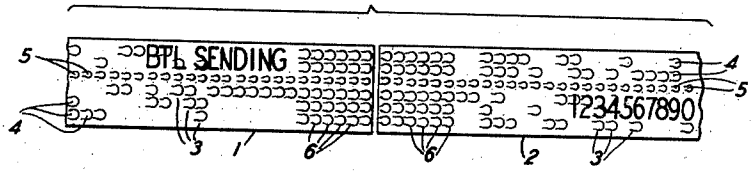
June 24, 1941. W. M. BACON 2,246,655

TAPE SPLICER

Filed Feb. 20, 1940

FIG. 1



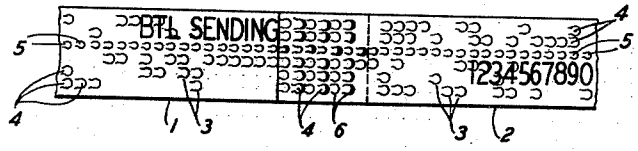


FIG. 2

FIG. 3

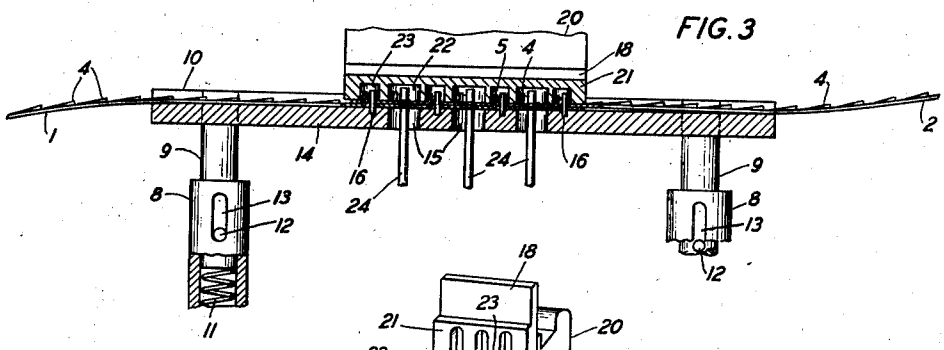


FIG. 4

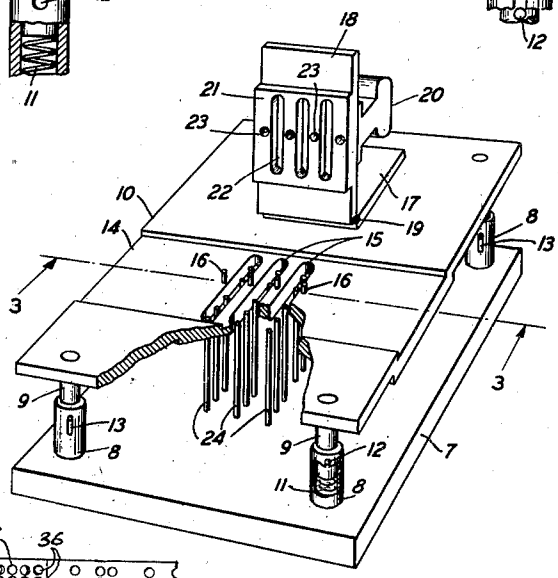
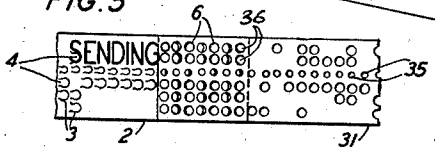


FIG. 5



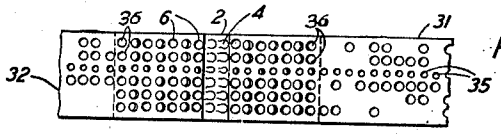


FIG. 6

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TAPE SPLICER

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10 Claims. (Cl. 93—1.1)

This invention relates to a splicer for splicing tape and, more particularly, for splicing sections of transmitting tape at least one section of which has signals stored therein in the form of chadless permutation code combinations.

In communication systems, such as telegraph systems, having several intercommunicating central offices with outlying subsidiary, or subscriber, stations connected to each central office, messages are transmitted from one central office to another central office where, in some types of systems, the messages are stored in a tape in the form of permutation code signals for subsequent retransmission by a tape transmitter located at the receiving central office to outlying stations connected locally thereto. In a busy system where the pressure of a large number of messages prevents extensive classifying and grouping of the individual messages at the transmitting central office before transmission, it is common for the receiving central office to receive a large number of messages having a variety of ultimate destinations, the sequence of the messages being irrespective of their destinations. For example, one message in the tape might be intended for ultimate retransmission to outlying station C on local communication channel B, the next message might have station D on channel C for its ultimate destination, and the next might be intended for station D on channel B. Therefore, when an operator at the receiving central office retransmits the stored messages, it is necessary to employ some means for routing each message into the proper channel and also for conditioning the equipment at connected stations so that each message will be recorded at only the proper station or stations.

As messages having the same destination are often interspersed among other messages in the tape having other destinations, it is not desirable to retransmit the messages by sending them out one by one in the order in which they were received. A more efficient method is to classify the messages by cutting the transmitting tape at points between messages assigned to different channels and then putting into one group all messages for transmission over one channel and forming another group of messages for transmission over another channel. Each group can also be subdivided into a plurality of subsidiary groups of messages, each subsidiary group being composed of messages assigned to the same station on a particular channel. The classified messages can then be retransmitted either by one tape transmitter or by a group of tape transmitters in which each tape transmitter in the group would be assigned to transmit over only an assigned channel. The advantage derived from this procedure is that it effects a considerable saving in line time that would otherwise be consumed in selecting a channel and a station in that channel every time a message was retransmitted.

After the pieces of transmitting tape have been cut into message lengths and properly classified, it is not desirable to feed them one by one through a tape transmitter. Instead, the efficiency of the system is increased by splicing the individual messages in each group end to end to form long strips of tape in order to assist in feeding the messages rapidly through a high-speed tape transmitter. Various splicing means, such as adhesives, have been tried but, in general, they have not been found to be entirely satisfactory.

Accordingly, it is an object of this invention to provide an improved method of splicing tape.

It is also an object of the invention to provide a device for splicing tape.

These and other objects of the invention are accomplished in a manner which will now be described in detail with reference to the drawing in which:

Fig. 1 represents two portions of message transmitting tape having signals stored therein in the form of chadless permutation code combinations;

Fig. 2 shows the same two portions of transmitting tape after their adjoining ends have been spliced;

Fig. 3 is a sectional view taken along the line 3—3 in Fig. 4 and illustrates the method of splicing the tape;

Fig. 4 is a three-dimensional view of the tape splicer;

Fig. 5 shows a strip or perforated transmitting tape spliced to a section of chadless tape; and

Fig. 6 shows two strips of perforated transmitting tapes joined by a short section of chadless tape spliced thereto.

Most of the message transmitting tape in general use has permutation code combinations stored therein in the form of round perforations. These perforations are formed by feeding blank tape through a perforator which punches small round holes in the tape to represent the permutation code signals. In making these perforations, the perforator cuts small round pieces of paper, known in the art as chads, out of the tape. These chads are objectionable as they accumulate in the perforator and must be removed

periodically. For this reason and also for other reasons, it is desirable to store signals in tape without forming chads.

Chadless tape is prepared by feeding blank tape through a device which will not punch a complete circle in the tape but, instead, will only cut approximately three-quarters of the circumference of a circle for each element of the permutation code thereby leaving a movable, or hinged, lid of paper in the tape. Since no chads are formed by this method, this type of transmitting tape is known in the art as chadless tape and the signals formed in this type of tape are known as chadless permutation code signals.

One of the advantages of using chadless tape is that in certain types of service, it is desirable to record a message twice on a tape by cutting the permutation code signal combinations into the tape and also by printing the characters on the tape. This enables each permutation code combination cut in the tape to be quickly and easily identified by the character which it represents. It also enables an operator to quickly identify a message and the station to which it is to be transmitted. Heretofore, a wider tape than ordinary perforated tape has been used in order to provide space for the characters to be printed along its margins. Use of this wider tape requires the changing of various apparatus, such as tape feeding channels and tape chutes. However, by using chadless tape, the characters can be printed directly over the permutation code combinations in the tape so that transmitting tape of standard width can be used.

For purposes of illustration, the invention will be described with reference to its use with this type of chadless tape. Two adjacent portions 1 and 2 of this chadless tape are shown in Fig. 1. As can be seen in Fig. 1, tapes 1 and 2 have permutation code signals 3, 3 stored therein in the form of partial perforations, or cut-outs, each of which forms a movable, or hinged lid 4. In accordance with the well-known Baudot code, each signal is composed of various combinations of one to five of these partial perforations. Instead of the usual row of small feed holes in the tape for enabling it to be fed through a perforator or tape transmitter by means of a small sprocket wheel, the chadless tape is provided with a row of small partial perforations each of which forms a small hinged lid 5. As can be seen in the drawing, the characters are printed directly upon, or over, the chadless signals in the tape, there being a lag of six spaces between each character printed on the tape and its particular chadless permutation code combination formed in the tape. This lag of six spaces is inherent in the preferred type of machine but other types of machines having lesser or greater lags may be employed.

The left portion of tape 1 and the right portion of tape 2 contain the permutation code combinations for various signals comprising the messages. In accordance with the preferred routine when this invention is to be used, each of the adjacent ends of tapes 1 and 2 has a succession of six identical code combinations 6, 6 formed therein which, in the preferred code employed, are known as "letters" signals. However, the particular name of the code combination 6 is immaterial as the important factor is that each signal 6 is composed of a complete row of five of the partial perforations.

The method of splicing this transmitting tape in accordance with the invention comprises first superimposing one end of one piece of tape, such as one end of tape 2, over one end of another piece of tape, such as an end of tape 1, as is illustrated in Fig. 3. The method further comprises aligning the "letters" signals 6, 6 stored in the end of tape 1 with the "letters" signals 6, 6 stored in the superimposed end of tape 2 and then pushing the hinged lids 4, 4 of the "letters" signals 6, 6 in the end of tape 1 through the partially cut-out "letters" signals 6, 6 in the super-imposed end of tape 2. The lids 4, 4 of tape 1 catch the upper surface of tape 2 thereby holding the ends of tapes 1 and 2 together.

This splice is sufficiently strong to enable the two tapes 1 and 2 to be handled and fed through a tape transmitter as one unit. Since this splice detachably joins the ends of tapes 1 and 2, the spliced tapes 1 and 2 can subsequently be separated, if desired, by pushing the lids 4 of tape 1 back through the partially cut-out signals 6, 6 in tape 2.

This method of splicing tapes 1 and 2 can be performed by hand solely by using the fingers to push the lids 4, 4 through the signals 6, 6. If desired, a pin or the point of a pencil may be employed to push the lids 4, 4 through the signals 6, 6. However, if a considerable number of splices are to be made, it would be advisable to employ some device for performing splices more quickly than can be done by hand.

Such a device is illustrated in Fig. 4 and comprises a rectangular base plate 7 having four hollow cylinders 8, 8 mounted near each of its corners. Each cylinder 8 is adapted to slidably receive a smaller cylindrical guide post 9, there being one such post 9 attached near each corner of a top plate 10. Inside each hollow cylinder 8 is a coil spring 11 for supporting the guide posts 9. Each post 9 has a stud 12 projecting through a slot 13 in each cylinder 8 to limit the extent of the up and down movement of the top plate 10. Springs 11, 11 are of sufficient strength to push the top plate 10 up to the limit of its upward travel and, accordingly, normally maintain the top plate 10 in the position shown in Fig. 4.

As can be seen in Fig. 4, the upper surface of the top plate 10 is provided with a transverse depressed portion, or groove, 14 which is adapted to receive the tapes 1 and 2 as it is the same width as the tapes 1 and 2. This groove 14 contains three transverse slots 15, 15 equidistantly spaced apart in such a manner that they are parallel with alternate rows of the "letters" code signals 6, 6 when either of the tapes 1 or 2 is placed in the groove 14. Four small pins 16, 16 are equidistantly spaced apart and are longitudinally mounted in groove 14 in such a manner that there is a pin 16 on each side of each slot 15. The pins 16, 16 are also so located that, when the tape is placed in the groove 14, the pins 16, 16 will fit into alternate feeding elements, the small partial perforations that are normally covered by the lids 5, 5.

Attached to the upper surface of the top plate 10 is a plate 17. A gate 18 is connected to plate 17 by hinge 19 and is equipped with a handle 20 for moving the gate 18 up and down about the hinge 19. It can be seen in Fig. 4 that the face of the gate 18 is provided with a raised portion 21 which is of approximately the same width and depth as the groove 14 so that, when the gate 18 is moved down my means of its handle 20, the raised portion 21 will fit into the groove 14. The raised portion 21 contains three slots 22, 22 and

four small holes 23, 23. The slots 22, 22 have the same size and shape as the slots 15, 15 in groove 14 and are so located that, when the gate 18 is moved down into the groove 14, each slot 22 will be directly over a slot 15. The holes 23, 23 are so located and are of such size and depth as to enable each hole 23 to receive therein a pin 16 when the raised portion 21 of gate 18 is moved into the groove 14.

Fifteen pins 24, 24 are mounted on the base plate 7 in three equidistantly spaced rows, each row being located directly under a slot 15. Each row is composed of five code pins 24, 24 which are spaced apart by the same distances as the code units of the signals 6, 6 in the tape. The pins 24, 24 are all of uniform height and they normally extend approximately halfway through the slots 15, 15 as is shown in Fig. 4.

After the gate 18 is swung down into the groove 14, the pins 16, 16 entering into holes 23, 23, downward pressure on the handle 20 will be transmitted through gate 18 to the top plate 10. When this downward pressure exceeds the upward force exerted by springs 11, 11, the top plate 10 will be forced down until the pins 12, 12 strike the bottom limit of slots 13, 13 thereby preventing further downward travel of plate 10. Movement of plate 10 to its lower position causes the three rows of pins 24, 24 to pass through slots 15, 15 and enter into slots 22, 22. Release of the downward pressure on handle 20 allows the springs 11, 11 to push the top plate 10 back to its normal position.

The method employed in splicing the tape with the aid of the splicer shown in Fig. 4 comprises placing an end of the tape 1 in the groove 14 with the open ends of the lids 4, 4 pointing to the right. The tape 1 is aligned by placing the small partial perforation at the extreme right end of the tape 1 over the extreme right pin 16 which pushes up the lid 5. The remaining three pins 16, 16 enter into alternate feeding elements in tape 1 and push up the lids 5, 5 that normally cover the small partial perforations. An end of the tape 2 is then placed in the groove 14 with the open end of the lids 4, 4 pointing to the right and is superimposed over the end of the tape 1. The extreme left feed element in tape 2 is placed over the extreme left pin 16, the remaining three pins 16, 16 passing through alternate feed elements in tape 2 and pushing up their lids 5, 5. This serves to quickly and accurately align the "letters" signals 6, 6 in the ends of the two tapes 1 and 2 with three alternate pairs of signals 6, 6 located directly over the slots 15, 15.

The gate 18 is then swung down to a horizontal position into the groove 14 to hold the aligned tapes 1 and 2 securely in place, the tops of the pins 16, 16 entering into the holes 23, 23 which, as shown in Fig. 3, are large enough to also receive the lids 5, 5 of both tapes 1 and 2. The operator of the splicer then pushes down on the handle 20 sufficiently hard to overcome the upward force exerted by springs 11, 11 thereby pushing the top plate assembly down until the studs 12, 12 reach the bottoms of slots 13, 13 as shown in Fig. 3. This causes the code pins 24, 24 to pass through the slots 15, 15 and into the aligned signals 6, 6 in the tapes 1 and 2. In so doing, the pins 24, 24 push the lids 4, 4 of the signals 6, 6 in tape 1 through the signals 6, 6 in tape 2 to a superimposed position over tape 2. The pins 24, 24 also push up the lids 4, 4 of the signals 6, 6 in tape 2 and finally enter the slots 22, 22 as is shown in Fig. 3. As is also illustrated in Fig. 3, the slots 22, 22 are sufficiently wide to receive the pushed up lids 4, 4 of both tapes 1 and 2.

The operator of the splicer then releases the pressure on handle 20 to allow the springs 11, 11 to push the top plate 10 up to its normal position shown in Fig. 4, thereby automatically withdrawing the code pins 24, 24 from the signals 6, 6 in tapes 1 and 2. The operator now swings the gate 18 up to its vertical position shown in Fig. 4 and picks the tapes 1 and 2 up off the feed pins 16, 16. The lids 4, 4 of tape 1 that were pushed through the signals 6, 6 in tape 2 remain superimposed over tape 2 and the front ends of the lids 4, 4 in tape 1 will now engage the upper surface of tape 2. This engagement of the lids 4, 4 of tape 1 with the upper surface of tape 2 serves to hold the tapes 1 and 2 together and forms a splice that is sufficiently strong to enable the two tapes 1 and 2 to be fed through a tape transmitter as one unit.

Under certain conditions, the owner of a station previously equipped with a standard keyboard perforator for punching permutation code combinations of perforations in ordinary transmitting tape for the purpose of controlling the operation of a tape transmitter might purchase a reperforator of new design for forming chadless code signals for subsequent transmission by the aforesaid tape transmitter. For efficient operation of this station it might, on some occasions, be desirable to first employ the tape transmitter for transmitting a message perforated in ordinary transmitting tape and then to use the tape transmitter for transmitting a message stored in chadless tape. Circumstances might then require that additional permutation code perforations in the ordinary tape be next transmitted and then be followed by a message stored in the chadless tape. During the course of a day this would necessitate considerable interchanging of the two types of tapes being fed through the tape transmitter.

To simplify this interchanging of the two types of tape, the tapes can be spliced by means of the splicer shown in Figs. 3 and 4. To splice these two different kinds of tape so that they will be joined in the manner shown in Fig. 5, the end of one tape and the beginning of the other tape are provided with a succession of "letters" signals. An end of a strip of chadless tape 2 is placed in the groove 14 and is aligned by the aligning pins 16, 16 as described above. An end of a strip of perforated tape 31 is then superimposed over the end of the chadless tape 2 in the groove 14, the aligning pins 16, 16 passing through the feed holes 35, 35 in the perforated tape 31. The gate 18 is then swung down over the ends of the two tapes 2 and 31. Upon pressing the handle 20 down, the code pins 24, 24 will push the lids 4, 4 of the chadless "letters" signals stored in tape 2 through the perforations 36, 36 of the "letters" signals perforated in tape 31 to a superimposed position over the upper surface of tape 31. When the downward pressure on the handle 20 is released and the gate 18 is swung back to its vertical position, the two tapes 2 and 31 can be removed from the groove 14. The engagement of the lids 4, 4 of tape 2 with the upper surface of tape 31 forms a splice that is sufficiently strong to enable the two tapes 2 and 31 to be fed through a tape transmitter as one unit.

After one end of the strip of chadless tape 2 has been spliced to an end of a strip of perforated tape 31, the other end of the chadless tape 2 can be spliced to another strip of perforated tape in a similar manner.

If desired, two pieces of tape having messages perforated therein can be joined by splicing an end of each perforated tape to a short strip of chadless tape as shown in Fig. 6. In this type of splice the short strip of chadless tape acts merely as a binder, or joining means, and need not have any message characters stored therein but may be provided only with a succession of "letters" signals and the spaces for the feed pins. This joinder is accomplished by splicing one end of the short strip of chadless tape 2 to one end of a strip of perforated tape 31 in the manner described above. The other end of the chadless tape 2 is then spliced to an end of another strip of perforated tape 32 in a similar manner. This joinder is sufficiently strong to enable the three tapes to be fed through a tape transmitter as one unit.

Any of these splices can be separated, or disjoined, by pushing the projected lids 4, 4 of the chadless tape back through the spaces in the superimposed tape by any suitable means.

It is to be understood that the use of a plurality of "letters" signals 6, 6 for forming the splice is preferred because such signals 6, 6 permit a strong splice to be made since they each consist of a complete row of five partial perforations. The invention can be modified to perform splices with other code combinations by varying the number of code pins 24, 24. It is also to be understood that the invention is not limited to the Baudot five-unit code but, instead, can be readily modified for use with six-unit codes or other codes by simply changing the arrangement and number of the code pins 24, 24. The invention can also be modified to splice either more or less than three sets of signals 6, 6 by varying the number of slots and pins employed to make either stronger or weaker splices as desired. As other changes and modifications embodying the principles and features of operation of the invention can be made without exceeding the scope of the invention, the invention is to be limited only by the claims appended hereto.

What is claimed is:

1. The method of splicing two strips of message transmitting tapes both of which are provided with feeding elements, each of said tapes having signals stored therein, at least one of said tapes having its signals stored therein in the form of partial cut-outs, each of said partial cut-outs forming a movable lid in the tape, said method comprising superimposing one strip of tape over the other strip of tape, aligning a group of alternate feeding elements in the end of one strip of tape with a group of alternate feeding elements in the superimposed end of the other strip of tape, and pushing some of said movable lids of alternate signals in one tape through some of the alternate signals in the other tape.

2. The method of splicing two strips of message transmitting tapes both of which are provided with feeding elements, each of said tapes having signals stored therein in the form of partial cut-outs, each of said partial cut-outs forming a movable lid, said method comprising superimposing one end of one strip of tape over one end of another strip of tape, aligning a group of alternate feeding elements in the end of one strip of tape with a group of alternate feeding elements in the superimposed end of the other strip of tape, and pushing the movable lids of a group of alternate signals in the end of one tape through a group of alternate partial cut-outs in the end of the other tape.

3. The method of splicing two strips of dissimilar types of transmitting tapes, one type having signals stored therein in the form of small holes completely cut out of the tape and the other type having signals stored therein in the form of partial perforations having movable lids, both of said tapes being provided with feeding elements, said method comprising superimposing a portion of a strip of one type of tape over a portion of a strip of the other type of tape, aligning a group of alternate feeding elements in the end of one strip of tape with a group of alternate feeding elements in the superimposed end of the other strip of tape for aligning the signals, and pushing some of the movable lids on one type of tape through some of the aligned holes in the other type of tape.

4. The method of joining two strips of transmitting tapes each having signals stored therein in the form of small holes completely perforated therein with a short strip of chadless tape having signals stored therein in the form of partial perforations having movable lids, both of said strips of transmitting tape and said strip of chadless tape being provided with feeding elements, said method comprising superimposing an end of one strip of perforated tape over an end of the short strip of chadless tape, aligning groups of alternate feeding elements in said overlapping tapes for aligning the superimposed holes in the perforated tape with the partial perforations in the chadless tape, pushing some of the movable lids at the end of the chadless tape through some of the aligned holes in the end of the perforated tape, superimposing an end of the other strip of perforated tape over the other end of the short strip of chadless tape, aligning groups of alternate feeding elements in said overlapping tapes for aligning the superimposed signals with those underneath, and pushing some of the movable lids at this end of the strip of chadless tape through some of the aligned holes in the end of this strip of perforated tape.

5. A tape splicer including in combination a base plate, a top plate, a plurality of pins affixed to said base plate instrumentalities for mounting the top plate for movement toward and away from the base plate, said instrumentalities including a plurality of guide posts affixed to one of said plates, a plurality of hollow cylinders affixed to the other of said plates, each of said hollow cylinders being adapted to receive therein one of said guide posts, and a plurality of springs each of which is adapted to be mounted within one of said hollow cylinders for pressing against a guide post received within said hollow cylinder, said top plate having means for allowing the pins to project through said top plate when the top plate is moved toward the base plate.

6. A tape splicer including in combination a base plate, a top plate disposed substantially above the base plate, said top plate having a groove adapted to receive tape, said groove having aligning means adapted to align tape, instrumentalities for mounting the top plate for movement toward and away from the base plate, a plurality of pins disposed between said plates substantially beneath said groove, and means for permitting said pins to pass through said groove

when the top plate is moved toward the base plate.

7. A tape splicer including in combination a base plate, a top plate disposed substantially above said base plate, instrumentalities for mounting the top plate for movement toward and away from the base plate, said top plate having a groove adapted to receive tape, a plurality of studs mounted in the groove and adapted to align tape, and a plurality of pins mounted in a plurality of rows upon said base plate and disposed substantially beneath said groove, said groove having a plurality of slots therein for permitting the rows of pins to pass through the groove when the top plate is moved toward the base plate.

8. A tape splicer including in combination a base plate, a top plate, a plurality of pins disposed between said plates, said top plate having a groove adapted to receive tape, aligning means mounted in said groove and adapted to align tape, instrumentalities for mounting the top plate for movement toward and away from the base plate, means for permitting said pins to pass through said groove when the top plane is moved toward the base plate, pressing means adapted to press tape upon the aligning means, and means attached to the top plate for supporting the pressing means for movement into and out of said groove.

9. A tape splicer including in combination a base plate, a top plate disposed substantially above said base plate, instrumentalities for mounting the top plate for movement toward and away from the base plate, said top plate having a groove adapted to receive tape, a plurality of studs mounted in the groove and adapted to aling tape, a plurality of pins mounted in a plurality of rows upon said base plate and disposed substantially beneath said groove, said groove having a plurality of slots therein for permitting the rows of pins to pass through the groove when the top plate is moved toward the base plate, pressing means adapted to press tape upon the aligning means, and means attached to the top plate for supporting the pressing means for movement into and out of said groove, said pressing means having a plurality of holes therein for receiving therein said aligning studs when said pressing means is moved into said groove, said pressing means also having therein a plurality of slots for receiving therein the rows of pins when the top plate is moved toward the base plate after the pressing means has been moved into said groove.

10. A device for splicing strips of transmitting tapes each having signals stored therein and each having feeding elements, at least one of said tapes being a chadless tape having signals stored therein in the form of partial cut-outs, each of said partial cut-outs forming a movable lid, said device being characterized in this that it includes receiving means for receiving a strip of chadless tape and another strip of tape superimposed one upon the other, a plurality of studs for entering into some of the feeding elements of each of said tapes for aligning the signals in the tapes, a plurality of pins, and means for causing said pins to pass through some of said partial cut-outs in the chadless tape and to push the lids of those partial cut-outs through the aligned signals in the other strip of tape.

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