicing pins are returned to their initial position as shown in Fig. 1 by means of a coil spring 184 connected between splicing pin block 174 and bracket 166, downward movement of the array and of the yoke being limited by the upper surface of solenoid cores or other suitable stops.

The mechanism for actuating splicing pin array 20 is similar in many respects to that just described. However, modifications are required to permit actuation of means for cutting the identification tape to be spliced between messages from the roll of identification tape contained in magazine 28. Referring to Fig. 3, splicing pin array 20 is driven by means of a pair of solenoids 26 mounted on bracket 186 (Fig. 1) secured to vertical wall 14. The plungers 188 of solenoids 26 are secured to a cross-head 190 from which extends a rod 192. A splicing pin block 194 is mounted on the upper end of rod 192 and is arranged for vertical movement on guides 196 and 198 secured to the frame of the machine and extending through holes in the splicing block. The individual splicing pins 200 of array 20 are arranged on the top surface of splicing block 194 in three rows of five each, the positions of the individual pins in the transverse rows being (as in the case of the pins of splicing pin array 18) such that the pins will engage and pass through the perforations of telegraph message tapes positioned over splicing table 10.

The identification tape or tab to be spliced between two messages is cut from the roll of identification tapes during the operation in which the head end of the right-hand message is spliced to the tab. The cutting operation is performed by a knife 202 pivoted at 204 to the splicing table for rotation about a horizontal axis extending transversely of the tape as positioned on the splicing table. As shown in Fig. 2 slots are formed in the right-hand end of the knife to permit passage therethrough of splicing pins 200 and the knife is arranged to cooperate with cutting block 208 secured to the top of wall 14.

Knife 202 is actuated by solenoids 26 through a plunger 210 (Fig. 3) extending through the upper portion of splicing block 194 and engaging the lower surface of knife 202. This plunger which is mounted for sliding motion relatively to the splicing block is engaged at its lower end by a spring leaf 212 secured to the under surface of splicing block 194 and extending transversely of the splicing pin array. This spring tends to urge plunger 210 and thus knife 202 upwardly at all times. Knife 202 is urged downwardly to-

ward the splicing pin block and against the action of leaf spring 212 by a coil spring 214 (Fig. 1) connected between the knife and the splicing block. The last-mentioned spring normally maintains the cutting mechanism in the position shown in Fig. 3. Thus leaf spring 212 normally occupies a position intermediate the splicing pin block and yoke 218 secured to the lower surface thereof.

Operation of the cutting mechanism during the making of a splice will now be considered with reference to the diagrams of Figs. 6 through 10 which show successive positions occupied by the cutting and splicing instrumentalities during the making of a splice. Fig. 6 indicates the initial positions occupied by these instrumentalities and by message tape 160 and identification tape 162 before the splicing operation is initiated. The splicing pin array, splicing block 194 and plunger 210 are at the lower limit of their travel and knife 202 is pulled down by spring 214 so that it does not engage the lower surface of identification tape 162.

When solenoids 26 are actuated and the splicing block begins its upward travel, pins 200 move upwardly through the perforations in identification tape 162 to the position shown in Fig. 7 the pins lifting the chads of the tape. At the same time knife 202 which travels with splicing block 194 for the initial part of the operation is raised to the position shown in Fig. 7 in which position it is parallel to the path of identification tape 162 from the end of tape chute 59 to the right-hand end of splicing table 10. Splicing pins 200 extend through the perforations in identification tape 162 and prevent the tape from moving in relation to splicing table 10.

Upon further upward movement of splicing block 194, plunger 210 driven through spring 212 moves knife 202 upwardly. The right-hand end of knife 202 cooperates with cutting block 208 and shears an identification tape from the roll of identification tape 162.

As further upward travel of splicing block 194 occurs knife 202 is moved upward and forms a table or platform beneath the alined portion of identification tab 216 and message tape 160 as shown in Fig. 9.

Finally splicing block 194 is driven to the position shown in Fig. 10 which represents the upper limit of its travel as defined by cross-head 190 on the lower end of solenoid plungers 188. Because of the presence of splicing table lid 126, knife 202 cannot move beyond the position shown in Fig. 9 and splicing pins 202 are driven upwardly through the perforations of the superimposed tapes by this final movement of splicing block 194. Leaf spring 212 is deformed during this final motion of splicing block to permit relative motion of cutter 202 and splicing pins 200, such relative motion being limited by yoke 218 (Fig. 3) secured to the lower surface of splicing block 194. Upon deenergization of solenoids 26 the splicing pins, block and knife are returned to their original positions as shown in Figs. 1 and 6 by the action of a spring 220 (Fig. 1) acting through a bell crank 222 which is pivoted at 224 to vertical wall 12, the spring 220 being connected between the upper arm of bell crank 224 and a bracket 227 secured to wall 12. The end of the lower arm of bell crank 222 engages cross-head 190 on the bottom of solenoid plunger 188.

Control system

The control system for the splicing instrumentalities is shown in Fig. 1 and in schematic form

in Fig. 4. In the operation of the machine the first splice is made between the trailing end of a message tape and the left-hand end of the identification tab through the operation of solenoids 24. For this purpose, and after tape carriage 32 has been moved to the right into operating position against the left-hand end of splicing table 10, the left-hand end of tape carriage 32 is depressed against the action of spring plungers 136. Depression of this end of splicing table 32 forces an actuator bar 225, pivotally secured to guide bar 142, downwardly to close the contacts of a normally open switch 226. Actuator 225 is held in the position shown in Figs. 1 and 3, by the action of a weight 228 secured to its lower end, clockwise rotation of the actuator about its pivotal mounting being limited by a pin 230 mounted on guide bar 142.

The closure of normally open switch 226 completes a circuit from ground through the windings of solenoids 24, to the positive terminal of a battery 232, the negative terminal of which is connected to ground. As the solenoid plunger drives splicing pin array 18 through the overlapping portions of identification tape 216 and message tape 164, the splicing pins interlock the chads of the two tapes joining them together.

As solenoid plunger 172 approaches the upper limit of its travel a projecting trip lever 236 secured to the lower end thereof engages the actuator of a second normally open switch 238 and closes the contacts thereof. This action completes a circuit from ground through the normally closed contacts of selector switch 240 through the windings of solenoids 26 to the positive terminal of a battery 242 the negative terminal of this battery being grounded. Closure of this circuit energizes solenoid 26 which drives cutting block 194 upward to actuate the splicing and cutting instrumentalities which have been described above with the ultimate result that the chads of the overlying portions of identification tab 216 and message tape 160 are interlocked at 244 (Fig. 12) to splice these two tapes together.

As the plungers of solenoids 26 move to the upper limit of their travel, bell crank 222 is rotated to a sufficient extent to cause the upper end thereof to engage actuator 225 and rotate it counterclockwise about its pivotal mounting on guide bar 142. This permits switch 226 to open, deenergizing solenoids 24 and permitting the plungers thereof to return to their normal position under the action of spring 184.

Such return to initial position of the plungers of solenoid 24 permits switch 238 to open, deenergizing solenoids 26 which are returned to their initial position by spring 220 acting through bell crank 222. The spliced tapes may then be removed from the machine by pulling them through to the left. It should be noted that the tapes may not be removed from the machine by pulling them to the right since the chads thereof would strike the end surface of lid 126 and cause destruction of the tape.

Should it be desired to employ the machine to join two message tapes or to splice an identification tape to the trailing end of a message tape without cutting the identification tape, selector switch 240 is operated opening the control circuit for solenoids 26. Then upon closure of switch 226 the single splice will be made and tape carriage 32 may be withdrawn to the left to return the equipment to its normal position.

In summarizing the operation of the machine for cutting an identification tape from a roll of

identification tapes and splicing it between the trailing end of one message and the head end of another, reference is made to Figs. 2 and 4. The head end of a message tape 160 is located on the teeth of sprocket 110 and moved to the left to the position shown in Fig. 4. A trailing end of another message tape is located on the teeth of sprocket 146 of tape carriage 32 and driven forward until it is in alinement with the end of carriage 32 as shown in Fig. 4.

The identification tape feeding switch 76 is depressed causing identification tape 162 to be fed from the magazine to the position shown in Fig. 4. The left-hand end of tape carriage 32 is depressed causing switch 226 to actuate splicing pins 18 which join the trailing end of message tape 164 and the leading left-hand end of identification tape 162. This operation causes switch 238 to actuate solenoids 26 to operate splicing pin array 200 and knife 202 to separate identification tape 216 from the identification tape roll 160 and to splice the head end of message tape 160 to the trailing or right-hand end of the identification tab. Operation of solenoids 26 opens switch 226 which returns splicing pins 18 to the initial position and thus in turn opens switch 238 returning splicing pins 20 and cutter 202 to their initial position.

What is claimed is:

1. In a machine for splicing two message tapes having partial cut-outs punched therein, each of the cut-outs in said tapes forming a movable lid, a splicing table, means for locating the trailing end of one of said message tapes over one end of said splicing table, means for locating the head end of the other of said message tapes over the opposite end of said splicing table, means for locating a splicing tape on said splicing table with some of the cut-outs therein in alinement with the ends of the two previously positioned message tapes, and means at each end of said splicing table for forcing the lids of the cut-outs of the underlying one of the superposed tapes through the cut-outs in alinement therewith in the overlying tapes.

2. In a machine for splicing an identification tape having partial cut-outs punched therein between two message tapes having partial cut-outs punched therein, each of the cut-outs in said tapes forming a movable lid, a splicing table, means for locating the trailing end of one of said message tapes over one end of said splicing table, means for locating the head end of the other of said message tapes over the opposite end of said splicing table, means for locating an identification tape on said splicing table with some of the cut-outs therein in alinement with the ends of the two previously positioned message tapes, splicing pin arrays at each end of said splicing table underlying the superposed identification and message tapes, and means for driving said splicing pin arrays upwardly to force the splicing pins thereof through the superposed message and identification tapes wherever the cut-outs in the superposed tapes are in alinement.

3. In a machine for splicing an identification tape having patterns of partial cut-outs each forming a movable lid punched in the opposite ends thereof between two message tapes, each having the same pattern of partial cut-outs punched at the ends thereof to be joined, a splicing table, means for locating the ends of said message tapes over the opposite ends of said splicing table, means for locating said identification tape on said splicing table with the patterns

of cut-outs therein respectively in alinement with the patterns of cut-outs in the ends of said message tapes, splicing pin arrays having the pins thereof arranged in the same pattern located at each end of said splicing table to underlie the superposed patterns of cut-outs in said message and identification tapes, and means for lifting said splicing pin arrays to force the pins thereof through the superposed cut-outs of said message and identification tapes.

4. In a machine for splicing an identification tape having partial cut-outs punched therein between two message tapes, each having partial cut-outs punched therein, a splicing table, means for locating the ends of said message tapes between which said identification tape is to be spliced over the opposite ends of said splicing table, means for feeding said identification tape on to said splicing table with some of the cut-outs therein in alinement therewith with some of the cut-outs in said message tapes, and means for lifting the lids of the cut-outs in the underlying tape of said alined tapes through the cut-outs of the overlying tapes.

5. In a machine for splicing an identification tape having partial cut-outs punched therein between two message tapes having partial cut-outs punched therein, each of the cut-outs in said tapes forming a movable lid, a splicing table, means for locating the head and trailing ends respectively of the message tapes to be spliced in respect to the ends of said splicing table, a supply of identification tapes, means for removing one identification tape from said supply and positioning it on said splicing table with some of the cut-outs therein in alinement with those in said message tapes, and means for forcing the lids of the cut-outs of the lower of the alined tapes at each end of the splicing table through the cut-outs of the upper of said tapes.

6. In a machine for splicing an identification tape having partial cut-outs punched therein between two message tapes having partial cut-outs punched therein, each of the cut-outs in said tapes forming a movable lid, a splicing table, means for locating the head and trailing ends respectively of the message tapes to be spliced in respect to the ends of said splicing table, a roll of identification tapes, means for feeding identification tapes from this roll on to said splicing table and positioning said identification tapes in alinement with the ends of said message tapes, a knife for severing a single identification tape from said roll after it has been positioned on said splicing table, and means for interlocking the lids of the alined cut-outs in said message and identification tapes to splice said tapes together.

7. In a machine for splicing a number tape having partial cut-outs punched therein between two message tapes also having partial cut-outs punched therein, each of said cut-outs forming a movable lid, a splicing table, means for locating the head and trailing ends respectively of message tapes to be spliced in respect to the ends of said splicing table, a supply of number tapes, means for feeding said number tapes on to the splicing table until the opposite ends of a single number tape are in alinement with the cut-outs in the ends of said message tapes, splicing means at each end of said splicing table for interlocking the lids of the partial cut-outs of the alined message and number tapes, one of said splicing means including a knife effective to sever the identification tape positioned on the splicing table

from the supply of tapes at the time at which the splice is made.

8. In a machine for splicing an identification tape having parial cut-outs punched therein between two message tapes also having partial cut-outs punched therein, each of said cut-outs forming a movable lid, a splicing table, means for locating the head and trailing ends respectively of message tapes to be spliced in respect to the ends of said splicing table, means for locking an identification tape with the partial cut-outs in the opposite ends thereof in alinement respectively with the cut-outs in the ends of said message tapes as positioned in relation to said splicing table, splicing means located at each end of said splicing table and arranged to interlock the lids of the alined cut-outs in said message and identification tapes, means for actuating one of said splicing means, and means operated upon the completion of operation of said splicing means to actuate the other of said splicing means.

9. In a machine for splicing an identification tape having partial cut-outs punched therein between two message tapes having partial cut-outs punched therein, each of the partial cut-outs in said tapes forming a movable lid, a splicing table, splicing pin arrays at each end of said splicing table, means for locating the head end of one of said message tapes with the cut-outs therein in alinement with the pins of the splicing pin array at one end of said splicing table, means for feeding an identification tape on to said splicing table with the cut-outs therein in alinement with said splicing pin array and underlying the cut-outs of the head end of said message tape, means for locating the trailing ends of the second message tape above said splicing table with the cut-outs therein in alinement with the other splicing pin array, means actuated upon the completion of operation of said last-mentioned positioning means to operate the second splicing pin array to join said identification tape to the trailing end of said message, and means effective upon operation of said second splicing pin array to actuate the other splicing pin array to join the head end of said first message tape to the other end of said identification tape.

10. In a machine for splicing an identification tape having partial cut-outs punched therein between two message tapes having partial cut-outs punched therein, each of the partial cut-outs in said tapes forming a movable lid, a splicing table, first and second arrays of splicing pins mounted for vertical motion relatively to said splicing table at the opposite ends thereof, means for positioning the head end of a first message tape with the partial cut-outs therein in alinement with said first splicing pin array, means for feeding an identification tape on to said splicing table with the cut-outs therein in alinement respectively with said first and second pin arrays, means for positioning the trailing end of a second message tape above said second splicing pin array with the cut-outs therein in alinement with the pins of said array, means for driving the pins of said second pin array through the alined cut-outs of the superposed identification tape and trailing end of said second message tape, means for driving the pins of said first splicing pin array through the cut-outs in the other end of said identification tape to hold it in position, means for cutting the identification tape so held from the supply of identification tapes, and means for thereafter driving the pins of the first splicing pin array through the cut-outs in the head end of said first message tape.

11. In a machine for splicing a section of an identification tape having identification characters punched therein between two message tapes each having characters punched therein, a splicing table, means for locating the head end of one of said message tapes over one end of said table, means for feeding a section of said identification tape on to said table beneath the leading end of said one message tape and positioning said identification tape with some of the perforations therein in alinement with those in said one message tape, means for positioning the trailing end of the second message tape over the other end of said splicing table and with the perforations therein in alinement with some of those in said identification tape on said table splicing pin arrays at each end of said table, and means for lifting the pins of said arrays through the superposed portions of said identification and message tapes, said pin lifting means being actuated upon operation of said trailing end positioning means.

12. In a machine for splicing punched tapes having partial cut-outs punched therein in which each of the cut-outs in said tapes forms a movable lid, a splicing table, means for locating the head and trailing ends respectively of the tapes to be spliced with respect to the ends of said splicing table, a supply of splicing tape also having partial cut-outs punched therein, means for removing a section of said splicing tape from said supply and positioning it on said splicing table with some cut-outs therein in alinement with those in said message tapes, and means for forcing the lids of the cut-out of the lower of the alined tapes at each end of said splicing table through the cut-outs of the upper of said tapes.

13. In a tape splicing device for splicing punched tapes, a splicing table, apparatus for automatically locating a section of punched tape to be spliced on said table, other apparatus for holding another section of tape on said table with a plurality of said punches in said two tapes in alinement one with the other, and means for interlocking said alined punches.

14. In combination, a punched tape splicing table, means for holding a punched tape in fixed relationship with said table, a supply punched tape, means to feed said tape from said supply, apparatus for interlocking punches in said two tapes to effectively splice them together, and means operative incident to the operation of said apparatus for interlocking punches in said tapes for severing said spliced tape from said supply from the portion spliced to said tape held in fixed relationship to said table.

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The following references are of record in the file of this patent:

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