June 4, 1963 M. V. SWICK ET AL 3,092,532

AUTOMATIC TAPE APPLYING MACHINE FOR SHEET METAL STRIPS AND METHOD

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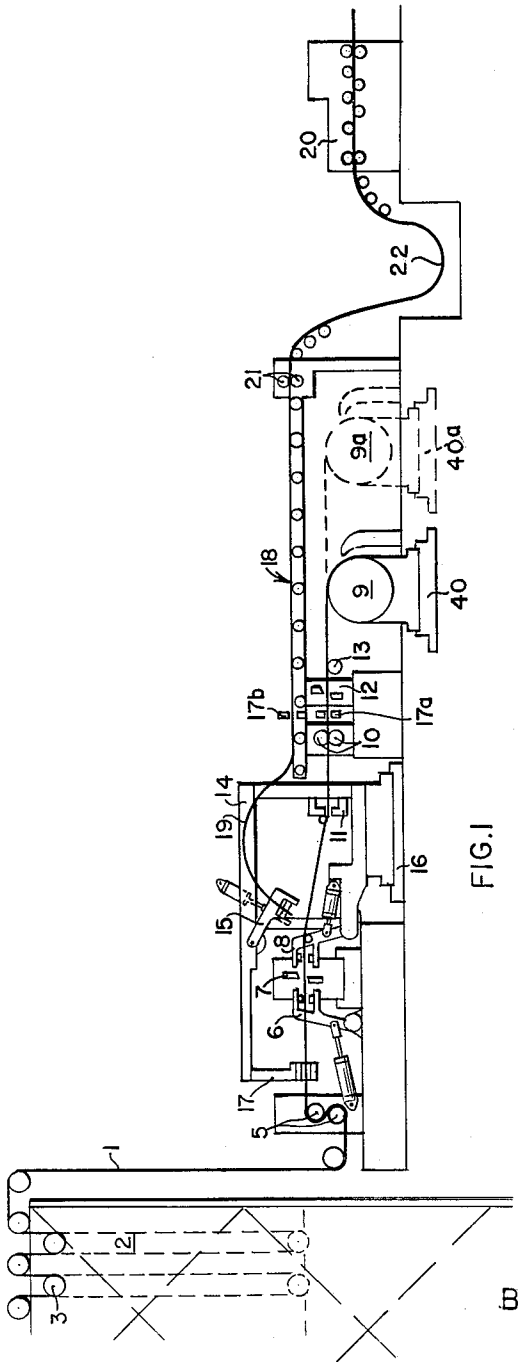


FIG. 1

INVENTORS
MICHAEL V. SWICK
FREDERICK W. A. WARD
JAMES DOUGLAS
BY- Smart & Biggar
ATTORNEYS.

June 4, 1963 M. V. SWICK ET AL 3,092,532

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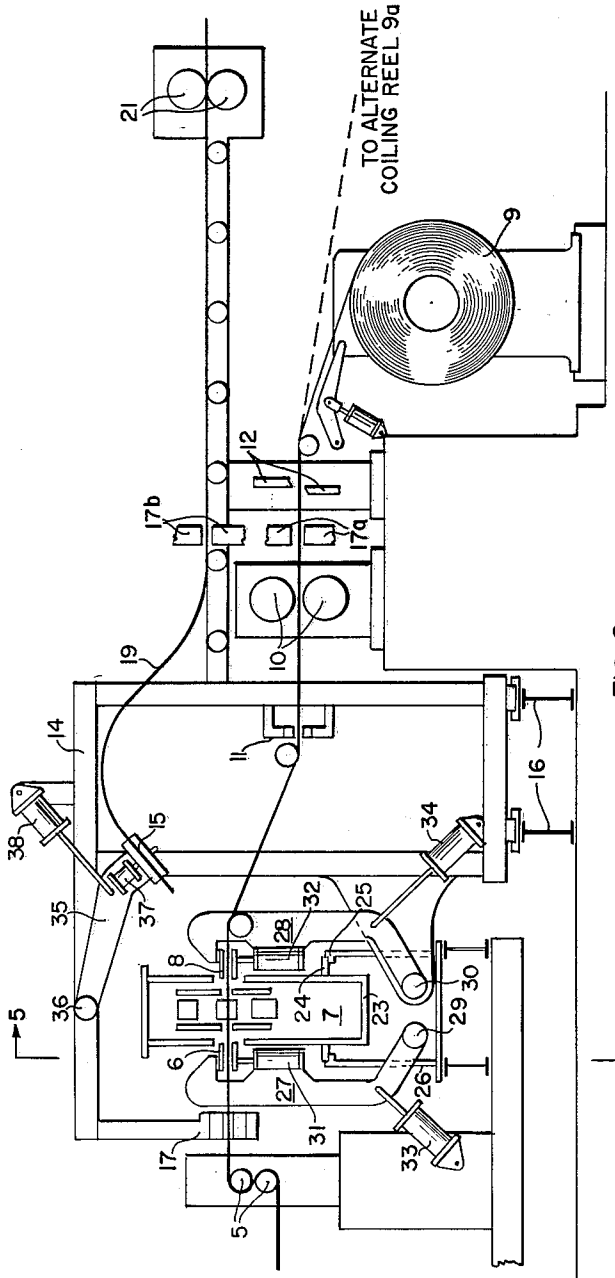


FIG. 2

INVENTORS
MICHAEL V. SWICK
FREDERICK W. WARD
JAMES DOUGLAS

BY- Smart & Biggar

ATTORNEYS

June 4, 1963 M. V. SWICK ET AL 3,092,532

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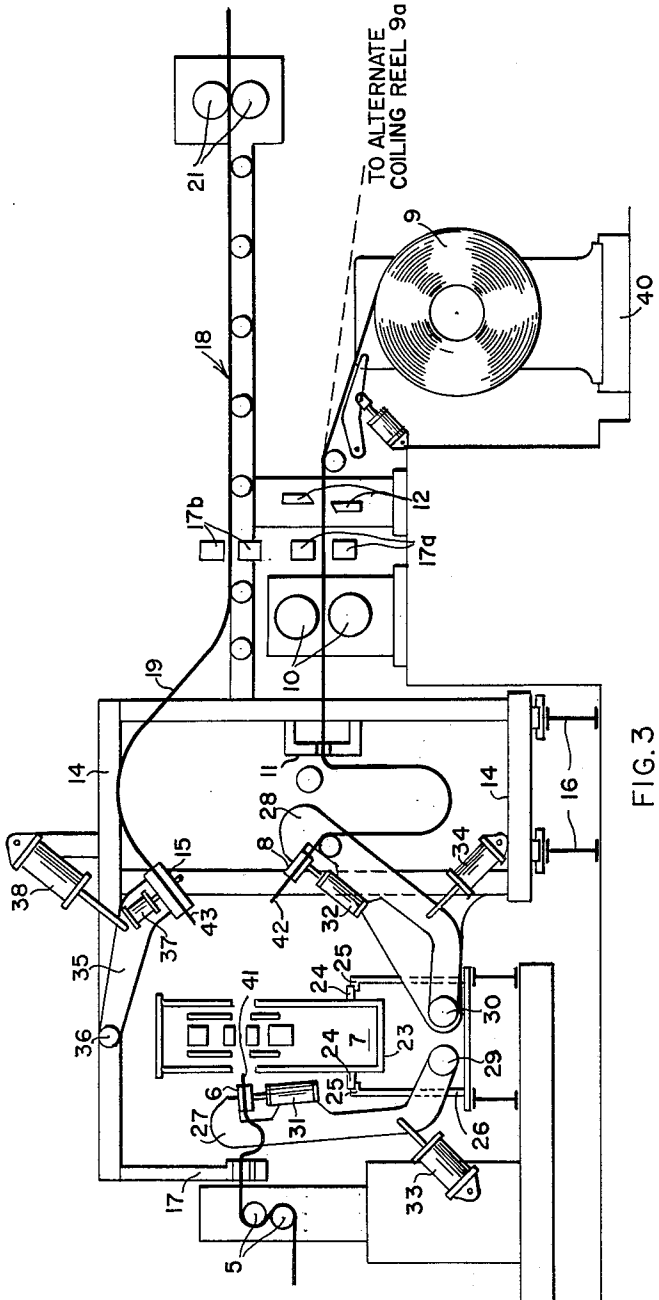


FIG. 3

INVENTORS
MICHAEL V. SWICK
FREDERICK W. WARD
JAMES DOUGLAS

BY- Smart & Biggar

ATTORNEYS.

June 4, 1963 M. V. SWICK ET AL 3,092,532

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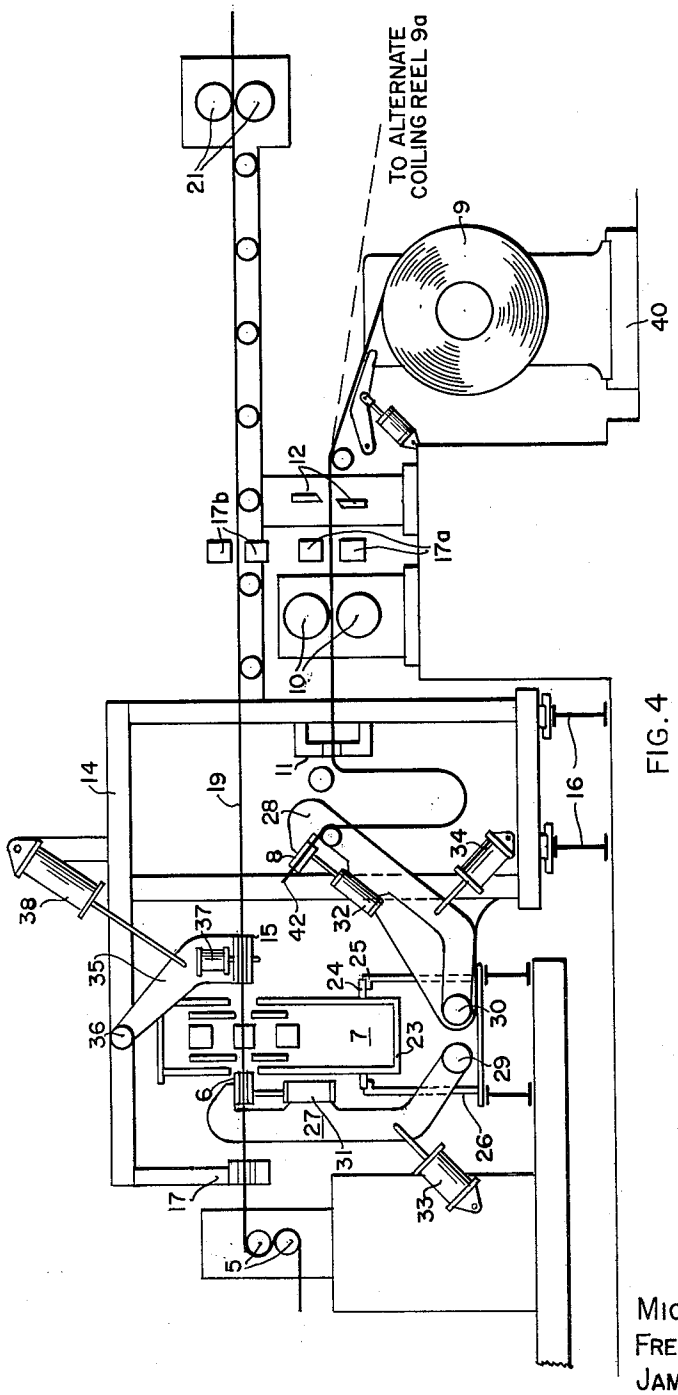


FIG. 4

INVENTORS
MICHAEL V. SWICK
FREDERICK W. WARD
JAMES DOUGLAS

BY Smart & Biggar

ATTORNEYS.

June 4, 1963 M. V. SWICK ET AL 3,092,532

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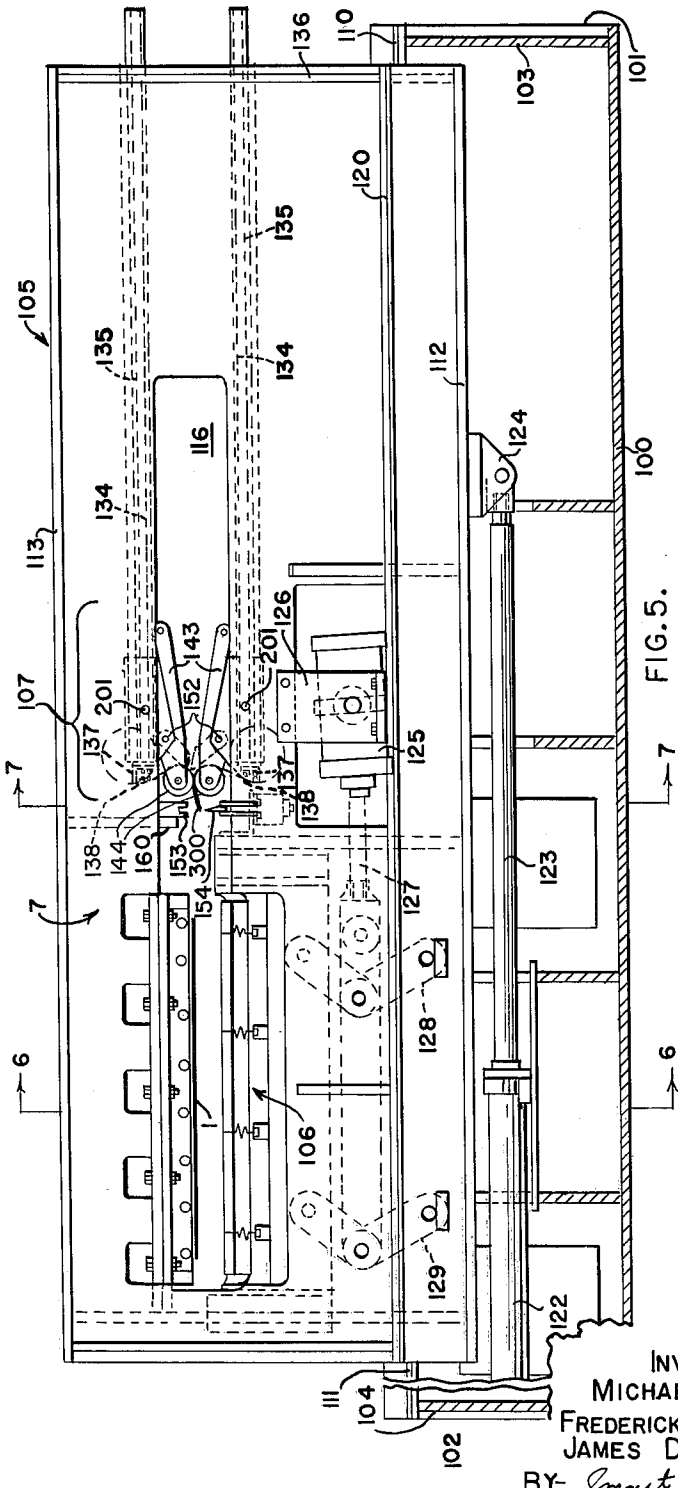


FIG. 5.

INVENTORS
MICHAEL V. SWICK
FREDERICK W. WARD
JAMES DOUGLAS
BY Smart & Biggar
ATTORNEYS.

June 4, 1963 M. V. SWICK ET AL 3,092,532

AUTOMATIC TAPE APPLYING MACHINE FOR SHEET METAL STRIPS AND METHOD

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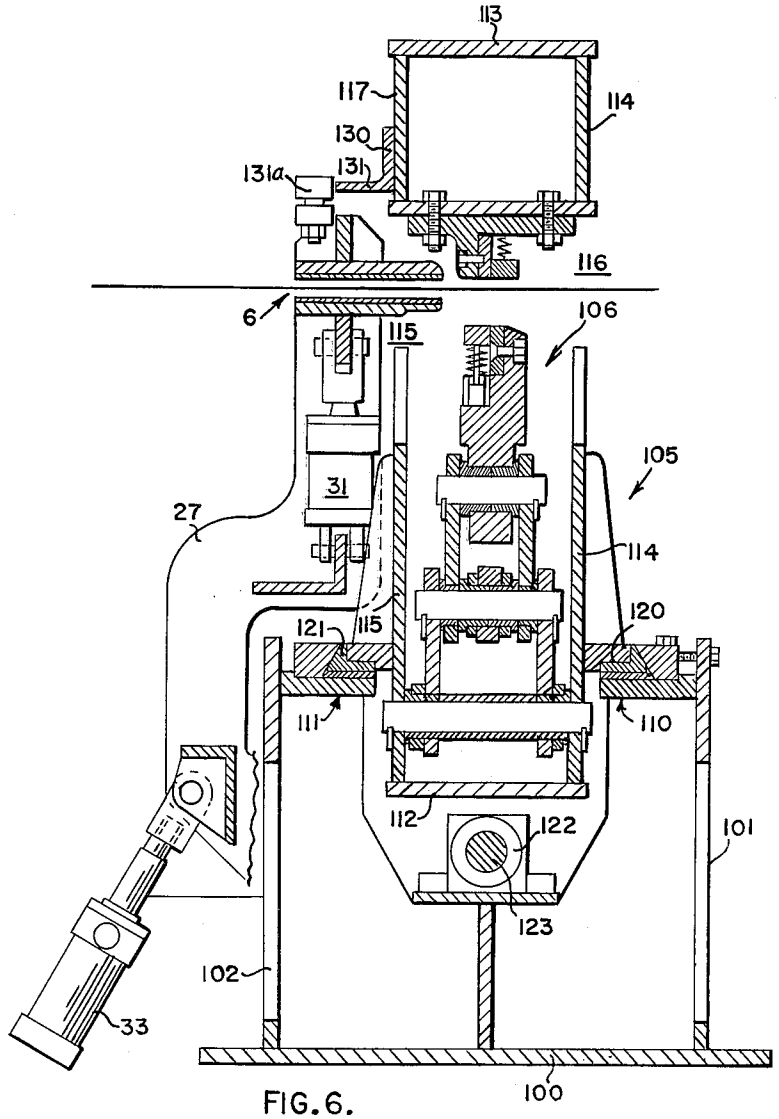


FIG. 6.

INVENTORS
MICHAEL V. SWICK
FREDERICK W. WARD
JAMES DOUGLAS

BY- Grant & Biggar.

ATTORNEYS.

June 4, 1963 M. V. SWICK ET AL 3,092,532

AUTOMATIC TAPE APPLYING MACHINE FOR SHEET METAL STRIPS AND METHOD

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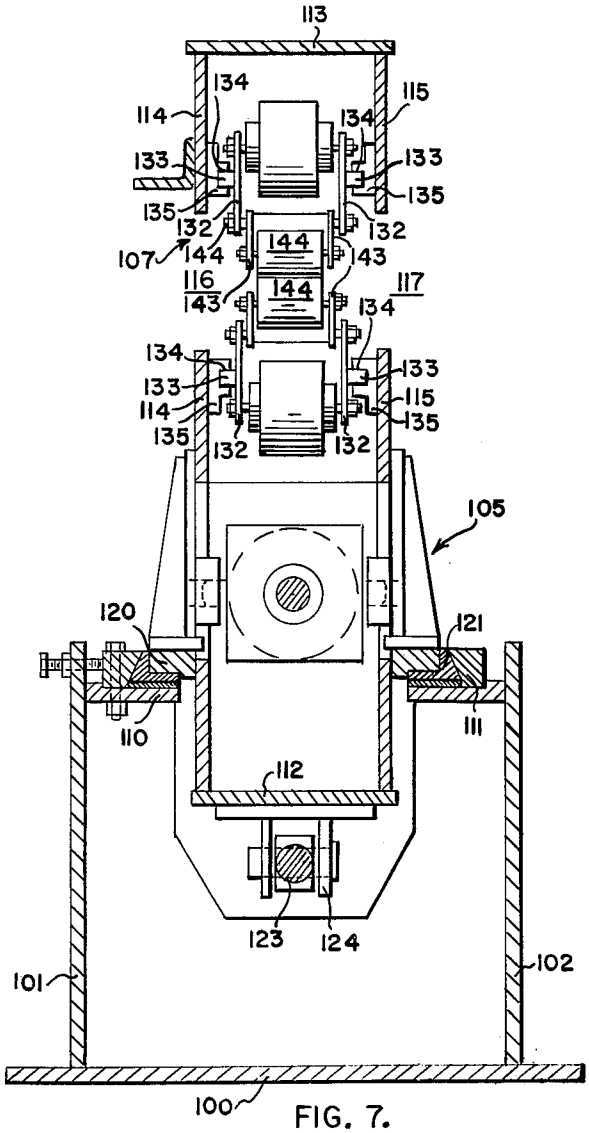


FIG. 7.

INVENTORS
MICHAEL V. SWICK
FREDERICK W. WARD
JAMES DOUGLAS

BY Smart & Biggar
ATTORNEYS.

June 4, 1963 M. V. SWICK ET AL 3,092,532

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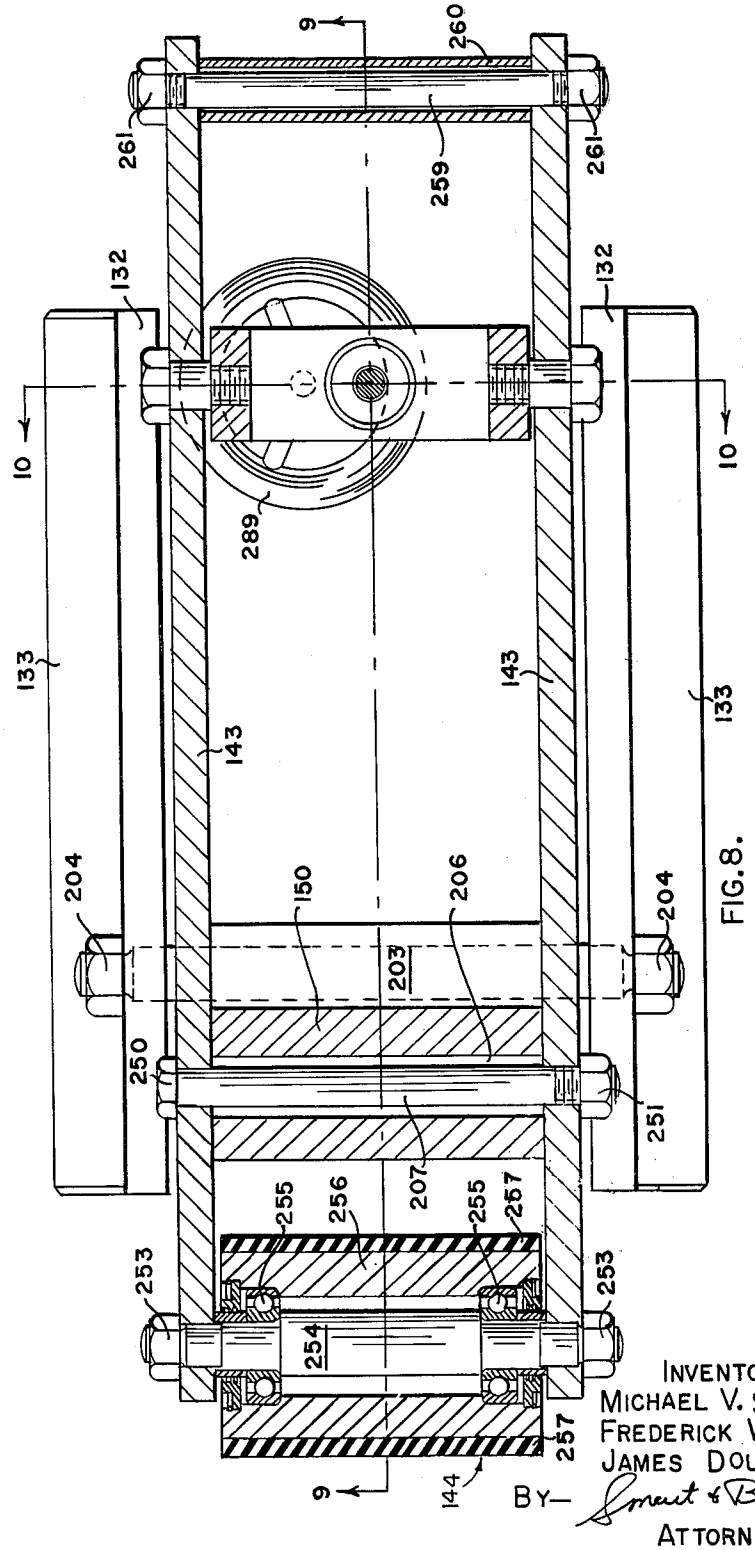


FIG. 8.

INVENTORS
MICHAEL V. SWICK.
FREDERICK W. WARD
JAMES DOUGLAS
BY— Grant & Biggar
ATTORNEYS.

June 4, 1963 M. V. SWICK ET AL 3,092,532

AUTOMATIC TAPE APPLYING MACHINE FOR SHEET METAL STRIPS AND METHOD

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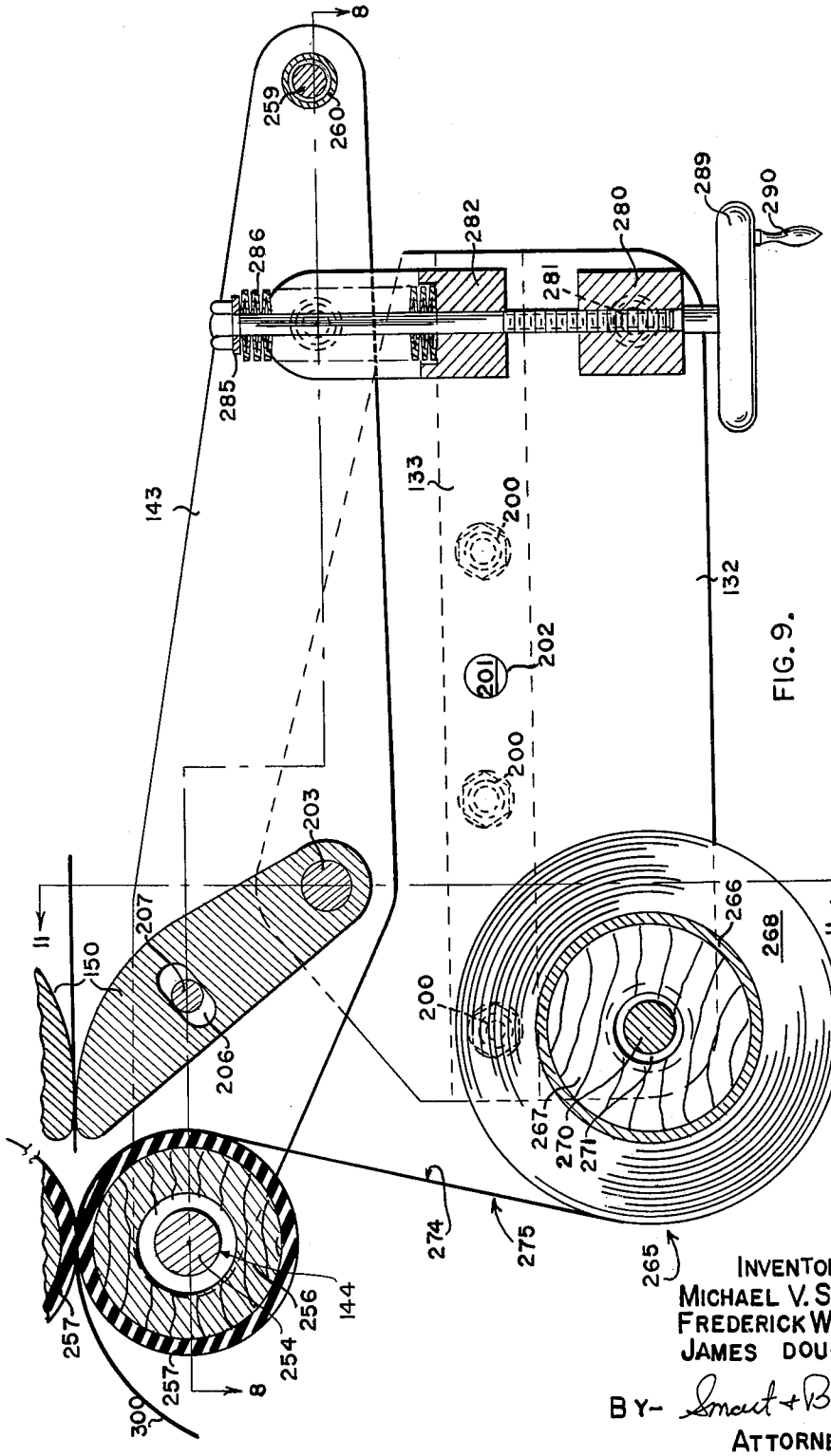


FIG. 9.

INVENTORS
MICHAEL V. SWICK
FREDERICK W. WARD
JAMES DOUGLAS

BY- Smart + Biggar
ATTORNEYS.

June 4, 1963 M. V. SWICK ET AL 3,092,532

AUTOMATIC TAPE APPLYING MACHINE FOR SHEET METAL STRIPS AND METHOD

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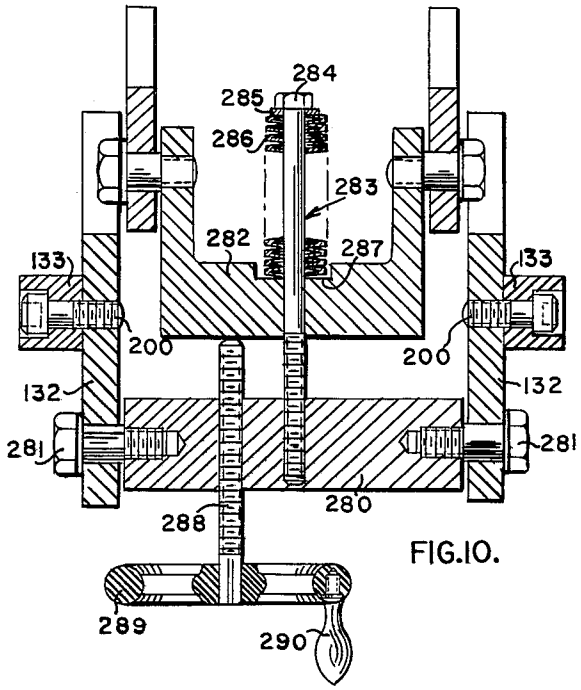


FIG.10.

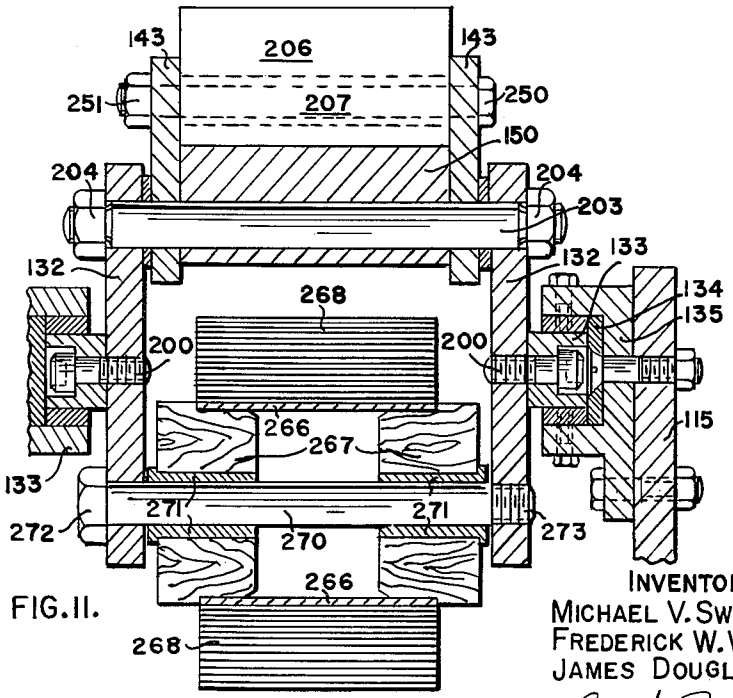


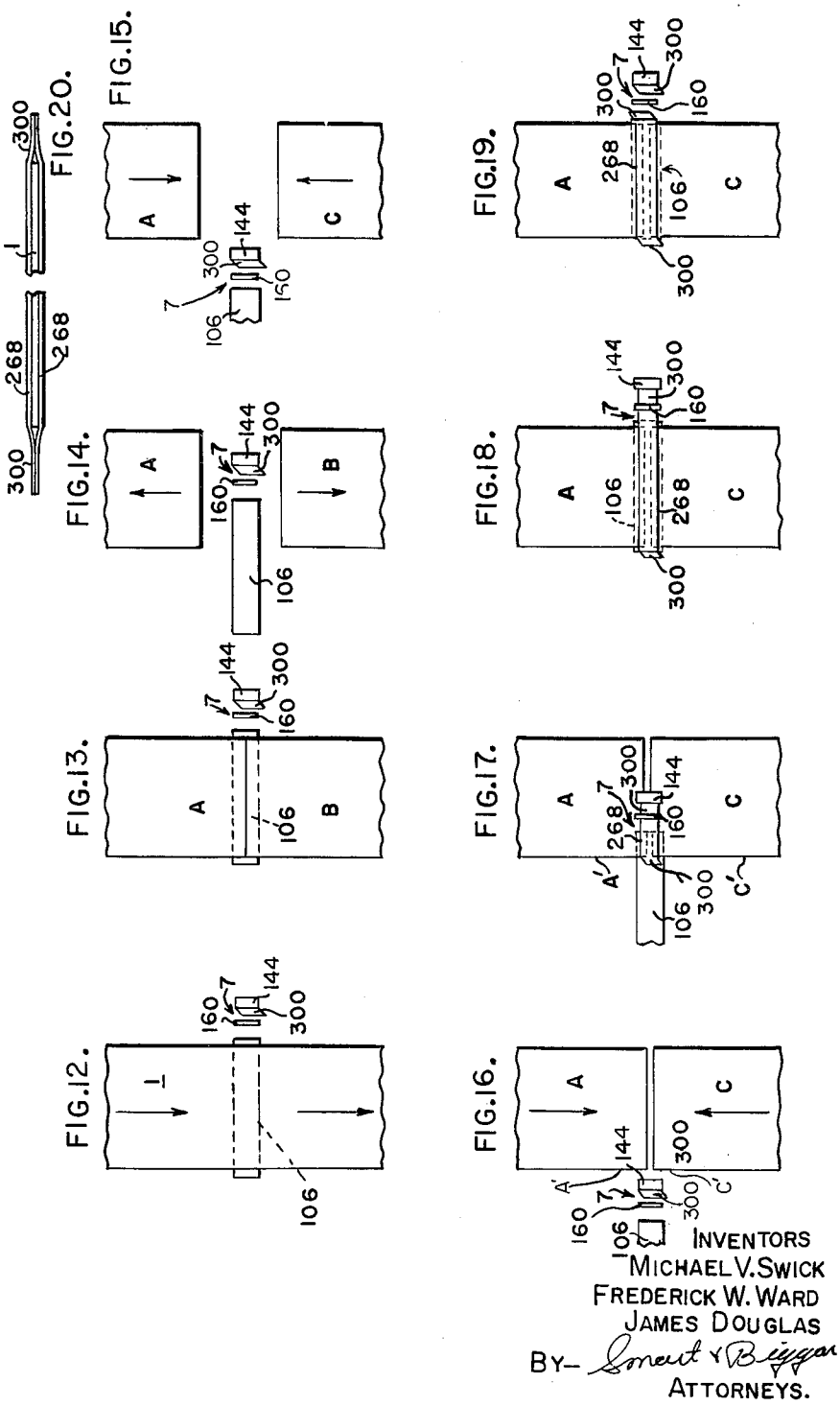
FIG.11.

INVENTORS
MICHAEL V. SWICK
FREDERICK W. WARD
JAMES DOUGLAS
BY- Grant & Biggar
ATTORNEYS

June 4, 1963 M. V. SWICK ET AL 3,092,532

AUTOMATIC TAPE APPLYING MACHINE FOR SHEET METAL STRIPS AND METHOD

Filed July 13, 1959 11 Sheets-Sheet 11



INVENTORS
MICHAEL V. SWICK
FREDERICK W. WARD
JAMES DOUGLAS
BY- Smart & Biggar
ATTORNEYS.

United States Patent Office 3,092,532 Patented June 4, 1963

3,092,532

AUTOMATIC TAPE APPLYING MACHINE FOR SHEET METAL STRIPS AND METHOD

Michael Victor Swick, Frederick William Allen Ward, and James Douglas, all of Hamilton, Ontario, Canada, assignors to The Steel Company of Canada, Limited, Hamilton, Ontario, Canada

Filed July 13, 1959, Ser. No. 826,875
10 Claims. (Cl. 156—157)

This invention relates to a method and apparatus for effecting a taped spliced joint in a continuously produced metal strip.

As a result of the need for increased production by the can manufacturing industry there has been a demand for machinery which would eliminate the costly and inefficient feeding of single sheets of tin plate by hand into the can forming machines. One solution to this problem would be to feed a continuous metal strip into the can forming machines so as to minimize waste, increase production speed, and at the same time cut down the manpower required for each machine. To carry out this change, however, it is first of all necessary to produce a coil of tin plate having characteristics satisfactory for it to be fed into the can forming machines. In order to maintain the efficiency of these machines such a coil must satisfy at least three important criteria: (*a*) It must contain as little scrap material as possible, (*b*) damaged or poorly tinned strip must be eliminated and (*c*) the coil must not contain abrupt changes in the thickness of the metal strip, such as for instance would be caused by lap welds.

The production of metal strip, such as for example tin strip for the fabrication of cans, is now invariably carried on by means of a continuous process whereby the finished product issues from the end of the manufacturing "line" at a substantial rate of speed. Production of tin strip in this manner, while affording substantial economies of manufacture, involves certain difficulties in carrying out the required quality control when the product is to be delivered in the form of more or less continuous rolls. As pointed out above, hitherto the manufacturer of tin cans has secured the tin strip from the steel manufacturers in the form of flat sheets of predetermined dimensions, which are sliced off the moving strip at the end of the tin line. With this arrangement it is obvious that if a section of poor quality strip is received from the tin line, any flat sheets cut therefrom can merely be discarded and arrangements can easily be made for this to be done without the necessity of stopping the previous units in the tin line.

With the advent, however, of demand for tin strip in coiled form, the previously used quality control methods are not satisfactory. It is obvious that when the tin strip is being coiled into a continuous roll, as opposed to being sliced into discrete flat sheets, special arrangements would have to be made for slicing out of the continuously produced strip such parts thereof as failed to satisfy the relevant quality control standards. This, moreover, must be done in a way which would be compatible with both (*a*) continuous operation of the previous units of the tin line and (*b*) providing a continuous strip of tin that is more or less flat so that it can be handled economically in the can manufacturing machines, in accordance with the three criteria listed above.

The problem here posed resolves itself into finding a satisfactory method, when the tin line starts to yield "reject" strip, of (*a*) severing the continuously produced strip at the point where poor quality strip commences, (*b*) leading off the poor quality strip to apparatus for disposing of the same, (*c*) severing the continuously produced strip a second time when good quality strip is again being produced and (*d*) joining the leading end of the newly produced good quality strip with the trailing end of the previously produced good quality strip already on the strip coiler. While not necessarily being the case, the solution to aspect (*d*) of the problem may at the same time provide a means for leading off the reject strip to its place of disposal. In principle, therefore, the problem resolves itself into formulating a satisfactory means of effecting a spliced joint between the severed ends of the strip, and, in conjunction therewith, further apparatus for selectively leading the incoming strip, in accordance with the quality thereof, to either the prime strip coiler or the reject strip disposal means.

The prior art reveals a number of methods which might conceivably be used to effect a spliced joint between the severed ends of the strip. It would, for instance, be possible to fit a butt-welder and shear into the tin line ahead of the coiling reel so that bad scrap could be removed and a new joint made. A number of serious disadvantages are, however, apparent in the arrangement of this type. The butt-welders required are relatively clostly. uncertain in operation and require about one minute in which to make a weld across the standard width of tin strip. This latter time factor would involve stoppage of the delivery end of the tin line for so long a period as to render impractical the size of looping towers required to accommodate the incoming strip which accumulates during the time taken by the splicing operation. This latter effect would be accentuated if, as would necessarily be the case, the delivery end of the tin line were arranged so as to permit two or three separate joints in quick succession. Moreover, apart from the time required to effect the actual joint, stoppage of the discharge end of the line in order to remove lengths of scrap before rewelding the severed ends of the prime strip would mean that anything more than a few feet of scrap would produce untenable delays in the line.

As a result of these conditions two basic requirements can be formulated for making a satisfactory scrap elimination system; they are (1) a method, quicker than known welding methods, for joining the severed ends of the strip and, (2) a method of continuously disposing of reject strip which does not require reduction of line speed to a level at which efficient plating operations can not be maintained. As a possible solution to part (1) of the problem consideration was given to the idea of using adhesive tape, and a search was commenced for a tape which would be strong enough, adhesive enough, and would stand some heat so as to perform satisfactorily as a splicing agent in a tin line. Tests were made on a large number of samples and it was eventually found that a fibre glass adhesive tape produced by the Minnesota Mining & Manufacturing Corporation satisfied these three requirements. The tape in question is so formed that it has an equal strength in both directions and is provided with a cellophane backing which prevents the outer, exposed surface of the tape, when it is in position on a join, for marking or in any way spoiling the immediately adjacent wrap of steel strip on the coil. In actual tests strips of this tape four inches wide proved capable, when applied completely across both the upper and lower surfaces of the tin strip, of withstanding about 200 pounds/inch tension, which is about twice the conventional maximum tin line coiling pressure. Such a joint can be made with the severed ends of the strip in direct butt engagement; preferably, however, a gap of about 1/16 inch is left between the ends of the strip so as to permit the mutually facing adhesive surfaces of the tape to contact one another directly in the region at the centre

of the join. The "lost motion" thereby provided helps to eliminate "peeling" of the tape immediately adjacent the severed ends and also facilitates smooth coiling of the finished strip.

Having found that an adhesive tape joint would apparently be satisfactory for joining together the severed ends of the tin strip, the further difficulty remained of finding a method of applying the adhesive tapes to the strip. In other types of manufacturing operations wherein a continuous strip is produced, such as for the example in paper making, splicing between the severed ends of the strips has apparently been satisfactorily accomplished by means of a taping operation in which an adhesive tape is applied to one or both sides of the strip in question. The methods used, however, in the manufacture of paper and like products have been found unsatisfactory for application to the manufacture of tin plate either because they involve some overlapping of the severed ends, which would therefore yield a coil of tin plate which is unsatisfactory for use in can forming machines, or because the type of splicing operation in question does not permit the application of the tape having the tensile characteristics necessary to give a splice of strength sufficient for tin line operations and later use in can forming machines. Moreover, a number of methods of applying adhesive tape were tried without success because no control could be kept on the tape ends after the joint had been made. The principle was then developed that, if the otherwise free ends of the adhesive tape coming from the supply spools could be left adhering together, control of them could be maintained and it was possible to begin "rolling on" the tapes on each side of the strip by using the adhering ends as a starting point. This concept proved sound, but had the disadvantage of leaving the taping device on the wrong side of the strip after each joint was made. This disadvantage was however, overcome by opening a gap between the severed ends of the strip, after the shearing operation had taken place, and passing the taping device through the gap so as to return to the correct side of the strip for starting a new joint.

With respect to the second basic requirement—i.e. that for a method of disposing of the reject strip continuously at line speed—it was decided that the Hallden shear now used on conventional tin lines for cutting up scrap strip could be used if a method could be found of leading into the Hallden shear the reject strip coming from the tin line. It was apparent that if the trailing end of the previous scrap strip fed into the Hallden shear were left in a position adjacent the splicer device such that it could be joined to the severed end of incoming reject strip, a means could be found for leading the same end to the Hallden shear. The solution to these problems was worked out on the basis that, in addition to the actual device which effects the splice joint—i.e. the shear and taping device, additional holding apparatus in the form of clamps would be associated therewith so as to permit the severed end of the incoming strip to be spliced by means of a taped joint to the trailing end of either (*a*) the previous reject strip leading to the Hallden shear or (*b*) the previous prime strip leading to the coiler, as the case may be.

We have found that the requirements outlined above for a satisfactory joint in tin strip can be brought about by adopting a method of splicing together the severed ends of two pieces of metal strip by the steps (*a*) clamping the pieces adjacent the ends thereof by means of clamps located on each side of the proposed join line, (*b*) moving the clamps to part the ends of the pieces, (*c*) moving a taping device to make a preparatory stroke wherein the said device passes between the ends and moves into a taping stroke preparatory position at the opposite side of the strip, (*d*) moving clamps to bring the ends towards each other and into position for taping, (*e*) moving the taping device so as to effect the taping stroke wherein the taping device moves from the pretaping position to its original position and in so doing applies a strip of tape to each surface of the pieces at the ends thereof, and, past the farther side thereof, causes the two mutually facing strips of adhesive to joint together and (*f*) severing the strips of adhesive adjacent said one edge so as to leave the portion of the outer ends of the tape strips pressed together.

The invention will now be described with reference to the following figures of drawings in which:

FIGURE 1 is a diagrammatic view of the delivery end of a tin line incorporating the invention;

FIGURE 2 is a diagrammatic view, in profile, of a splicer device and associated clamps, in accordance with the invention, the position of the clamps shown in this case being that in which the incoming prime strip is fed directly to the coiling reel;

FIGURE 3 is similar to FIGURE 2, but shows the clamps in "out" position, after the shear has severed the incoming strip and before a taped joint is effected;

FIGURE 4 is similar to FIGURE 2 but shows the clamps in the position such that the incoming strip, being reject strip, is fed to the Hallden shear where it is sliced to facilitate disposal;

FIGURE 5 is a front elevational view, partly in section, of the complete splicer device showing the carriage with the strip and tape shears, and the taping device, mounted thereon, as seen along line **5—5** of FIGURE 2;

FIGURE 6 is a sectional view taken along line **6—6** of FIGURE 5; and showing as well the clamp **6** of FIGURES 1 to 4, in its "in" position;

FIGURE 7 is a sectional view taken along line **7—7** of FIGURE 5;

FIGURE 8 is a sectional, plan view of the lower half of the taping device, taken along line **8—8** of FIGURE 9;

FIGURE 9 is a side elevational view, in section, of the lower half of the taping device taken along line **9—9** of FIGURE 8;

FIGURE 10 is a sectional view taken along line **10—10** of FIGURE 8;

FIGURE 11 is a sectional view taken along line **11—11** of FIGURE 9, showing as well a sectional view of the track and side pieces of the carriage on the right side.

FIGURES 12 to 19 inclusive illustrate the different steps in effecting a taped joint in accordance with the invention; and

FIGURE 20 is a sectional view of a taped joint made in accordance with the invention.

One application of the present invention is to be seen in FIGURE 1 of the drawings. Such embodiment shows a particular set-up adapted to direct selectively an incoming strip of continuously produced sheet metal from one destination to a second destination with a minimum of stopping time. Incoming strip **1**, being continuously produced by a production line is fed past a visual inspection tower (not shown) into a storage loop tower **2** (part of which is shown in FIGURE 1) which normally runs empty with the carriage **3** at the top thereof. The sheet metal strip then passes through bridle **5**, clamp **6** and thence into a splicer device generally represented at **7**. Splicer device **7** is constructed in such a manner that during normal operation, when incoming strip **1** is of good quality—i.e. "prime" strip—it may pass freely through such device, a second clamp **8** and on through clamp **11** mounted on framework **14**, tension rolls **10**, shear **12** and reflector roll **13** and, finally, to either of the two tension coiling reels **9**, **9***a*. During such normal operation both clamps **6** and **8** are "open"—i.e. in non-gripping position. Tension rolls **10**, clamp **11**, shear **12** and deflector roll **13** are employed when the incoming strip **1**, being prime strip, is to be fed into the next (i.e. alternately **9** and **9***a*) coil, either when the operation of the line is commenced, or after a full coil has been wound on one of the reels and it is desired to commence forming a new coil on the other.

A general frame-work 14 is provided which supports a third clamp 15 which is adapted to be swung aside during normal operation of the line, as can be seen from the drawing, clamp 8 is also supported by the frame-work 14. Clamp 15 is used in conjunction with reject line 18 for directing reject strip 19 to a Hallden shear 20 via rolls 21 and loop 22. Hallden shear 20 is used to slice up the reject strip and thereby facilitate its disposal. Frame-work 14 is, as will be explained in detail below, slidably mounted on track means rigidly attached to base 16. Similarly, the coiling reels 9, 9*a* are both slidably mounted on tracks attached to bases 40 and 40*a*. Movement along the tracks, transverse to the motion of the line, is in each case effected by suitable hydraulic means not shown.

Referring now to FIGURE 2, it can be seen that the splicer device generally represented at 7 is mounted on a carriage 23 having slide members 24 engaging with track means 25 which are in turn mounted on a supporting frame-work 26. The splicer device 7, comprising a carriage having mounted thereon strip and tape shears, and a taping device, will be more particularly described below with reference to FIGURE 5. Clamps 6 and 8 are of known construction and are mounted on arms 27, 28 respectively, which arms are swingably movable about pivots 29 and 30, between an "in" position, such as is shown in FIGURE 2 and an "out" position such as is shown in FIGURE 3. Pivot 29 is attached to base 26, whereas pivot 30 is attached to the frame-work 14. Clamps 6 and 8 are actuated by means of hydraulic cylinders 31, 32 respectively, and the clamp arms 27 and 28 are moved between "in" and "out" positions by means of hydraulic cylinders 33 and 34 respectively. Clamp 15 is mounted on clamp arm 35 which is swingably mounted on frame-work 14 through pivot 36. Clamp 15 is actuated by means of cylinder 37 and the clamp arm 35 is made to swing between an "in" position, such as is shown in FIGURE 4, and an "out" position such as is shown in FIGURE 2, by means of a hydraulic cylinder 38. Frame-work 14 is adapted to move in response to a signal from the sensing nozzle 17 (e.g. an Askania nozzle) of a strip centering control which is sensitive to lateral movements of the incoming strip 1. As shown in the drawings, it is convenient to locate the sensing nozzle 17 which controls movement of the frame-work 14 immediately ahead of the clamp 6. The sensing nozzle 17, and its associated control equipment, ensures that the frame-work 14 and with it the rigidly clamped trailing end of either the prime strip (in clamp 8) or the reject strip (in clamp 15) is kept in lateral registry with the incoming strip so that when necessary a spliced joint can be effected without requiring further lateral adjustment of the frame-work.

Coiling reels 9, 9*a* are slidably mounted on bases 40, 40*a* and are adapted to move in response to signals received from either of the sensing nozzles 17*a* and 17*b* depending upon whether the prime strip or reject strip is being received from the line. When the former is the case lateral movement of the coiling reels is controlled by nozzle 17*a* located at one side of the path of the prime strip, preferably between the pinch rolls 10 and the shear 12 as shown. When reject strip is being receiver, it is of course desirable in maintain the lateral position of coils 9, 9*a* in registry with the incoming strip (albeit reject strip) so that when prime strip is again received the coils will be in a lateral position ready to receive it without further adjustment. Consequently, it is convenient to arrange that when a clamp 15 is in "in" position, such as is shown in FIG. 4, the nozzle 17*b* located at one side of the reject strip 19, controls the lateral movements of the reels 9, 9*a*. When prime strip is once more being received, the clamp 15 moves to its "out" position shown in FIGS. 2 and 3, and automatically transfers control of the lateral position of the coiling reels 9, 9*a* to the nozzle 17*a*.

The relationship between the three clamps 6, 8 and 15, and the operation of directing incoming strip 1 to either the Hallden shear 20 or to the tension coiling reels (in accordance with whether or not the incoming strip 1 is either reject strip, or prime strip, respectively) can be seen in FIGURES 2, 3, and 4 of the drawings. Such figures represent a sequence of steps during operation of a splicer device made in accordance with the invention. During normal operation of the tin line, the incoming strip 1 is free to move through the complete apparatus without interruption and it is formed into a coil by tension coiling reel 9 or 9*a* as fast as it is produced. During such normal operation clamps 6 and 8 are "open"—i.e. free from contact with strip 1. Moreover, as is shown in FIGURE 2, the clamp arms 27 and 28 are moved to an "in" position. Pinch rolls 10 and clamp 11 are also "open." Previously rejected strip 19, the trailing end of which is gripped in clamp 15, which is "closed" and in "out" position, is vertically displaced above the line so as not to impede its operation. When poor quality strip is observed approaching the bridle 5 (see FIGURE 1) the following procedure is carried out.

Bridle 5 and tension coiling reel 9 (or 9*a*) cease to rotate and as soon as they are still cylinders 31, 32 are actuated so as to close clamps 6 and 8 and grip the incoming strip 1; as explained above the clamps are already in "in" position, as shown in FIGURE 2. Since, as will be apparent from what follows, clamp 11 must act in conjunction with clamp 8, it is convenient to arrange for the former to be closed automatically when the latter closes. Splicer device 7 then shears across the incoming strip 1 in the region between clamps 6 and 8. Clamp 6, gripping the incoming strip 1 adjacent the leading end 41 thereaof, is then swung away from splicer device 7 by means of cylinder 33 acting on arm 27, so that the clamp moves to its "out" position. At the same time clamp 8, gripping the trailing end 42 of the prime strip leading to the coiling reel 9 is also swung away from splicer device 7 by means of cylinder 34 acting on arm 28 so that it moves to its "out" position. The several clamps are now in the position shown in FIGURE 3. When the clamps are in their "out" position, the strip ends 41, 42 and 43 are a sufficient distance apart to enable splicer device 7 to make a preparatory stroke therebetween and take up a "pre-taping" position. With the splicer device 7 in this "pre-taping" position, clamp 6, holding the leading end 41 of the incoming strip 1 is swung back to "in" position by means of cylinder 33 acting on arm 27. Clamp 8, gripping the trailing end of the prime strip leading to coiling tension reel 9 remains in its "out" position. In its place clamp 15, gripping the trailing end of the previously rejected strip 19 is swung back into "in" position by means of the cylinder 38 acting on arm 35. When both clamps 6 and 15 have been moved to "in" position, the strip ends 41 and 43 are in registry with one another, in butt joint relation. As explained above, alignment of the edges of incoming strip 1 and reject strip 19 is ensured by the action of the alignment sensing nozzle 17 which automatically controls lateral movement of the carriage 14 upon which is mounted the clamp 15 gripping the trailing end of the reject strip 19. The arrangement is such that the frame-work 14 is adapted to move laterally, when actuated by the sensing nozzle 17, to compensate for any lateral movement of the incoming strip 1 so that the edges of strip 1 and of strip 19 are automatically kept in alignment. With the strip ends 41 and 43 in butt join relation, and the edges of strips 1 and 19 in alignment, splicer device 7 makes a "taping" stroke, applying a strip of high strength adhesive tape across both bottom and top faces of the strips 1 and 19, thus joining such strips together. When the joint has been made, clamps 6 and 16 "open" so as to release the strip. The incoming strip 1 then moves forward into the reject line 18 until all

the reject strips have been disposed of by Hallden shear **20**. During such operation, as shown in FIGURE 4, clamps **6** and **15**, although in "in" position, are "open" and consequently not gripping the strip.

When the section of poor quality strip has been dealt with by the Hallden shear the strip inspector signals that good quality strip is approaching from storage loop tower **2**, whereupon bridle **5** is deactuated. As soon as the strip has stopped moving clamps **6** and **15** are "closed" so as to grip the strip on both sides of the splicer device **7**. The problem now is to redirect the incoming strip **1** back to the tension coiling reels and for so doing the foregoing steps are repeated in reverse as follows:

Splicer device **7** shears across the strip between clamps **6** and **15**. Clamp **6**, gripping incoming strip **1** adjacent the leading end **41** thereof, is swung away from the splicer device **7** to the "out" position. Clamp **15**, gripping reject strip **19** adjacent the trailing end **43** thereof, is also swung away from splicer device **7** into the "out" position. Splicer device **7** makes a preparatory stroke into the "pre-taping" position. Clamp **6** is then swung back into the "in" position. At the same time, clamp **8**, gripping the prime strip which was previously directed to tension coiling reel **9** adjacent the trailing edge **42** thereof is also swung back into "in" position. With clamps **6** and **8** both move to "in" position, ends **41** and **42** are in butt joint relation. Splicer device **7** then effects a "taping" stroke applying a strip of high strength adhesive tape across both top and bottom faces of the strips thereby joining them together. When the joint has been made, clamps **6** and **8** are "opened" so as to release the strip, and open clamp **11**, bridle **5** and tension coiling reel **9** or **9***a* being used start to operate. Normal operation of the tin line is then continued with the incoming strip **1** being coiled by tension coiling reel **9** until another reject portion of the strip is detected.

When it is desired to finish coiling a roll, (e.g. on coiling reel **9**) the strip is gripped by pinch rolls **10** and is then sheared by the shear **12**. The pinch rolls **10** and the shear **12** are actuated by any well known means and no attempt will here be made to specify the details of their construction. The completed coil is then delivered from tension coiling reel **9** and the pinch rolls **10** feed the leading end of the incoming strip **1** forward to start a new coil on coiling reel **9***a*. When this has been done, the pinch rolls **10** are released, and at some convenient later time the completed coil on reel **9** is removed therefrom.

The complete operation described above takes such a relatively short time that the production section of the line can be kept operating continuously. The conventional storage loop tower **2** is more than sufficient to take up the incoming strip **1** produced during the complete clamping-shearing-switching-taping-restarting operation.

Reference will now be made to FIGURES 5 to 11 inclusive which show in greater detail the construction of the splicer device generally represented at **7** in the previous figures.

The splicer device **7** is mounted on a base **100** from which extend upwardly at each side thereof vertical supporting members **101** and **102**. The ends of the box-like structure thus formed are, in the embodiment shown in the drawings, enclosed by further vertical members **103** and **104**, as shown in FIGURE 5. As is apparent from the description of the general operation of the invention given above, the supporting structure just described extends across the line of travel of the strip **1** and is long enough to permit the movable carriage, generally indicated at **105**, to move transversely of the line of travel of the strip **1** from a first position in which the shear, generally indicated at **106**, straddles the strip (i.e. the position shown in FIGURE 5) and a second position wherein the taping device, generally indicated at **107**, occupies (in an embodiment of the invention such as shown in FIGURE 5) a position immediately to the left of strip **1**. This means that, for an arrangement of the invention such as shown in FIGURE 5, and the particular position of the movable carriage **105** shown therein, the supporting structure mounted on base **100** extends considerably to the left of the carriage, as shown.

Adjacent the upper ends of each of the vertical members **101** and **102** are inwardly extending stationary tracks **110** and **111** which provide a bearing surface along which the movable carriage **105** may slide from its first to second positions, and vice versa as discussed above. As shown in FIGURES 5, 6 and 7 the carriage itself comprises a base member **112**, a top member **113**, and two vertically positioned parallel side members **114** and **115**, each having aligned, appropriately placed cut-outs **116** and **117** respectively which are designed to permit passage of the strip **1** through the splicer device **7**. On the upper and lower edges of the cut-outs are mounted the respective parts of the shear **106** and the taping device **107**, as will be described in more detail below.

As best shown in FIGURES 6 and 7 the slide members **120**, **121** extend outwardly from the side members **114** and **115**, the said slide members engaging with complementary track members **110** and **111** referred to above. As shown in FIGURE 5 the carriage as a whole is caused to slide along the tracks **110**, **111**, by push-pull cylinder **122**, the piston **123** of which is connected by means of bracket **124** to the base **112** of the carriage.

The shear generally represented at **106** is of a conventional type and no attempt will here be made to describe in detail its construction. As seen in FIGURE 5 it is actuated by hydraulic cylinder **125** which is attached to the carriage **105** by means of a bracket **126**. The piston **127** of the cylinder **125** is in turn connected to the centre point of toggles **128** and **129**, the upper elements of which are connected to the lower, movable part of the shear **106**. As is apparent from the drawing, actuation of the cylinder **125** will cause the toggles to spread, thereby actuating the shear.

Referring now to FIGURE 6, an angle piece **130** is attached to the side **115** near the top thereof, so as to have one of its flanges **131** extend outwardly therefrom. The outer end of the flange **131** constitutes a cam surface which is "followed" by a roller **131***a* rotatively mounted at the upper end of arm **27** which supports the clamp **6**. The angle piece **130** extends the whole of the way along the length of the carriage **105**. On the left side of the carriage, above the shear **106**, the width of the flange **131** is less than its width on the right side, above the taping device, a smooth transition between the two widths being effected in the region of the carriage between the shear **106** and the taping device **107**. As is apparent from FIGURE 6, the outer end of the flange **131** constitutes a "stop" against which the arm **27** comes to rest when in the "in" position. The variation in width of flange **131** between the shear and taping device portions of the angle piece **130** ensures that, when the arm **27** returns to the "in" position after the carriage has moved to the point where the taping device is in its "pre-taping position," the severed end of the incoming strip **1** does not return to exactly the same place that it occupied immediately after the shearing operation took place; on the contrary, the greater width of the flange **131** in the region of the taping device ensures that the arm **27** does not swing all the way back to its original position, thereby leaving a slight gap between the two severed ends of the strip **1**. As a result the join is taped with a slight gap between the severed ends of the strip, thereby permitting a certain amount of "lost motion" and eliminating difficulties which are encountered when an attempt is made to coil strip having taped joints in which the severed ends of the strip in question are in tight butt relation.

The taping device generally indicated at **107** comprises two upper and lower aligned pairs of bracket members **132** which, by means of flanges **133** extending outwardly from opposite sides thereof, are adapted to engage slidably in the respective grooves **134** of the rails **135** which

are mounted on the inside surfaces of the side pieces 114, 115 as best shown in FIGURE 7. As shown in FIGURE 9, the flanges 133 can conveniently be attached to the bracket members 132 by means of counter-sunk cap screws 200. As is apparent from FIGURE 5, the rails 135 extend past the vertical pieces 136 at each end of the carriage 105 and permit both the upper and lower halves of the taping device 107 to be moved along the rails to a position where it is "outside" the confines of the carriage proper, thereby facilitating adjustment of the tension applied to the tape applicator rolls, and also reloading of the tape spools.

Adjacent the centre of the carriage 105 are two angle pieces 137 which extend between the side members 114, 115 at the end of the rails 135, as best shown in FIGURE 5. These angle pieces are provided with adjustable stop members 138 as shown and thereby define the end of permissible travel along the rails 135 of the upper and lower halves of the taping device 107. When the latter has been pushed along the rails to the point where the forward end engages the stop members 138, four locking pins 201 are then inserted through the sides 114, 115 and into the apertures 202 provided therefor in the flanges 133 located on each side of the upper and lower halves of the taping device 107. These pins serve to maintain the device in fixed position in the carriage.

Some of the details of the construction of the taping device 107 will now be described with reference to FIGURES 9, 10 and 11 which illustrate to lower half only; it will be understood that the upper half is identical therewith, except that, when mounted in the carriage, its position is inverted with respect to the lower half so that the corresponding parts are in aligned, opposed relation.

As shown in FIGURES 9, 10, and 11, the lower half of the taping device comprises, in addition to the brackets 132 and flanges 133 already mentioned, two tape applicator arms 143 which are rotatively mounted between the brackets 132 by means of a pin 203. The pin 203 extends between the two brackets 132 which comprise the opposite sides of the lower half of the taping device, and is held in position by means of nuts 204 threaded on each end. Also rotatively mounted about the pin 203 is a tape applicator foot 150 which serves to ensure that the severed ends of the strip which are to be joined are in alignment with one another just prior to application of the tape. The foot 150 is provided with a slot 206 which accommodates a further pin 207 extending between the opposing arms 143. The pin 207 has a head 250 on one end, and a thread adapted to releasably engage with nut 251 on the other. This arrangement permits of adjustment of the angular position of the foot 150 around the pin 203 at any desired location within the range of swing defined by slot 206.

Immediately behind the foot 150, and (in the embodiment of the invention shown in FIGURE 9) at the left end of the arm 143, is a tape applicator roll 144 rotatively mounted on the arm by means of a shaft 254 maintained in position on the arm by means of nuts 253, and ball bearing races 255, as best shown in FIGURE 8. The core 256 of the tape applicator roll can be fabricated from any convenient material, such as for example wood, but preferably the outside surface 257 is made from a substance having some degree of resiliency, such as rubber, so as to facilitate a smooth application of the tape.

At the opposite, right end of the arms is a further threaded shaft 259 surrounded by a tube member 260 as shown in FIGURE 8. The ends of the shaft 259 are threaded, and extend through apertures in the ends of the arms 143 so as to engage with nuts 261 which, when tightened, jam to inside surfaces of the arms against to ends of the tube 260 and thus keep the arms in rigid, accurate alignment.

Rotatively journalled between the opposing brackets 132 is a tape supply spool generally indicated at 265 comprising a roll of tape 268 on a core 266, and wood spacer plugs 267, all of which are journalled about shaft 270, by means of bushings 271. As shown, the shaft 270 is in the form of a bolt having a head 272 at one end, and a threaded portion 273 screwed into the opposite bracket 132 at the other. When in operation, the leading end 275 of tape 268 is fed from the supply spool 265 upwardly (in the case of the lower half of the taping device) to the tape applicator roll 144 in the direction shown in FIGURE 9, the adhesive surface 274 of the tape 268 being oriented outwardly so that the two surfaces 274 of the upper and lower tapes face each other, and, in the absence of metal strip between the applicator rolls 144, are pressed into contact with one aonther, as shown in phantom in FIGURE 9.

Adjacent the end of the bracket 132 opposite from the supply spool 265 is a further cross member 280 extending between the two brackets, and maintained in position by screws 281. Aligned with this cross member, and also extending between the two arms 143, is a yoke member 282, best shown in FIGURE 10. Extending through the centre part of the yoke 282 is a bolt 283 having its lower end threaded into the cross member 280 as shown. Beneath the head 284 of the bolt 283 is located a washer 285. A spring 286 is positioned around the shank of the bolt 283 between the washer, at one end, and is seated in a depression 287 on the upper side of the yoke 282. Extending through the cross member 280 at one side of the bolt 284 is a threaded rod 288, provided on its lower end with a wheel 289 having a handle 290. The upper end of the threaded rod 288 is designed to engage with the lower surface of the centre part of the yoke 282. As is apparent from FIGURE 10, when the wheel 289 is turned so as to advance the threaded rod 288 up through the cross member 280, the upper end thereof engages with the lower surface of the yoke 282 and causes compression of the spring 286 between the upper surface of the yoke and the washer 285. This in turn causes the opposite end of the tape applicator arms 143, where the tape applicator roll 144 and foot 150 are located, to move downwardly, and thus out of engagement with their counter parts in the upper half of taping devices. This accordingly releases the pressure between the opposing tape applicator rolls 144 and facilitates removal of the upper and lower halves from the tracks 135 when, for any reason such as reloading of the tape spools, it is necessary to take the tape applicator device out of the carriage. Because of the side pieces 114, 115 it is not feasible to turn the wheels 289 when the taping device 107 is located in its operative position near the centre of the carriage 105. The procedure followed, therefore, is to remove the pins 202 which maintain the taping device in operative position, slide the upper and lower halves together along the rails 135 to the point where the wheels 289 are accessible at the right end (in the embodiment shown in FIGURE 5) of the carriage. The wheels are then turned so as to compress the spring, whereupon the upper and lower halves can be individually removed from the carriage without difficulty. It will in many instances be advantageous to have "spare" upper and lower halves of the taping device as these can be kept ready, loaded with a fresh supply of tape, to be placed on the rails 135 and pushed back into operative position at the centre of the carriage as soon as upper and lower units having exhausted tape supplies are removed therefrom.

As best shown in FIGURE 5, mounted on the side members 114, 115 at a convenient location immediately to the left of the tape applicator rolls 144 is a tape shear generally represented at 160 which, in the embodiment shown in FIGURE 5, is in the form of an air operated guillotine type shear knife having a female part 153 mounted between the side pieces 114, 115 so as to extend downwardly from the upper margin of cut-out 116, and a male part 154 in the complementary location immediately below there. The exact form of shear used is not,

of course, critical; a number of different types will operate satisfactorily. The shear serves to cut off the tape after it has been applied to the severed ends of the strip being joined. Its operation can be initiated by any number of well known control means, such as a photoelectric cell arrangement which can be adjusted to secure cutting of the tape substantially exactly at the edge of the metal strip, or alternatively at some point past the edge so that short lengths of tapes having their adhesive faces mutually joined together extend outwardly from the edge of the strip. This latter procedure has the advantage of not only tending to prevent "peeling" of the tape ends from the edges of the strip, but also provides an identification of the positions in the roll where a splice has been made. It will be noted, moreover, that the position of the shear **160** with respect to the tape applicator rolls **144** is such that, after the tape has been cut, there will be a short length of tape extending to the left of the rolls wherein the mutually facing adhesive surfaces of the two tape strips have been joined together; as has been explained above, and will be discussed in more detail later, this feature is of considerable importance in facilitating the start of the taping stroke when a splicing operation is to be effected.

As is apparent from the foregoing description, the carriage **105**, carrying the splicer device **7** which in turn comprises the strip shear **106**, the taping device **107**, and the tape shear **160**, is adapted to move between a first position, in which the strip shear **106** straddles the strip **1**, and is operably associated therewith, and a second position in which the splicer device **7** is in a pre-taping position with respect to the strip **1**. More particularly, the carriage **105** is adapted to move, when clamps **6**, **8** and **15** are in out position, between a first point in which the tape shear **160** is located beside strip **1** on one side thereof (e.g. the right side as seen in FIGURE 5) and a second point in which the tape applicator rolls **144** are located beside strip **1** on the other side thereof. When carriage **105**, and with it the splicer device **7**, moves from such first point to the second point it executes what may appropriately be called a "preparatory" stroke. Such a stroke is necessary so that the taping device **107** is in a position, with respect to strip **1**, to commence a taping stroke, after clamp **6** and either of clamps **8** or **15**, as the case may be, have been moved back into in position.

The operation of the taping device **107** will now be described with respect to the actual joining together of two pieces of strip; for this purpose particular reference will be made to the sequence of operations illustrated in FIGURES 12 to 19 inclusive.

When a sheet of strip has been sheared by the strip shear **106**, the clamps gripping the ends of the pieces of strip are moved away from the splicer device into out position. Hydraulic push-pull cylinder **123** pulls the carriage **105** through a preparatory stroke so that it passes between the ends of the strip. Splicer device **7**, being rigidly mounted on carriage **105**, is thus moved to a "pre-taping" position in which the tape applicator rolls **144** are located, as explained above, beside the pieces of strip on one side thereof. This can be clearly seen in FIGURES 12 to 19 inclusive. FIGURE 12 shows the normal operation in which strip **1** is being continuously passed through the splicer device **7**, and is indeed passing through the strip shear **106**, the bottom part of which is shown in each of the FIGURES 12 to 19. In FIGURE 12, the tape shear **160** is located beside the strip on one side thereof and the tape applicator rolls **144** are located beside the tape shear **160**, on the side thereof remote from the strip **1**. The leading ends **275** of the tape **268** coming from the supply spools **265** (and thence between the tape applicator rolls **144**) are shown joined together as at **300** (see also FIGURE 9). It will be noted that this joined portion **300** of the leading ends of the tapes **275** extend towards the tape shear **160** from between the tape applicator rolls **144**. FIGURE 13 shows the strip **1** after it has been stopped and sheared into two pieces A and B by means of the strip shear **106**. FIGURE 14 shows the pieces A and B moved apart to allow the splicer device **7**, which is mounted on the carriage **105**, to move between the ends of the pieces of strip A and B into the "pre-taping" position which is illustrated in FIGURE 15. In such "pre-taping" position, the tape applicator rolls **144** are located beside the pieces of strip A and B on the other side thereof—i.e. the side opposite from that on which they were located in the position illustrated in FIGURES 12 and 13.

With the taping device **107** now located in "pre-taping" position, the clamp holding the leading end of piece A is swung into its in position. At the same time a clamp holding the trailing end of another piece of strip C is also swung to its in position so that the pieces of strip A and C are in butt-joint relation, as shown in FIGURE 16. The taping device **107** is now ready to commence a "taping" stroke. This is effected by hydraulic push-pull cylinder **123** pushing the carriage **105** between the aforementioned second and first points respectively. As the taping device **107** approaches the rigidly clamped pieces of strip A and C, the edges A′ and C′ thereof become closer to the tape applicator rolls **144**. As soon as the edges A′ and C′ contact the strips of tape **268** which extend around and through the tape applicator rolls **144**, the said rolls begin to rotate, one on the top surface of the strips A and C and the other on the bottom surface. They leave behind them a strip of tape on both the upper and lower surfaces of the joint. FIGURE 17 shows the taping device **107** midway through a "taping" stroke, with the strip of tape **268** effecting a join between the upper surfaces of the pieces of strip A and C. It is to be noted that the joined portion **300** of the strips of tape **268** which normally extends from between the tape applicator rolls **144** when the taping device **107** is not operating, is in an overhanging position with respect to the joined strips A and C, and positively identifies such a join. As shown in FIGURE 20, an identical piece of tape **268** is applied to the bottom surface of the join between the pieces A and C. As discussed above, tape applicator rolls **144** are yieldably urged together by means of the springs **286** and consequently roll the pieces of tape onto the strip under considerable pressure. This ensures that the tape strips firmly adhere to the surface of the metal.

In FIGURE 18, the taping device **107** has completed its "taping" stroke and is back in the normal position—i.e. with the strip shear **106** straddling the metal strip pieces A and C which are now, of course, spliced together. The completed join is shown in FIGURE 18 before the tape strips **268** have been sheared by the tape shear **160**. This figure clearly shows the spaced relation between the tape shear **160** and the tape applicator rolls **144** which results in a direct join between the mutually facing adhesive surfaces of the leading ends of the tape strips coming from the tape supply spools, thus forming a segment of joined strip **300**. It is obvious, moreover, that the tape shear **160** can be positioned so that a portion of the mutually adhering pieces of tape is allowed to overhang the edges of the strip pieces A and C, so as to inhibit "peeling" of the tape from the edges of the metal strip and also to serve as an additional marker to indicate the location of the join. FIGURE 19 shows the finished join between the pieces of strip A and C after the tape shear **160** has severed the tapes. The clamps gripping the pieces of strip A and C are then released and the strip allowed to move forward.

It will be apparent from the foregoing description that positive control over the ends of the tape strips has been obtained by permitting a joined section **300** to protrude at all times from between the tape applicator rolls **144**. If this joined section **300** was not present, there would be no adequate control over the tape strips and a satisfactory taped sliced joint would not be obtained.

What we claim as our invention is:

1. A method for selectively directing a continuously produced metal strip from a first destination to a second destination with a minimum of stopping time, said method comprising the steps of: (*a*) stopping the strip, (*b*) clamping the strip by means of first and second clamps respectively located on opposite sides of a strip shear, which straddles the strip, and a taping device, aligned with said shear, which is located in a first position on one side of the strip, said first clamp being on the side of said shear and taping device adjacent the source of said incoming continuously produced strip and said second clamp being on the opposite side thereof, (*c*) shearing the strip, (*d*) moving outwardly, away from each other, both of said clamps so as to part the severed ends of the pieces of strip (*e*) moving said strip shear and taping device between the ends of the strip until the taping device reaches a second position at the other side of the sheared pieces of strip (*f*) moving said first clamp so that the end gripped by said clamp is in position for taping (*g*) moving a third clamp, also located on said opposite side which grips the trailing end of strip previously directed to said second destination, so that said last-mentioned end is in position for taping (*h*) moving the taping device so as to effect a taping stroke and apply a strip of tape to each surface of the pieces at the ends thereof and, past said one side thereof, so as to cause the strips of tape to join together, (*i*) severing said strips of tape adjacent said one edge so as to leave a portion of the outer ends of the strips of tape leading from the tape supply pressed together in the taping device.

2. A method of effecting a butt joint between the ends of two pieces of sheet material by applying to each of the surfaces of said pieces a strip of adhesive tape having a length which extends from one edge of the pieces to the other and a width which spans the joint line, said method comprising the steps of (*a*) arranging said pieces so that the ends are in butt joint relation, (*b*) establishing at one edge of said pieces a nip formed of two strips of adhesive tape having joined together ends extending out of the exit side of the nip with the other ends thereof located above and below opposite surfaces of the pieces, said tapes having their adhesive surfaces facing each other in the nip; passing said one edge of the pieces into the entry side of the nip and continuing to effect relative movement therebetween, while maintaining said joined together ends in fixed position with respect to said pieces on one side thereof, and continuing said relative movement until said nip has passed said other edge of the pieces whereby a strip of adhesive tape is applied along the joint line on each surface of the pieces and a further length of joined together tape extends from the exit side of the nip to said other edge.

3. A method of effecting a butt joint between the ends of two pieces of relatively rigid sheet material by applying to each surface of said pieces a strip of adhesive tape the length of which extends from one edge of the pieces to the other, and the width of which spans the joint line, said method comprising the steps of (*a*) clamping said pieces adjacent the ends so as to maintain them in registry with each other in a butt joint relation (*b*) establishing at one edge of said pieces a nip formed of joined together ends of two adhesive tapes respectively extending from tape supply sources disposed above and below opposite surfaces of the pieces, said tapes having adhesive surfaces facing each other in the nip and forming a segment of joined together tapes extending out of the exit side of the nip, (*c*) advancing the nip thus formed so as to engage therein said one edge of the pieces, (*d*) continuing to advance the nip so as to cause it to traverse the pieces and apply the adhesive tape along the joint line on the surfaces thereof, (*e*) further advancing the nip beyond the other edge of said pieces so as to cause the tapes to contact directly and once again form a joined together length of tape extending out of the exit side of the nip and (*d*) severing said tapes adjacent said other end edge of said pieces.

4. A device for effecting a taped joint between the ends of two pieces of rigid sheet material comprising: a supporting framework; track means mounted on the supporting framework and extending thereacross substantially parallel to the proposed joint line; a movable carriage mounted on said track means, said carriage having a taping device which includes aligned upper and lower tape applicator members having a continuous circular periphery, said members being yieldably urged together to form a nip having entry and exit faces, upper and lower strips of tape respectively extending to the upper and lower applicator members, said strips entering the nip, passing between said applicator members and thence extending beyond the exit face of the nip, said strips having adhesive surfaces facing each other so as to form, beyond said exit faces, a segment of joined together tapes, and tape shear means mounted on said carriage independent of said applicator members, said tape shear means being located adjacent the exit faces of the nip; clamps mounted on the framework for releasably gripping the pieces to be joined adjacent the ends thereof and for maintaining the same in butt joint relation; and means for moving the carriage on the track so as successively to advance the nip towards one edge of both said pieces and cause said edge to enter the entry side of the nip, further advancing the nip so as to cause it to traverse said pieces to the other edge thereof and apply a strip of adhesive tape along the join line on both surfaces of said pieces, and still further moving said carriage until the shear means is located at said other edge and a joined together length of tape extends out of the exit side of the nip to said other edge.

5. In the continuous production of strip material the method of selectively directing the travel of the strip from a first destination to a second destination comprising the steps of (*a*) stopping movement of a section of the strip when the same is in a region of the line of travel of the strip which is common to both destinations, while accumulating during the next four steps incoming strip between said region and the source of said incoming strip (*b*) shearing said strip in said region (*c*) moving away from the leading end of the incoming strip the trailing end of the strip previously going to said first destination (*d*) moving into proximity with said leading end the trailing end of a segment of strip previously directed to said second destination and extending thereto (*e*) joining by means of adhesive tape said last-mentioned leading and trailing ends and (*f*) releasing the strip in said region so as to permit the same to travel to said second destination.

6. In the classification and handling of metal strip continuously delivered from a source thereof to a first destination intended for prime quality strip only, the method of diverting from said first destination any reject strip which the source may yield so as to segregate the prime strip from the reject strip, said method comprising the following steps: (*a*) stopping the movement of that part of the strip containing the transition from prime strip to reject strip so as to locate such part in a region of the line of travel of the strip which is common to both said destinations while continuing during the next four steps to accumulate between said region and the source incoming reject strip (*b*) severing the strip in said region at a point prior to the commencement of the reject portion thereof (*c*) separating the trailing end of the prime strip from the leading end of the incoming reject strip (*d*) moving into proximity with said leading end the trailing end of a segment of previously produced reject strip which extends to said second destination (*e*) effecting by means of adhesive tape a joint between said last-mentioned leading and trailing ends (*f*) releasing the strip in said region and permitting the same to move to said destination until the source again delivers prime strip (*g*) stop-

ping the movement of that part of the strip containing the transition from reject strip to prime strip so as to locate such part in the said region while continuing during the next four steps to accumulate incoming prime strip between said region and the source (*h*) severing the strip in said region at a point prior to the commencement of the prime portion thereof (*i*) separating the trailing end of the reject strip from the leading end of the incoming prime strip (*j*) moving into proximity with said last-mentioned leading end the trailing end of the segment of the previously produced prime strip which extends to said first destination (*k*) effecting by means of adhesive tape a joint between said last-mentioned leading and trailing ends and (*l*) releasing said strip in said region so as to permit the incoming prime strip to pass to said first destination.

7. A device for effecting a taped joint between the ends of two pieces of relatively rigid sheet material, comprising: a supporting frame work; track means mounted on the supporting frame work and extending thereacross substantially parallel to the joint; a movable carriage mounted on said track means, said carriage having a taping device which includes aligned upper and lower tape applicator members yieldably urged together to form a nip having entry and exit faces, upper and lower tape supply spools each feeding a strip of adhesive tape to the upper and lower applicator members, respectively, said strips entering the nip, passing between said applicator members and thence extending beyond the exit face of the nip, the adhesive surfaces of the strip facing each other, and tape shear means located adjacent the exit face of the nip; clamps mounted on the frame work for releasably gripping the pieces to be joined adjacent the ends thereof; means for moving at least one of the clamps between an out position in which an end to be joined is remote from the carriage, and an in position in which the ends to be joined are aligned with the taping device; means for moving said carriage along said track between a first point where, when the clamps are in an in position, the tape shear means is located adjacent one edge of the pieces, and a second point where, when the clamps are in an in position, the entry face of the nip is adjacent the other edge of the pieces.

8. A device for effecting a taped butt joint in a continuously produced metal strip comprising; a supporting frame work; track means mounted on the supporting frame work and extending thereacross substantially parallel to the joint; a carriage having a strip shear and a taping device, said taping device including aligned upper and lower tape applicator members yieldably urged together to form a nip having entry and exit faces, upper and lower tape supply spools each feeding a strip of adhesive tape to the upper and lower applicator members, respectively, said strips entering the nip, passing between said applicator members and thence extending beyond the exit face of the nip, the adhesive surface of the strips facing each other, and tape shear means located adjacent the exit face of the nip; movable clamps mounted on the frame work for releasably gripping the pieces to be joined adjacent the ends thereof; means for moving the clamps between an out position in which the ends to be joined are remote from the carriage, and an in position in which the ends to be joined are aligned with the taping device; means for moving said carriage along said track between a first point where, when the clamps are in in position, the tape shear means is located adjacent one edge of the pieces and the strip shear extends across the line of travel of the strip, and a second point where, when the clamps are in position, the entry face of the nip is adjacent the other edge of the pieces.

9. A device for effecting a taped butt joint in a continuously produced metal strip as defined in claim 8, including a sensing nozzle associated with the incoming continuously produced metal strip, and means controlled by said sensing nozzle whereby the edges of the pieces of strip to be joined are maintained in aligned position.

10. A device for selectively directing a continuously produced metal strip to either of two destinations with a minimum of stopping time, said device comprising: a storage loop tower; a first supporting framework; track means mounted on said first framework and extending thereacross substantially at right angles to the direction of travel of the strip; a carriage having a strip shear and a taping device; said taping device including aligned upper and lower tape applicator members and pressure applying means associated with each of said applicator rolls, said pressure applying means yieldably urging said rolls together to form a nip having entry and exit faces, upper and lower tape supply spools each feeding a strip of adhesive tape to the upper and lower applicator members, respectively, said strips entering the nip, passing between said applicator members and thence extending beyond the exit face of the nip, the adhesive surface of the strips facing each other, and tape shear means located adjacent the exit face of the nip; a second supporting framework slidably mounted on a second track means; a first clamp swingably mounted on said first framework adjacent one side of the carriage for releasably gripping the incoming continuously produced metal strip adjacent the leading edge thereof, a second clamp swingably mounted on said second framework adjacent the other side of the carriage for releasably gripping the trailing end of strip which has been directed to a first destination, a third clamp swingably mounted on said second framework adjacent the carriage on the other side thereof and spaced vertically from said second clamp for releasably gripping the trailing end of strip previously directed to a second destination; means for moving the clamps between an out position in which the ends to be joined are remote from the carriage, and an in position in which the ends to be joined are aligned with the taping device; means for moving said carriage along said track between a first point where, when the clamps are in in position, the tape shear means is located adjacent one edge of the pieces and the strip shear extends across the line of travel of the strip, at a second point where, when the clamps are in in position, the entry face of the nip is adjacent the other edge of the pieces.

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