MACHINE FOR APPLYING PRESSURE-SENSITIVE TAPE TO METAL SHEETS

Fred D. Childs, Springville, Utah, assignor to Brigham Young University, Provo, Utah
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9 Claims. (Cl. 156—852)

The present invention relates to a machine for applying pressure-sensitive tape to metal sheets, including plate and strip.

Sheets of metal such as aluminum, brass, Monel, stainless steel and the like are frequently finished to a fine polish which can easily be damaged during handling, fabrication of articles therefrom and the like. Such damage can be avoided by applying pressure-sensitive tape to the polished surfaces of the metal sheets. The machine of the present invention is capable of applying such tape smoothly and rapidly over either the upper or lower surface or simultaneously over both upper and lower surfaces of metal sheets, including strip and plate.

The structure and principle of the machine of the present invention will be apparent to those skilled in the art from the following description taken in conjunction with the drawings in which:

FIG. 1 is an elevation of the infeed side of the machine; FIG. 2 is an end elevation looking toward the left of FIG. 1; FIG. 3 is a vertical sectional view along the line 3—3 of FIG. 1; FIG. 4 is a fragmentary sectional view on a larger scale of the upper part of FIG. 3 showing some of the parts in a different operative position; FIG. 5 is a fragmentary elevation on a larger scale of the right end of the machine looking at it from the outfeed side; FIG. 6 is a horizontal sectional view of the fragment of the machine along the line 6—6 of FIG. 5; and FIG. 7 is a circuit diagram of the motor control circuit.

The machine comprises a frame 10 on which the various operating parts of the machine are suitably mounted. While any suitable frame will function satisfactorily a relatively inexpensive and conveniently fabricated frame comprises two side pieces 12 and a top piece 14 made of channel iron welded together with two base rails 16 and a base stabilizer angle iron 18 welded to each side piece 12 adjacent to the bottom end thereof as seen in FIGS. 1 and 2. For a purpose set forth hereinafter the frame 10 is preferably constructed of a lower section 20 and an upper section 22 by making the side pieces 12 in two parts separated by a horizontal line of separation. Adjacent to the top of the side rails or pieces 12 of the lower section 20 are two upper angle iron rails 24 welded at their ends to the side pieces 12. They serve also as part of the means for guiding metal sheets into the machine and supporting them as they move from the machine. Bottom rails 26 are similarly welded to the lower part of the side pieces 12 of the upper section.

A motor mount 28 is provided at one end of the machine by welding a suitable piece to the base rails 16 as seen in FIGS. 1 and 3. Pivot means 30 are provided for joining the upper section 22 to the lower section 20 so that they can swing relative to each other on a pivot axis. A convention pivot structure comprises a lower frame journal block 32 welded to the side pieces 12 of the lower section adjacent to their upper ends, an upper frame journal block 34 suitable welded to the side pieces 12 of the upper section adjacent to their lower ends, e.g., by means of an upper frame mounting block 36 which is welded both to the side piece 12 and the block 34 extending across the horizontal line of separation of the upper and lower frame sections, and a pivot rod 38 passing through the two journal blocks at each end to form the pivot axis.

Toward the opposite side of the upper frame section 22 from the pivot means 30 an upper feed roll 40 is suitably journaled in the side pieces 12 and directly below roll 40 a lower feed roll 42 is preferably pressure-sensitive adhesive layer 44 adhered to the uncoated or adhesive-free side of the backing. This property is utilized in the machine of the present invention in particular in the outfeed side to support the trailing end of the sheet as it is leaving the machine with the pressure-sensitive tape adhering to it and facilitates the shearing operation later to be described.

Means to drive at least one of the feed rolls may comprise an electric motor 44 mounted on the motor mount 28 connected through a suitable speed reduction means to the lower feed roll 42. The speed reduction means shown in the drawing comprising in FIGS. 1 and 2 comprises a small pulley 46 mounted on the motor shaft, a stub shaft 48 journaled in the side piece 12 having a large pulley 50 on its inner end and a small pulley 52 on its outer end, a large pulley 54 mounted on the end of feed roll 42 and V-belts 56 for pulleys 46 and 50 and 58 for pulleys 52 and 54. The gear reduction is such that the peripheral speed of the feed roll, and therefore the speed at which a sheet moves through the machine, approximates about one foot a second, although this speed is not critical.

Where both feed rolls are to be driven the lower roll is provided at the end opposite pulley 54 with a gear 56 which meshes with a like gear 62 on the adjacent end of the upper feed roll 40 which may also be provided with a hand wheel 64 to facilitate threading of tape into the bight.

An upper tape roll 70 wound around an axle 72 is rotatably mounted on the upper frame section by means of a bracket 74. A lower tape roll 76 wound around an axle 78 is rotatably mounted on the lower frame section by means of a bracket 80. An idler roll 82 is provided in bracket 74 for the tape from roll 70 and a similar idler roll 84 is provided in the lower frame section for tape from roll 76. The tape is of the masking tape type, preferably, which those skilled in the art know comprises a backing coated on one side only with a suitable pressure-sensitive adhesive. It is the adhesive-free surface of the backing that runs over the idler rolls 82 and 84 and which engages the feed rolls 40 and 42. Thus the adhesive-coated surface of the tape is pressure-sensitive adhesive layer to the uncoated or adhesive-free side of the backing. This property is utilized in the machine of the
present invention to assure smooth application of the tape to the metal sheet as it is pulled from the tape roll by the feed roll. The tension on the tape between the line where it is being pulled from the roll to the line where it is being pressed against the sheet by the feed roll, and the absence of any contact with the adhesive-coated side between these two lines, assure smooth un wrinkled application of the tape to the sheet. The pivotal connection between the upper and lower sections permits the feed rolls to separate whatever distance is necessary to accommodate sheets of different thicknesses and still give substantially the same yielding pressure on the tape as it is being applied to the metal sheet moving through the bite of the feed rolls.

Any suitable means may be provided for facilitating the feed of sheets of metal into the machine and the removal of finished sheets from the machine. In FIG. 3 an infeed table 86 is shown fragmentarily and an outfeed table 88 is similarly shown on the other side of the machine and such tables have proved satisfactory in use but it is contemplated that roller conveyors and automatic feed devices may be used if desired.

An electric circuit 90 is provided for the motor 44 which may comprise a source of electric current 92, lead lines 94 and a switch 96. Means such as a shear 100 may be and preferably is provided for severing the tape after a sheet has passed through the machine and while the trailing end is still resting on the angle iron 24 as shown in FIG. 3. A suitable shear comprises a lower blade 102 fixedly secured in the lower frame section to the sides 12, e.g., by a bracket 104, which has a stop 106 secured thereto for a purpose to be set forth hereinafter, an upper blade 108 slidably mounted in channels at each end provided by guides 110 fastened to the side pieces 12 of the upper frame section as shown in FIG. 4 and having a braking means 112 secured thereto so that the means 112 will contact the periphery of the roll 40 when the shear blade 108 is lowered, and a control lever 114 for operating the shear. The control lever may comprise two lever bars 116 at each side of the machine pivoted at the inner end to pivot 118 and having a connecting bar 120 secured to the outer ends of the lever bars 116. Intermediate the ends of the lever bar is a connection 122 to the upper blade 108 whereby raising and lowering of the connecting bar 120 raises and lowers the blade 108. A spring 124 biases the control lever to its upper position as shown in FIG. 4. The switch 96 may be a manually operated switch such as shown in FIG. 2. It may also be a switch operated automatically when the control lever 114 is moved. Thus it may be a mercury switch attached to one of the lever bars 116 in such position that it turns on when the bar is at its uppermost position and turns off when the control lever is moved downwardly. In this type of arrangement the movement of the control lever downwardly from its uppermost position first breaks the circuit to the motor, then the further downward movement brings the braking element 112 in contact with the feed roll 40 and stops the feed of the tape and movement of the covered sheet. This leaves the sheet just beyond the shear at the time it passes through the plane of the sheet and tape so that it cuts only the tape behind the shear. The covered sheet is then removed by hand or automatically as desired. Continued movement of the control lever downwardly brings the upper blade in contact with the stop 106 when the continued pressure on the control lever causes the upper section to tilt clockwise as seen in FIGS. 3 and 4 and thus open up the bite between the feed rolls 40 and 42 for the entrance of the next sheet fed into the machine from the table 86.

When both tape rolls 70 and 76 are used to cover both surfaces of the metal sheets, it will be clear from what has been said above that the two strips of tape will be stuck together when the sheet passes beyond the bight. The adhesive-coated side of the tape projects into the crotch between these two adhering ends which are pushed out ahead of the advancing sheet. The tape from two new rolls may be stuck together at the ends and then fed into the bight of the feed rolls, e.g., by use of the hand wheel 64, to start the operation.

The machine is adapted for use to cover only the top surface of a sheet or only the bottom surface or both surfaces simultaneously. Thus if it is desired to cover only the top surface, the tape from the bottom roll would not be fed into the bight while the tape from the top roll would be fed into the bight, e.g., by sticking the end of the lower feed roll 42 for a very short distance or by sticking it to the lead end of the sheet and then feeding the sheet on through the machine where the tape may be severed in the same way already described for the operation in which both sides of the sheet are simultaneously covered. The manner of operating to cover only the lower surface of a sheet is analogous to the operation just described for the top surface except that the tape from the upper roll 70 is not fed into the bight while that from the lower roll is fed into the bight, either on the end of the sheet or by sticking the end to the feed roll 40.

The sharp lower edge of the upper blade 108 may be sloped so that the cut of the tape is progressive from one side to the other. A slope of two inches across a 48" wide strip of tape is sufficient for this purpose. Other modifications and variations may be made without departing from the spirit and scope of the invention as set forth in the claims.

Having thus described the invention what is claimed is:

1. A machine for applying pressure-sensitive tape to metal sheets comprising a frame having a lower section and an upper section, means pivoting the upper section to the lower section to swing with pressure-sensitive adhesive from said upper section to form a bight for feeding metal sheets therebetween, means for supporting on said frame a roll of pressure-sensitive tape having a backing coated with pressure-sensitive adhesive on one surface only and feeding tape therefrom to one of said feed rolls with the adhesive-free surface of the tape in contact with the metal sheet and the adhesive-coated surface against a metal sheet in the bight of said feed rolls, and means to guide a metal sheet into the bight of said rolls whereby said pressure-sensitive tape is smoothly applied to a surface of said metal sheet as it is fed between said feed rolls.

2. A machine for applying pressure-sensitive tape to metal sheets comprising a frame including an upper section and a lower section, an upper and a lower feed roll each journaled for rotation on axes in parallel relationship to each other in the upper and lower sections respectively of said frame, means to drive at least one of said feed rolls, said rolls being journaled on axes laterally displaced from and parallel to said pivot axis and parallel to each other whereby the rolls can be yieldedly biased toward each other in said frame, means for pivot connection to said upper section to form a bight for feeding metal sheets therebetween, means for supporting on said frame a roll of pressure-sensitive tape having a backing coated with pressure-sensitive adhesive on one surface only and feeding tape therefrom to one of said feed rolls with the adhesive-free surface of the tape in contact with the metal sheet and the adhesive-coated surface against a metal sheet in the bight of said feed rolls, and means to guide a metal sheet into the bight of said rolls whereby said pressure-sensitive tape is smoothly applied to a surface of said metal sheet as it is fed between said feed rolls.
a similar roll of pressure-sensitive tape and guiding tape therefrom to said lower feed roll with the adhesive-free surface of the tape against said lower feed roll and the adhesive-coated surface against the lower surface of said sheet in the bight of said feed rolls but free from all contact between the line of separation from said similar tape roll to said lower surface in said bight, and means to guide a metal sheet into the bight of said feed rolls whereby pressure-sensitive tape is smoothly applied to both surfaces of said metal sheet.

3. A machine as set forth in claim 1 which comprises means mounted in said frame for severing the tape.

4. A machine as set forth in claim 1 which comprises means to inactivate said drive means and apply a braking force to one of said feed rolls to stop rotation thereof.

5. A machine as set forth in claim 1 which comprises means mounted in said frame for severing said tape and means for inactivating said drive means and applying a braking force to one of said feed rolls to stop rotation thereof.

6. A machine as set forth in claim 1 in which said drive means comprises an electric motor, an electric circuit including a switch for supplying current to said motor and a control lever pivoted in said frame for operating said switch.

7. A machine as set forth in claim 3 in which said drive means comprises an electric motor, an electric circuit including a switch for supplying current to said motor, braking means to apply a braking force to one of said feed rolls to stop rotation thereof, and a control lever pivoted in said frame for operating in one direction in sequence the opening of said switch, the application of said braking means and said severing means and in the other direction in sequence the release of said braking means and the closing of said switch.

8. A machine as set forth in claim 4 in which said drive means comprises an electric motor, an electric circuit including a switch for supplying current to said motor and a control lever pivoted in said frame for operating in one direction in sequence the opening of said switch and application of said braking means and in the other direction in sequence the release of said braking means and the closing of said switch.

9. A machine for applying pressure-sensitive tape to metal sheets comprising a frame, an upper and a lower feed roll, each journaled in parallel relationship to each other in said frame, means to drive at least one of said feed rolls, means including an upper frame section in which said upper feed roll is journaled, a lower frame section in which said lower feed roll is journaled and a pivot connecting said upper frame section to said lower frame section on an axis offset from the axes of said feed rolls foryieldingly biasing by gravity said feed rolls toward each other to form a bight for feeding successive metal sheets therebetween, means supporting on said frame a roll of pressure-sensitive tape having a backing coated with pressure-sensitive adhesive on one surface only and guiding tape therefrom to one of said feed rolls with the adhesive-free surface of the tape against said feed roll and with the adhesive-coated side free from all contact between the line of separation from said tape roll to the metal sheet at said bight, and means to guide a metal sheet into the bight of said rolls whereby said pressure-sensitive tape is smoothly applied to a surface of a metal sheet as it is fed by and between said feed rolls.

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EARL M. BERGERT, Primary Examiner.
DOUGLAS J. DRUMMOND, Examiner.