Jan. 26, 1960 H. J. KROBATH 2,922,540

APPARATUS FOR APPLYING MARKERS TO WIRE

Filed May 12, 1959 3 Sheets-Sheet 1

Fig. 2

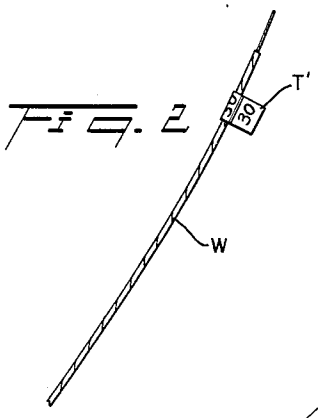


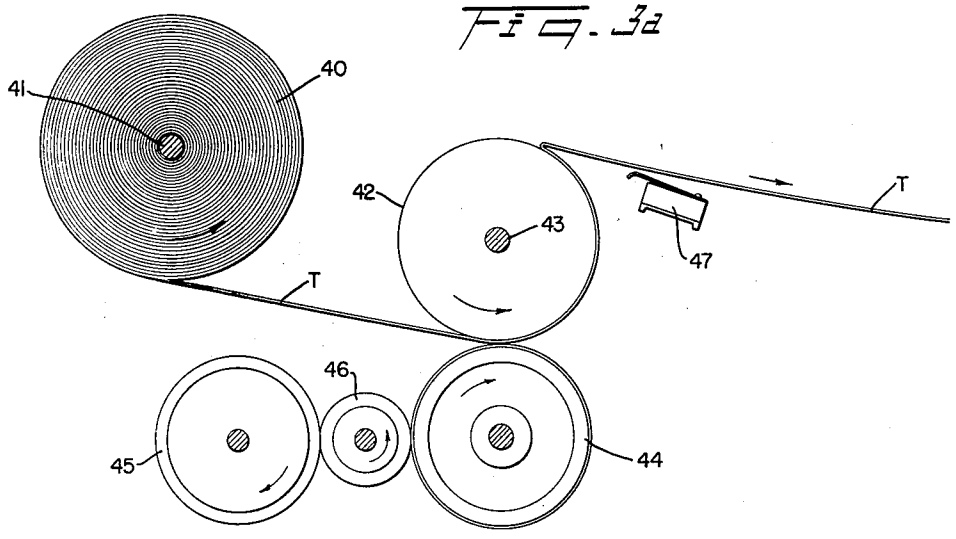
Fig. 1

Jan. 26, 1960 H. J. KROBATH 2,922,540

APPARATUS FOR APPLYING MARKERS TO WIRE

Filed May 12, 1959 3 Sheets-Sheet 2

Fig. 3a



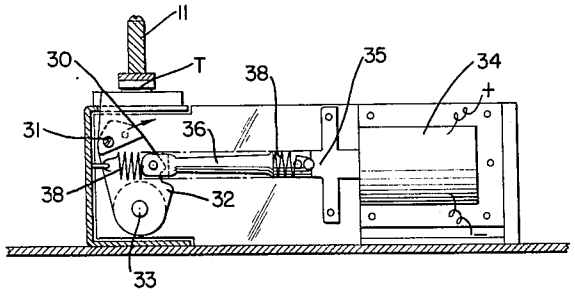


Fig. 4

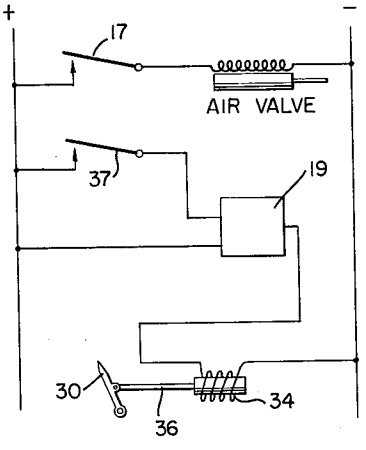


Fig. 9

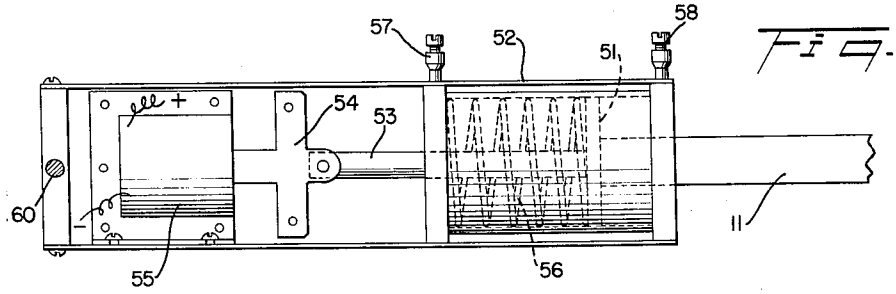


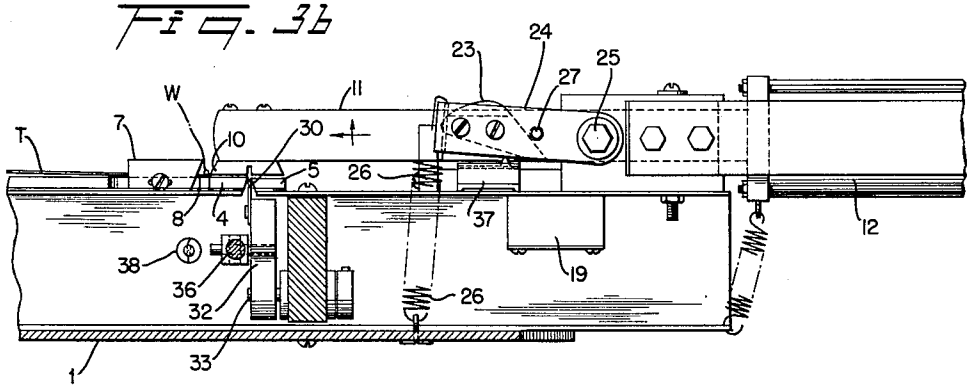
Fig. 10

Jan. 26, 1960 H. J. KROBATH 2,922,540

APPARATUS FOR APPLYING MARKERS TO WIRE

Filed May 12, 1959 3 Sheets-Sheet 3

Fig. 3b



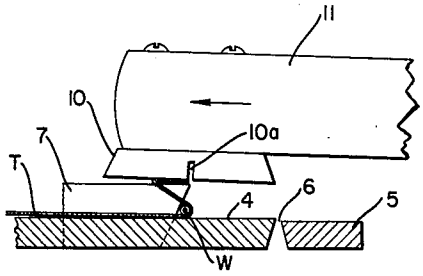


Fig. 5

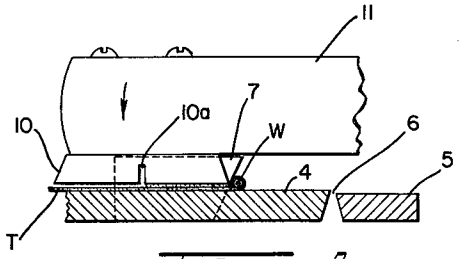


Fig. 6

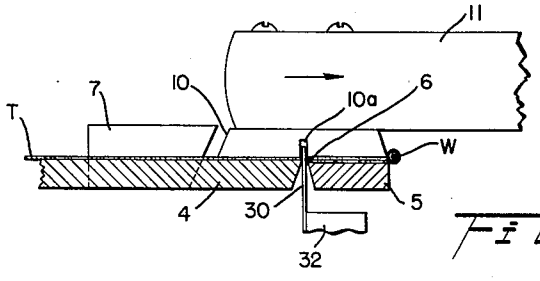


Fig. 7

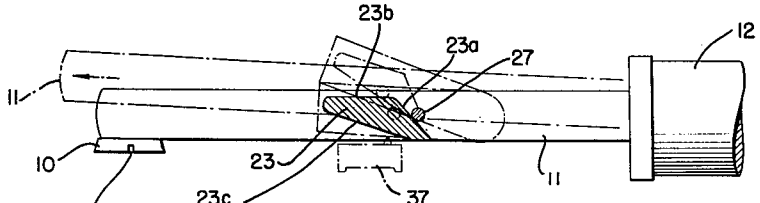


Fig. 8

United States Patent Office 2,922,540 Patented Jan. 26, 1960

2,922,540

APPARATUS FOR APPLYING MARKERS TO WIRE

Hans Johann Krobath, Glen Cove, N.Y., assignor to Abilities, Inc., Albertson, Long Island, N.Y., a corporation of New York

Application May 12, 1959, Serial No. 812,685

13 Claims. (Cl. 216—29)

The present invention relates to apparatus for applying labels or markers to wire, the term wire being used broadly to include cables, bars, strands, rods, etc.

In wiring harnesses and other wiring systems for electrical and electronic equipment, it is necessary to have each wire identified. This is conveniently done by means of adhesive tape which passes around the wire and has opposite ends adhered to each other to form a tab. The tapes marking different wires are distinguished from one another by color, letters, numbers, characters or other indicia. Heretofore, tape markers of this kind have been applied by hand. However, this has been a laborious and expensive operation particularly since complicated wiring systems may have a very large number of wires and since each wire must be marked at least adjacent each end and sometimes at intermediate points.

It is an object of the present invention to provide apparatus for applying markers to wires rapidly and economically. The characteristics, objects and advantages of apparatus in accordance with the present invention will be more fully understood from the following description and claims in conjunction with the accompanying drawings which illustrate by way of example preferred embodiments of the invention. In the drawings:

Fig. 1 is a plan showing apparatus embodying the invention.

Fig. 2 is a perspective view showing a portion of wire with a marker applied to it.

Figs. 3*a* and 3*b* are together a partial side elevation, partially in section, showing apparatus embodying the invention.

Fig. 4 is a cross section taken approximately on the line 4—4 in Fig. 1.

Figs. 5, 6 and 7 are enlarged fragmentary side elevations shown partially in section and illustrating successive phases in the operation of the machine.

Fig. 8 is a partial side elevation illustrating the operation of the apparatus.

Fig. 9 is a wiring diagram showing control circuits for the apparatus and

Fig. 10 is a partial side elevation illustrating a modification.

The embodiment of the invention shown by way of example in the drawings comprises a supporting structure or frame 1 which supports the operating parts of the apparatus. A continuous length of adhesive tape T that is to be applied to a wire is fed over a roller 2 and feed table 3 onto a supporting surface 4 (Fig. 5). A second supporting surface 5 is located at a slightly lower level than the supporting surface 4 and is separated from the supporting surface 4 by a gap or slot 6 which extends transversely of the direction of travel of the tape T. The difference in level of the two supporting surfaces is preferably about the thickness of the tape T. On opposite sides of the supporting surface 4 there are provided guide blocks 7 which guide the tape laterally and have inclined end faces 8 which slope downwardly and in a direction

opposite to the direction of movement of the tape. A wire W to which an adhesive tape marker is to be applied is positioned in the acute angle between the inclined end faces 8 of the guide block 7 and the supporting surface 4 and extends transversely of the tape as illustrated in Fig. 1.

The tape T is preferably a plastic, paper, fabric or other strip having on one side an adhesive surface which will adhere to itself. A portion of the tape T is wrapped around the wire W to form a marker by means of a head 10 carried by a reciprocating plunger 11 which is guided in its reciprocation so as to move the head 10 in a selected path. The plunger 11 is reciprocated mechanically, electrically or by fluid pressure. In the embodiment illustrated by way of example in Figs. 1 and 3*b*, the means for reciprocating the plunger 11 comprises a cylinder 12 to which air under pressure is supplied by a line 13 under control of an electrically operated valve 14 connected to a supply line 15. When the valve 14 is opened, air is supplied to the cylinder 12 to move the plunger to the left as viewed in Fig. 3*b*, the plunger being connected to a piston (not shown) in the cylinder. Return movement of the plunger 11 in the opposite direction is effected by a compression spring (not shown) enclosed in the cylinder 12 and acting between the end of the cylinder and the piston.

The electrically operated air valve 14 is controlled by a switch 17 having an actuating lever 18. The switch 17 is connected in circuit with the air valve as illustrated in Fig. 9 so that when the switch 17 is actuated by pressure on the lever 18 it supplies current to the valve 14 which is thereby opened to supply air to the cylinder 12 and move the plunger 11 to the left as viewed in Fig. 3*b*. When pressure on the lever 18 is removed the air supply valve is closed and a release port is opened to permit the plunger to return to its initial position under action of the return spring to complete a cycle. While the switch 17 can, if desired, be controlled photoelectrically or by contact with the wire W, it is shown arranged for manual operation, the actuating lever 18 being located adjacent the position of the wire W and near the supporting surface 4 so as to be actuated conveniently by a finger of the operator holding the wire W.

The cylinder 12 is supported by pivots 21 so as to swing about a transverse horizontal axis located adjacent the rear end of the cylinder. The pivotal mounting of the cylinder 12 permits the assembly comprising the plunger 11 and cylinder 12 to swing about the pivots 21 as the plunger is reciprocated so that during its reciprocation, the plunger can be moved transversely in a vertical direction by associated guide means to move the head 10 in a selected path. The means for guiding the plunger 11 is shown as comprising an approximately triangular cam 23 fixed to and carried by an arm 24 swingable about a pivot 25 having a horizontal pivotal axis parallel to that of the cylinder pivots 21. The arm 24 carrying the cam 23 is biased downwardly against a selectively positioned stop by a spring 26. The cam 23 is engaged by a cam follower on the plunger 11, shown in the form of a laterally projecting pin 27 (Fig. 1). During forward movement of the plunger 11 (toward the left as viewed in Fig. 8), the pin 27 rides up an upwardly inclined face 23*a* of the cam to lift the plunger 11, and then along a substantially horizontal upper face 23*b* of the cam 23. At the end of the forward movement of the plunger, the pin 27 drops down over the nose of the cam. On the return stroke of the plunger, the pin 27 engages the downwardly sloping lower face 23*c* of the cam and thereby lifts the cam 23 so that the arm 24 swings upwardly about its pivot 25 to the position shown in broken lines in Fig. 8. At the end of the return stroke of the plunger the pin 27 clears

the lower rear point of the cam 23 so that the cam rides off of the pin, and the arm 24 together with the cam 23 drops back to its initial position.

The resulting movement of the head 10 is illustrated in Figs. 3*b*, 5, 6 and 7. In its initial position (Fig. 3*b*) the head 10 is spaced from the inclined end faces of the guide blocks 7 in the direction of movement of the tape. A forward portion of the head 10 rests on an end portion of the tape T supported on the surface 4 with its adhesive side up. With the parts in this position, a wire W is placed transversely of the tape and against the inclined end faces 8 of the guide blocks 7. The switch 17 is then actuated by means of the lever 18 to start the cycle of movement of the head 10.

As the head 10 moves forwardly (to the left) it is raised by engagement of the pin 27 with the cam 23 and passes over the wire W as illustrated in Fig. 5. During this movement an end portion of the tape is wrapped up around the wire W and is peeled progressively off of the head 10. At the end of the forward movement of the plunger 11, the pin 27 drops off of the nose of cam 23 to permit the head 10 to drop down onto the tape T as illustrated in Fig. 6. It will be noted that the length of the stroke of the plunger is such as to bring the head 10 just past the wire W. A rearward portion of the head 10 engages the end portion of the tape that has been folded over the wire and presses it against the adhesive face of an adjacent portion of tape. The forward portion of the head 10 overlies the adhesive face of a further portion of tape. The head 10 is then moved toward the left to its initial position as illustrated in Fig. 7 carrying the wire W and tape T with it and thereby drawing the tape forwardly with a feeding movement. When the head reaches its initial position, the folded-over portion overlies the supporting surface 5 which is lower and hence permits the forward portion of the head to drop down into firm engagement with the adjacent portion of tape on supporting surface 4. The tape is then severed adjacent the end of the folded-over portion to complete the operation.

Means for automatically severing the tape T is shown in the drawings (Figs. 1, 3*b* and 4) as comprising a small double edged knife blade 30 which is reciprocable transversely of the tape in the slot 6 between tape supporting surfaces 4 and 5 and a slot 10*a* in the head 10 which registers with the slot 6 when the head is at the end of its movement as illustrated in Fig. 7. The knife blade 30 is shown (Fig. 4) as being connected by a screw 31 to a knife holder 32 which is pivoted at 33. The blade carrier 32 is swingable about its pivot 33 by means of a solenoid 34 having an armature 35 connected to the blade carrier by a connecting rod 36 which is pivotally connected to the armature 35 and to the blade carrier 32. In its rest position, the blade 30 is at one side of the tape T with the point of the blade approximately level with the tape. When the solenoid 34 is energized, the armature 35 moves toward the right as viewed in Fig. 4 and the blade carrier 32 is swung about its pivot 33 in a clockwise direction to move the blade 30 transversely of the tape so that the tape is thereby severed. On its return movement, the blade 30 is moved across the tape in a reverse direction to assure complete severance.

In the embodiment illustrated by way of example in the drawings, the solenoid 34 is controlled by an interval time switch 19 and by a micro switch 37 (Fig. 3*b*) which is located under the swinging arm 34 carrying the cam 23 and has an operating member engageable by the arm 24 when the cam 23 drops off of the pin 27 at the end of the return movement of the plunger 11. The switches are connected as shown in the wiring diagram of Fig. 9. The switch 19 is of the time delay interval timer type to supply current to the solenoid 34 a selected short interval of time after the switch 37 is actuated and to continue the supply of current for a further short interval of time, for example 0.1 second. The slight delay assures that the head is completely "home" before the cutting operation. The solenoid 34 is thus energized momentarily to actuate the blade 30 and thereby sever the tape T when the head 10 has completed its cycle of movement and has returned to its rest position as illustrated in Fig. 7. The solenoid is then deenergized by action of the interval switch 37 and knife carrier and knife are returned to their rest position by a spring 38.

When the tape is severed by the knife 30 as illustrated in Fig. 7 the cycle of operations is completed and the wire is removed from the machine. It will be seen that a portion of the tape is wrapped around the wire and adhered to an adjacent portion of tape so as to form a tab T' on the wire as illustrated in Fig. 2. The tape is of a distinctive color or is previously printed with numbers or other characters to identify the wire to which the tape is applied.

The tape may, if desired, be supplied from a roll which has been previously printed, for example during the manufacture of tape. Alternatively the tape may be printed during the process of applying it to the wire as in a preferred embodiment of the invention as illustrated in Fig. 3*a*. In this embodiment adhesive tape from a roll 40 supported on a spindle 41 is fed over a feed roller 42 on a motor driven shaft 43. The roller 42 is preferably formed of nylon or other firm, resilient material. A rotatable printing wheel 44 engages the non-adhesive face of the tape as the tape passes over the feed roll 42. On its periphery the printing wheel 44 is provided with a series of type characters arranged so as to print the desired number or other code repeatedly on the tape. Ink is supplied to the type on the printer wheel 44 by suitable inking rollers 45 and 46. By reason of its adhesive character, the tape T tends to stick to the feed roll 42 but is readily removed therefrom by a slight pull. From the feed roll 42 the tape passes through the tape applying mechanism illustrated in Figs. 1 and 3*b*. As the tape is progressively fed forwardly by operation of the reciprocating head 10 as described above, it is pulled from the roller 42. The driving motor for the feed roll 42 is controlled by a micro switch 47 located in a position to be engaged by the tape when a selected portion of tape has been stripped from the roll 42 by the tape applying mechanism. The feed roll 42 is thereupon motor driven in a counterclockwise direction to print more tape and make it available for application to the wire. The feeding and printing mechanism is thus automatically controlled in accordance with the operation of the tape applying mechanism.

Instead of being reciprocated by fluid pressure as illustrated in Fig. 1, the plunger 11 may be reciprocated electrically as illustrated in the embodiment shown in Fig. 10. In this embodiment, the plunger 11 is connected to a piston 51 in a cylinder 52. The piston 51 is connected by a connecting rod 53 to the armature 54 of a solenoid 55. When the solenoid 55 is energized the armature 54, pistons 51 and plunger 11 are moved toward the left as viewed in Fig. 10. Return movement is effected by a coil spring 56 enclosed in the cylinder 52 and acting between the end of the cylinder and the piston 51. Rate of movement of the piston 51 is controlled by means of adjustable air valves 57 and 58 which regulate the rate at which air is admitted to and exhausted from opposite ends of the cylinder. By suitable adjustable of the valves 57 and 58 the rate of movement of the plunger 11 is regulated as desired. While the plunger 11 is shown as being moved toward the left by energizing the solenoid 55 and toward the right by the spring 56 it will be understood that this action may be reversed if desired. The assembly comprising the cylinder 52 and solenoid 55 is supported by a frame 59 which is pivotally mounted to swing about a pivot 60 corresponding to the pivots 21 of the embodiment shown in Fig. 1.

While preferred embodiments of the invention have been shown by way of example and particularly described, it will be understood that the invention is in no way

limited to these embodiments and that other modifications may be made without departing from the scope and spirit of the invention.

What I claim and desire to secure by Letters Patent is:

1. Mechanism for applying an adhesive tape marker to a wire, comprising means for guiding an adhesive tape to be applied, including a surface supporting the tape with the adhesive side up, means for supplying tape to said guide means, means for severing tape supported by said surface, means for positioning a wire transversely on said tape supported on said surface between said severing means and said supplying means, a head engageable with said tape supported on said surface and means for moving said head from a rest position in which said head engages the adhesive side of an end portion of said tape supported on said surface, upwardly and over said wire in a direction toward said supplying means and then downwardly to fold said end portion of tape over said wire and bring it into engagement with an adjacent portion of tape while bringing said head into engagement with a further portion of said tape, and thereafter returning said head to said rest position, and means for operating said severing means to sever said tape between said folded-over portion and said further portion.

2. Mechanism for applying an adhesive tape marker to a wire, comprising means for guiding an adhesive tape to be applied, including a surface supporting said tape with the adhesive side up, means for supplying tape to said guide means, means for severing tape supported by said surface, means for positioning a wire transversely on said tape supported on said surface between said severing means and said supplying means, a plunger moveable in a direction generally lengthwise of said tape and also toward and away from said surface, a head carried by said plunger and engageable with tape supported on said surface, means for reciprocating said plunger and simultaneously guiding it in a selected path to move said head from a rest position in which said head engages the adhesive side of an end portion of said tape supported on said surface, upwardly and over said wire in a direction toward said supplying means and then downwardly to fold said end portion of tape over said wire and bring it into engagement with an adjacent portion of tape while bringing said head into engagement with a further portion of said tape, and thereafter returning said head to said rest position, and means for operating said severing means to sever said tape between said folded-over portion and said further portion.

3. Mechanism according to claim 2, in which said means for reciprocating said plunger comprises an air cylinder and piston, means for supplying air to said cylinder and means for controlling the supply of air to said cylinder.

4. Mechanism according to claim 3, in which the means for controlling the supply of air to said cylinder comprised an electrically operated air valve, means for supplying electricity to energize said valve and switch means controlling the supply of electricity to said valve.

5. Mechanism according to claim 3, further comprising means pivotally supporting said cylinder to swing about a transverse axis to permit movement of said head toward and away from said surface as said plunger reciprocates.

6. Mechanism according to claim 2, in which said means for guiding said plunger during its reciprocation comprises a cam and a cam follower.

7. Mechanism according to claim 2, in which said means for guiding said plunger during its reciprocation comprises a member pivotally mounted on a support, a cam carried by said pivoted member and a cam follower on said plunger engaging said cam to raise the plunger during a forward stroke of said plunger and to swing said member about its pivot during a return stroke of the plunger.

8. Mechanism according to claim 7, in which said means for operating said tape severing means is electrically operated and in which switch means associated with and actuated by said pivoted member controls said operating means.

9. Mechanism according to claim 1, further comprising means for printing identification characters on said tape, said printing means being disposed between said tape supplying means and said guide means.

10. Mechanism according to claim 9, in which said printing means comprises a printing roller having characters on its periphery, means for applying ink to said characters and a pressure roller pressing said tape against said printing roller as said tape passes from said supplying means to said guide means.

11. Mechanism for applying an adhesive tape marker to a wire, comprising means for guiding an adhesive tape to be applied, including a first tape-supporting surface and a second tape-supporting surface spaced from said first surface by a narrow slot, means for supplying tape to said guide means so as to pass sequentially over said surfaces with the adhesive side up, said slot extending transversely of the tape, means for severing tape supported by said surfaces, said severing means comprising a cutter movable through said slot and means for moving said cutter, means for positioning a wire transversely on said tape supported on said first surface between said slot and said supplying means, a head engageable with tape supported on said surfaces and means for moving said head cyclically from a starting position in which said head engages the adhesive side of an end portion of tape supported on said first surface, upwardly and over said wire in a direction toward said supplying means to fold said end portion back over said wire while progressively peeling it off of said head, then downwardly toward said surfaces to press said end portion into adhesive engagement with an adjacent portion of the tape and bring said head into engagement with a further portion of the tape and thereafter returning said head to the starting position and thereby advancing said tape so that said folded end portion is past said slot, said severing means being operated to cut said tape adjacent the end of said folded end portion while it is held between said head and said surfaces.

12. Mechanism according to claim 11, in which said second surface is lower than said first surface by an amount approximately equal to the thickness of said tape.

13. Mechanism according to claim 11, in which said head has a transverse slot registering with said slot between said surfaces when the head is in starting position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,232,729	Randolph	Feb. 25, 1941
2,704,168	Nord et al.	Mar. 15, 1955