

Oct. 25, 1955

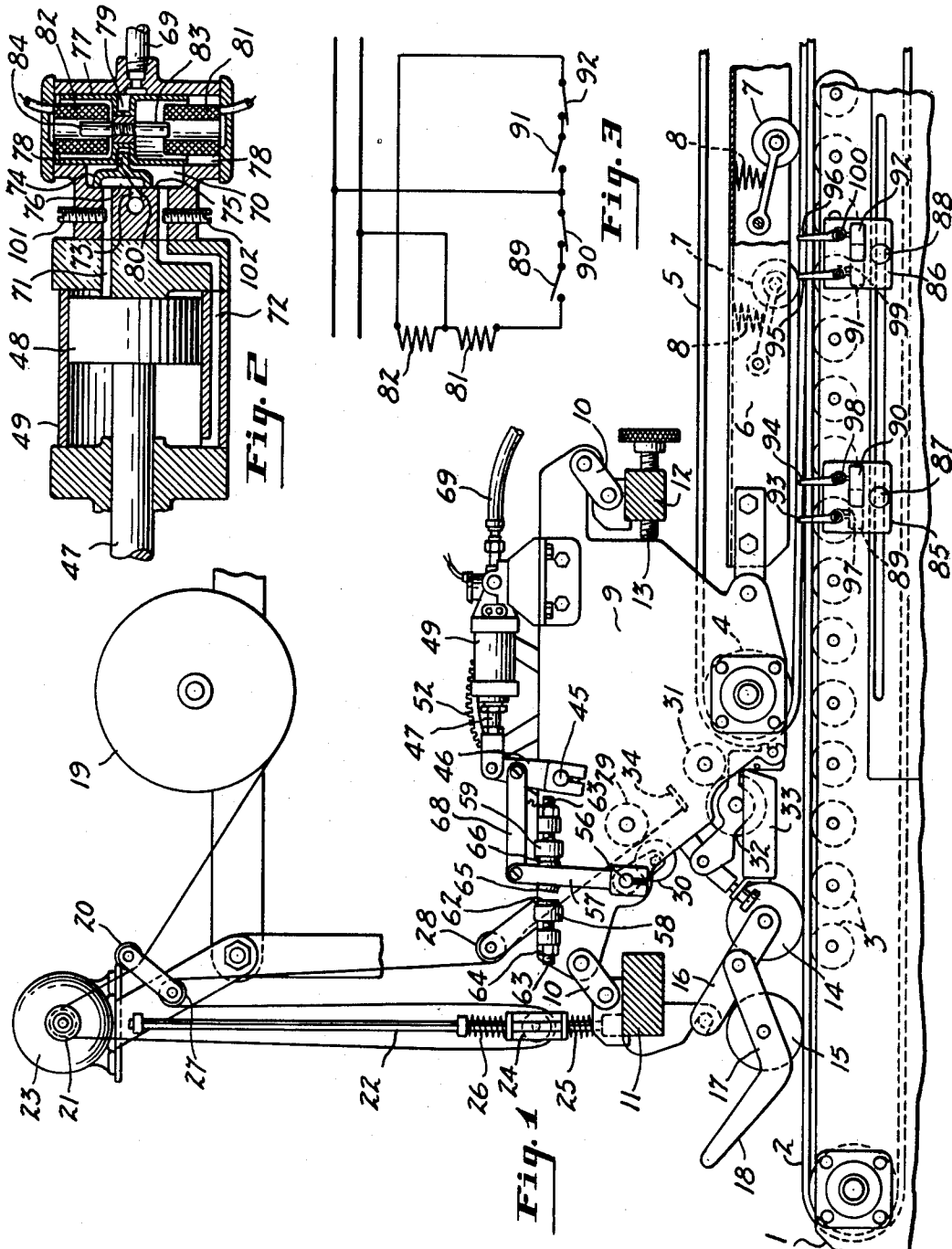
M. G. SHENIGO

2,721,670

BOX BLANK TAPING MACHINE

Filed Jan. 11, 1952

4 Sheets-Sheet 1



INVENTOR

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BY Evans + McCoy
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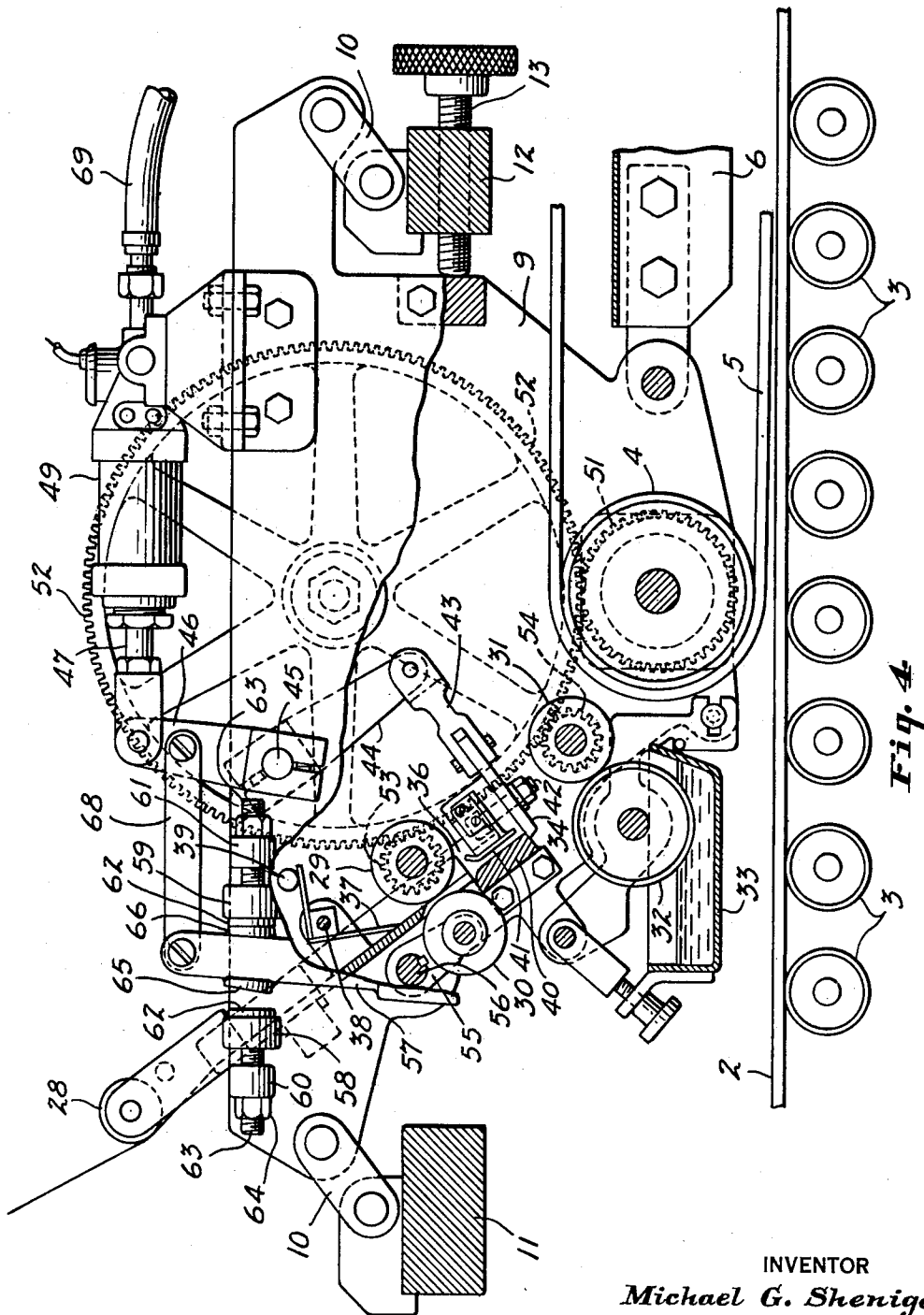


Fig. 4

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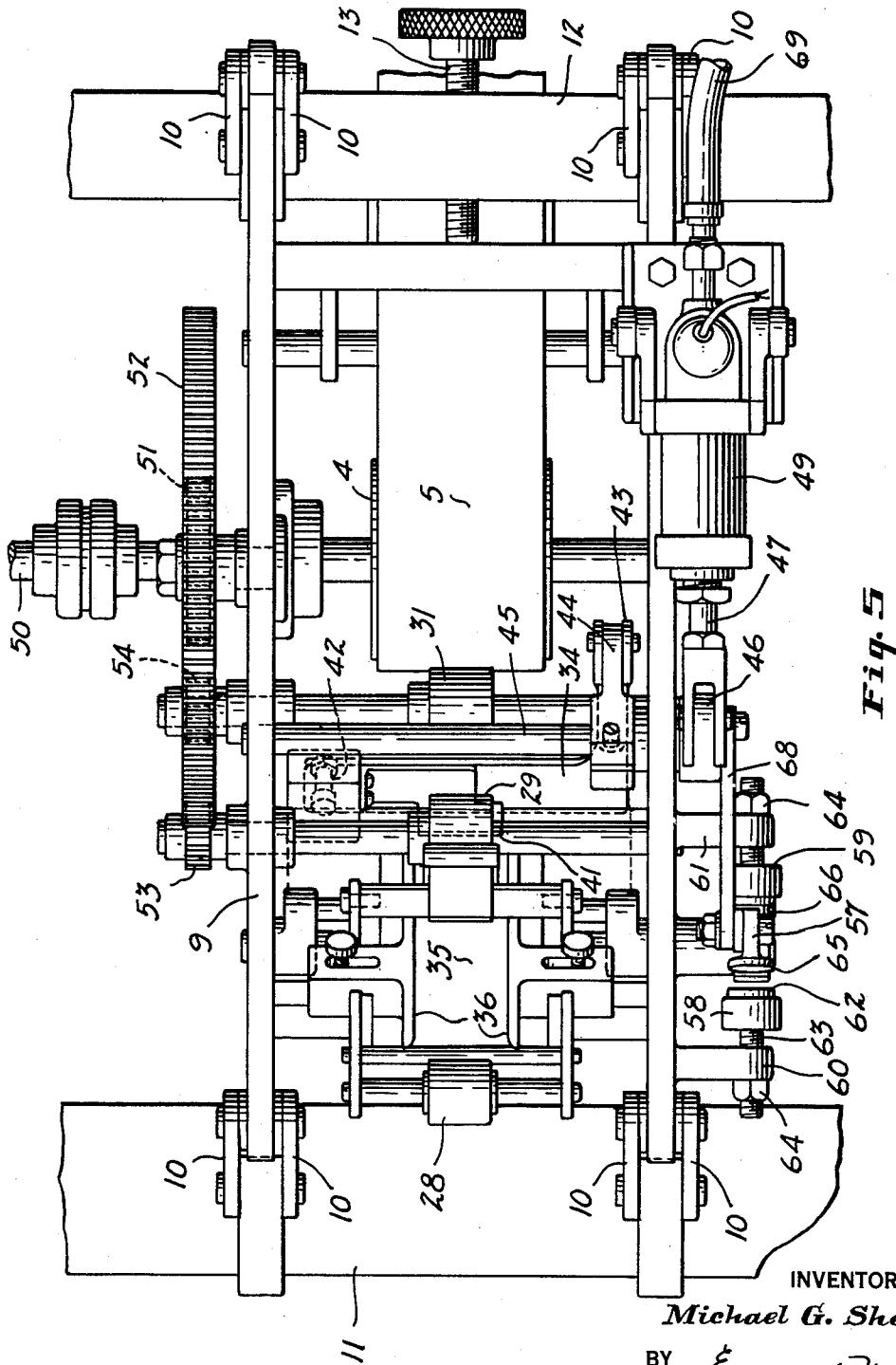


Fig. 5

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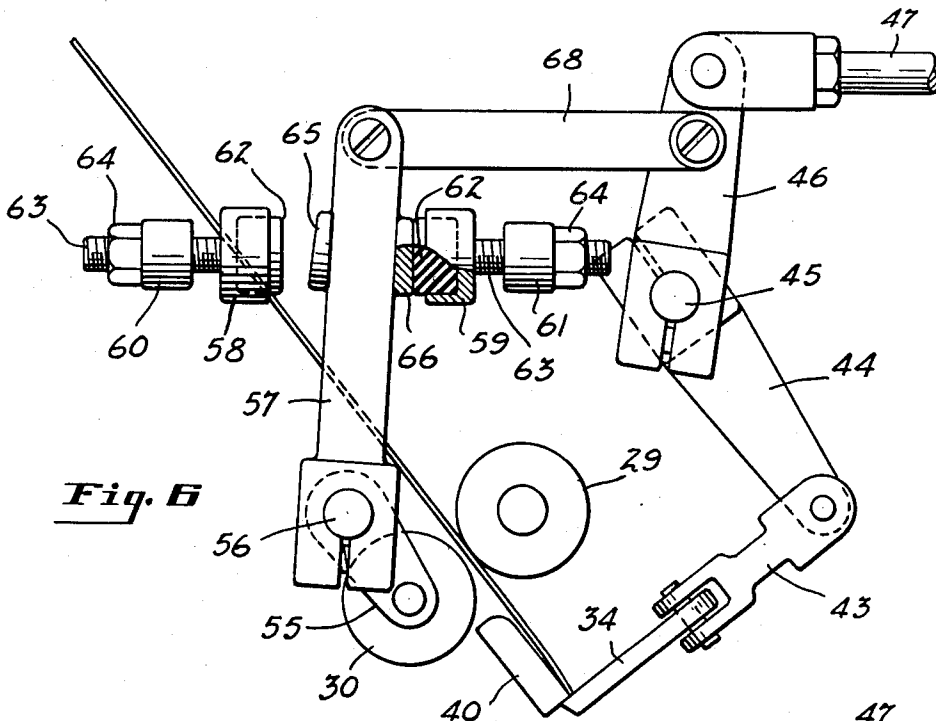


Fig. 6

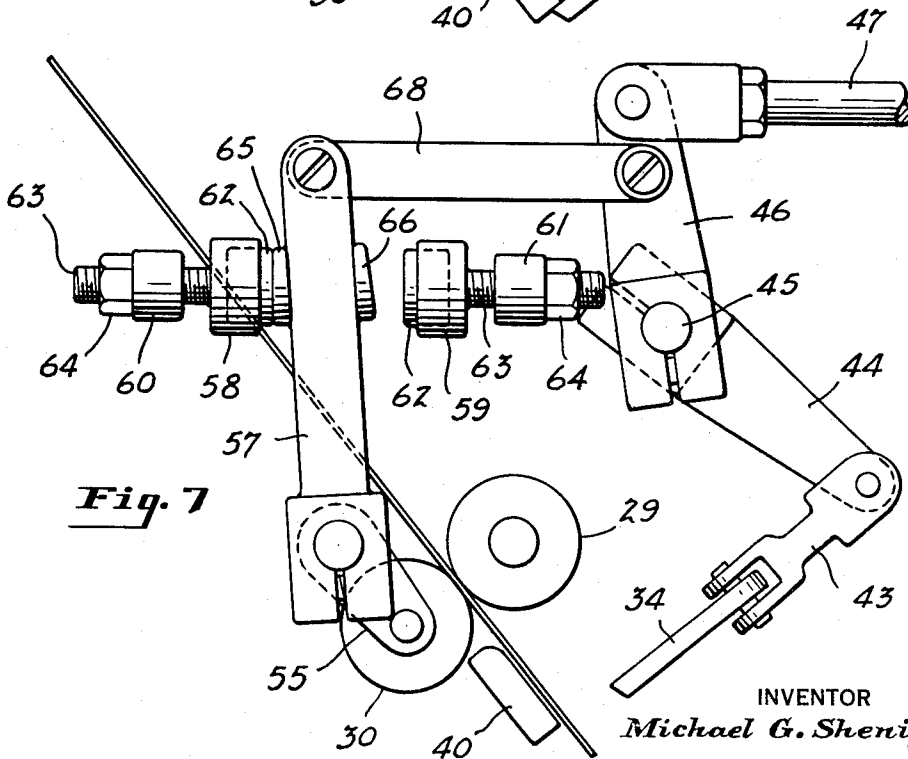


Fig. 7

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BOX BLANK TAPING MACHINE

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Application January 11, 1952, Serial No. 266,025

6 Claims. (Cl. 216—29)

This invention relates to a machine for applying tape to paperboard box blanks and particularly to a machine for applying tape to adjoining edges of a folded box blank to join the same.

In the machine of the present invention folded box blanks are continuously advanced one at a time and at a uniform speed along the supporting bed while a tape strip is fed endwise toward the bed. Means is provided for applying the leading end of the tape strip to a predetermined portion of a box blank on the bed and for severing the tape strip at a predetermined distance from the end of the strip applied to the blank, the tape feeding means being so controlled that the feed of tape toward the bed is stopped substantially simultaneously with the severing of the tape and is started in timed relation to the movement of the blanks so as to apply the leading end of the tape to a predetermined portion of each box blank. The operation of the tape severing means and of the tape feeding means is controlled by trips operated by the individual blanks during their travel along the bed, the trips being spaced apart a distance proportional to the length of tape to be applied to the blanks and each trip controlling both the tape feeding means and the tape severing means to insure proper timing of the tape feeding and tape severing operations.

The invention has for its object to provide tape feeding and tape severing mechanisms that are so controlled as to deliver accurately predetermined lengths of tape to the box blanks and to accurately position the tape on the box blanks while the blanks are being continuously fed at high speed along the supporting bed.

Reference should be had to the accompanying drawings forming a part of this specification in which:

Figure 1 is a side elevation of a machine embodying the invention;

Fig. 2 is a central vertical section through the cutter blade actuating cylinder and the solenoid operated control valve associated therewith;

Fig. 3 is a wiring diagram showing the solenoid controlling circuits;

Fig. 4 is a fragmentary, vertical, longitudinal section on an enlarged scale taken through the forward end of the machine and showing the tape feeding and applying mechanisms;

Fig. 5 is a fragmentary top plan view of the forward part of the machine shown in Fig. 4;

Fig. 6 is an enlarged view of the mechanism actuating the tape cutter and the movable tape feed roller, showing the cutter blade in the path of the tape and the tape feed rollers separated; and

Fig. 7 is a view similar to Fig. 6, showing the cutter blade out of the path of the tape and tape feed rollers in tape gripping position.

The machine of the present invention has a frame 1 that supports an endless belt 2, the upper run of which is disposed horizontally and supported by closely spaced transverse rollers 3 to provide a runway for the box blanks to be taped. The belt 2 is continuously driven

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to advance the box blanks past the tape applying mechanism. The tape is pressed against the top surfaces of the blanks by means of a constantly driven drum 4 which preferably has an endless belt 5 running over it. The drum 4 serves as the drive pulley for the belt 5 and is attached to one end of a belt supporting frame 6 which carries a series of rollers 7 which are pressed against the lower run of the belt 5 by springs 8 so that the lower run of the belt 5 presses against the tape applied to the box blanks to adhere the tape to the blanks.

The presser drum 4 is mounted in a vertically adjustable frame 9 that is supported by parallel links 10 on frame cross bars 11 and 12. The frame 9 may be adjusted vertically away from the belt 2 by means of a screw 13 carried by the frame cross bar 12 and engaging with the frame 9 to shift the same forwardly and swing the links 10 toward vertical position to lift the frame 9 which is held by gravity in engagement with the forward end of the screw 13. The presser drum 4 is spaced from the forward end of the belt 2 to which the box blanks are fed and, to assure movement of the box blanks with the belt 2 to the tape applying mechanism, a pair of feed rollers 14 and 15 are supported by gravity on the belt 2 forwardly of the presser drum. The rear roller 14 is supported by links 16 from the cross bar 11 and the forward roller 15 is supported by arms 17 that are pivoted to the links 16. The rollers 14 and 15 are rotated by frictional engagement with box blanks traveling with the belt and by engagement with the belt 2 when no box blanks are passing beneath them and serve to hold the box blanks flat against the belt 2 so as to insure movement of the blanks with the belt. The box blanks are ordinarily fed from the top of a pile supported at the front end of the machine onto the belt 2 either by hand or by automatic machinery and the arms 17 are provided with upwardly inclined forward end portions 18 which serve to guide the individual box blanks into the bight of the roller 15 as they are pushed off the pile and onto the belt.

In the operation of the machine a strip of tape is fed downwardly toward the box blank conveyor and beneath the presser drum 4 and belt 5 where the leading end of the strip is pressed against the box blanks. The tape strip is supplied from a reel 19 mounted on a part of the stationary frame 1 above the movable frame 9. The tape passes from the reel 19 under a guide roller 20 and over a pulley 21 at the upper end of a supporting standard 22 that forms part of the supporting frame. The pulley 21 is continuously driven by a motor 23 mounted on the standard 22. The tape passes downwardly from the pulley 21 under a pulley 24 that is slidable vertically on the standard 22. The pulley 24 is yieldably supported by a coil spring 25 which counterbalances the weight of the pulley and a similar spring 26 yieldingly resists upward movement of the pulley 24. The tape is fed by the pulley 21 when under tension, but, since the weight of the pulley 24 is counterbalanced by the spring 25, the tape is normally slack between the pulley 24 and the reel 19, so that there is insufficient friction between the tape strip and the pulley 21 to drive the tape strip and the pulley 21 slips. However, when tension is applied to the tape beyond the pulley 24 the friction between the tape strip and the continuously driven pulley 21 increases and the tape strip is advanced by the pulley 21. The tape passes upwardly from the pulley 24 over a guide pulley 27 adjacent the top of the standard 22 and downwardly under a guide pulley 28 mounted on the adjustable frame 9.

The frame 9 carries a pair of feed rollers 29 and 30 which grip the tape between them, the lower roller 30 being movable downwardly from its tape gripping position to release the tape. Between the feed rollers 29

and 30 and the presser drum 4 a second pair of feed rollers 31 and 32 are provided. The rollers 31 and 32 are maintained in tape gripping position and the roller 32 may serve as a moistening roller to moisten the gummed face of the tape, a water pan 33 detachably mounted on the frame 9 being positioned to receive the lower portion of the roller 32 to wet the roller as it rotates.

Between the pairs of feed rollers 29 and 30 and 31 and 32 a reciprocating cutter blade 34 is provided which moves into and out of the path of the tape strip to sever the same. The cutter blade 34 is operated in timed relation to the movement of the individual box blanks along the supporting bed to sever pieces of tape of predetermined length from the leading end of the tape strip. The feed rollers 31 and 32 serve to support and advance the severed length of tape as it passes to the box blank on the supporting bed.

As shown in Figs. 4 and 5 of the drawings, the adjustable frame 9 carries a downwardly inclined tape supporting bed 35 that is provided with laterally adjustable side guides 36 which may be adjusted to accommodate tapes of various widths. Reverse movement of the tape on the supporting bed 35 is prevented by a brake arm 37 which bears against the top face of the tape on the bed 35 and which is pivoted to a transverse shaft 38. The brake arm 37 extends downwardly from its pivot, is disposed at an acute angle to the surface of the bed 35 and rests by gravity on the tape strip so that its frictional resistance to movement of the tape exerted by the brake arm when the tape is moved upwardly on the bed is greater than its frictional resistance to downward movement and the pressure exerted by the arm 37 on the tape is increased by an upward pull on the tape tending to slide the tape upwardly on the bed 35. Upward swinging movement of the brake arm 37 is limited by a stop pin 39. At the lower end thereof the tape supporting bed 35 is provided with a shear block 40 across the lower edge of which the cutter blade 34 moves to shear the tape. To insure proper positioning of the tape on the shear block 40 a suitable guide 41 is provided above the top face of the block.

The cutter blade 34 is connected at one end to the frame 9 by a pivot pin 42 and the opposite end of the cutter blade is connected by a link 43 to a lever arm 44 that is adjustably attached to a cross shaft 45. A second lever arm 46 is adjustably attached to the shaft 45 at one end and at its opposite end is pivoted to a piston rod 47 which is connected to the piston 48 of a reciprocating pneumatic motor 49. Actuation of the piston 48 in one direction imparts a downward stroke to the cutter blade 34 and movement of the piston in the opposite direction moves the blade 34 upwardly out of the path of the tape strip.

The presser drum 4 is continuously driven by suitable means such as a shaft 50 and a gear 51 attached to the drum shaft rotates with the drum 4 and continuously drives a large gear 52 mounted in the frame 9 above the gear 51. The gear 52 meshes with gears 53 and 54 which are attached to the feed rollers 29 and 31. The presser drum 4 is preferably driven at a peripheral speed such that the presser drum will have the same linear speed as the supporting belt 2, and the peripheral speed of the feed rollers 29 and 31 is preferably the same as the linear speed of the belts, so that the tape strip will be moved into engagement with the box blanks at a linear speed which is the same as the linear speed of the blanks.

The roller 30 is mounted for movement toward and away from the driven roller 31 to start and stop the tape feed, the tape being fed toward the conveyor 2 while it is gripped between the rollers 30 and 31, the feed being discontinued when the roller 30 is moved out of contact with the tape. The roller 30 is mounted on an arm 55 attached to a transversely disposed shaft 56 journaled in the frame 9 that is rolled to shift the roller 30 by means

of a lever arm 57 attached thereto and extending upwardly therefrom.

The forward and rearward swinging movements of the arm 57 are limited by adjustable stops 58 and 59 that are mounted in brackets 60 and 61 attached to the frame 9. The two stops 58 and 59 which may be of identical construction are each provided with a rubber cushioning block 62 in the path of the lever 57. Each stop has a threaded stem 63 screwed into its supporting bracket and is locked in adjusted position by means of a nut 64 on the stem that engages with the bracket.

The stop member 58 cushions the impact of the lever when it is moved forwardly and is adjusted to hold the roller 30 against the tape with the desired pressure. The stop 59 limits the rearward movement of the lever and is adjusted to provide the desired length of stroke. The lever 57 has buffer plates 65 and 66 attached to the front and rear edges thereof for engagement with the rubber cushioning blocks 62.

The lever 57 is actuated by the pneumatic motor 49 through the arm 46 attached to the cutter operating rock shaft 45 and connected to the lever arm 57 by a link 68.

The extent of downward movement of the cutter is regulated by adjustment of the stop 59 and the cushioning blocks 62 permit rapid and noiseless intermittent operation of the tape feeding and severing mechanism. The cushioning blocks also assist in overcoming the inertia of the parts actuated by the motor 49 upon each reversal of pressure on the piston 48 so that the acceleration is more rapid and the roller 30 is moved substantially instantaneously or with snap action into and out of tape feeding position.

Fluid under pressure, preferably air, is delivered to the cylinder 49 through a pressure conduit 69 which supplies pressure to the motor 49 through a valve chamber 70 provided on the rear head of the cylinder. As shown in Fig. 2, pressure is supplied to the rear side of the piston 48 through a passage 71 in the rear of the cylinder head and pressure is supplied from the chamber 70 to the forward side of the piston 48 through a passage 72 extending through the rear head of the cylinder and through the wall of the cylinder to adjacent the forward head of the cylinder. An exhaust passage 73 is provided in the rear head of the cylinder between the passages 71 and 72. The operation of the cylinder 49 is controlled by a valve 74 that is mounted to slide on a flat face 75 of the front wall of the chamber 70 to which the passages 71, 72 and 73 open. The valve 74 has a recess 76 in its front face which is of a width to provide communication between either of the passages 71 or 72 and the central exhaust passage 73, the valve 74 being movable from an upper position in which the passage 71 communicates with the exhaust passage 73 to a lower position where the passage 72 communicates with the exhaust passage 73. When the valve 74 is in its uppermost position pressure is delivered through the passage 72 to the forward end of the cylinder to move the piston 48 rearwardly and when the valve 74 is in its lowermost position pressure is delivered through the passage 71 to the rear end portions of the cylinder to move the piston 48 forwardly. Forward movement of the piston 48 actuates the cutter blade 34 to move the same upwardly out of the path of the tape and shifts the lever arm 57 with a snap action to move the roller 30 to tape gripping position to start the tape feed. Rearward movement of the piston 48 imparts a cutting stroke to the blade 34 and operates the lever arm 57 with a snap action to instantly discontinue the feed of the tape as the knife moves across the path of the tape to sever the same.

The valve 74 is intermittently operated under control of box blanks passing along the supporting bed to first cause the knife blade to be lifted out of the path of the tape and then to cause the tape strip to be fed downwardly into engagement with a box blank on the bed. After a predetermined movement of the box blank along the supporting bed and a corresponding movement of the tape

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past the feed rollers 29 and 30, the valve 74 is actuated to impart a rearward movement to the piston 48 and a cutting stroke to the cutter blade 34, stopping the tape feed with the cutter blade in the path of the tape until another box blank has moved to a predetermined position on the supporting bed.

Rearwardly of the valve 74 a sheet metal cylinder 77 is mounted in the chamber 70 for movement transverse to the axis of the cylinder 49, the cylinder 77 being mounted in cylindrical extensions 78 of the chamber 70. The cylinder 77 has a central reduced portion 79 which provides a recess to receive a projection 80 on the valve 74 which constrains the valve 74 to move with the slidable cylinder 77.

Solenoids 81 and 82 are mounted in the extensions 78 of the valve chamber 70 within opposite ends of the cylinder 77. Cores 83 and 84 are attached to the central portion of the cylinder 77 within the reduced portion 79 and project into the solenoids 81 and 82. Energization of the solenoid 81 shifts the valve 74 to a position to supply pressure to the cylinder through the passage 71 to move the piston 48 forwardly. Energization of the solenoid 82 moves the valve 74 to a position to deliver pressure to the forward end of the cylinder and move the piston 48 rearwardly. The solenoids 81 and 82 are energized by means of trip switches positioned in the path of travel of the box blanks on the supporting bed. The trip switches are carried on spaced supporting blocks 85 and 86 that are slidably mounted on the frame 1 and that are secured in adjusted positions on the frame 1 by means of clamping screws 87 and 88. The forward block 85 carries a normally open switch 89 and a normally closed switch 90, and the block 86 carries a normally open switch 91 and a normally closed switch 92. The switches 89 and 91 are solenoid energizing switches which effect the shifting movements of the valve 74. The switches 90 and 92 are solenoid deenergizing switches which serve to deenergize each solenoid immediately after it has shifted the valve 74.

Trip arms 93 and 94 on the block 85 project into the path of the leading edges of box blanks on the supporting bed which may be a substantial distance in advance of the portions of the blanks to which the tape is to be applied and similar trip arms 95 and 96 on the block 86 also project into the path of the leading edges of box blanks on the supporting bed. The trip arms 93 and 94 carry cams 97 and 98 which actuate the switches 89 and 90 and the trip arms 95 and 96 carry cams 99 and 100 which actuate the switches 91 and 92.

The switch 89 is moved from open to closed position by the cam 97 on the arm 93. The switch 90 is moved from closed position to open position by the cam 98 on the arm 94. The switch 91 is moved from open position to closed position by the cam 99 on the arm 95. The switch 92 is moved from closed position to open position by the cam 100 on the arm 96.

The location of the trip switches with respect to the supporting bed is such that when the leading edge of a box blank engages the trip arm 93 the knife blade 34 is moved upwardly out of the path of the tape and the roller 30 is moved to tape feeding position to feed the tape strip downwardly into engagement with a predetermined portion of the box blank engaging the trip arm 93. The trip arm 94 is spaced sufficiently from the trip arm 93 to permit the solenoid 81 to move the valve 74 into registry with the passages 72 and 73 before the box blank engages the arm 94. As the box blank moves along the runway the arms 93 and 94 are held down by engagement with the under side of the blank and the feed of the tape continues until the leading edge of the blank engages the trip arm 95, closing the valve 91 and energizing the solenoid 82 to actuate the knife blade to sever the tape and simultaneously discontinue the feed of the tape. The trip arm 96 deenergizes the solenoid 82 so that subsequent energization of the solenoid 81 by another box blank will cause the feed of tape to the succeeding blank.

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Since the tape feed is controlled by the cutter blade actuating mechanism and both the tape feed and tape severing mechanism are controlled by the same trips, the timing of the tape feeds with respect to the movement of the cartons and the length of tape delivered to each box blank are accurately regulated. By reason of the fact that the cutter blade and tape feed control mechanism are actuated by a fluid pressure cylinder, the speed of actuation of the cutter blade and of the tape feed control mechanism can be adjusted to the speed of travel of the box blanks along the supporting bed by regulating the pressure delivered to the motor 49 and thereby controlling the speed of actuation of the piston 48.

Any suitable means may be provided for regulating the pressure applied to the cylinders. As herein shown, adjustable flow control valves 101 and 102 are provided in the passages 71 and 72 to regulate the rate of flow of fluid to the cylinders.

It is to be understood that in accordance with the provisions of the patent statutes, variations and modifications of the specific devices herein shown and described may be made without departing from the spirit of the invention.

What I claim is:

1. A machine for applying tape to paperboard box blanks comprising a supporting bed, a frame above said bed, means mounting said frame for movement vertically toward and away from said bed, an adjustable stop for limiting the downward movement of said frame while permitting upward movement thereof, said frame being movable by gravity against said stop and thereby supported in different positions of vertical adjustment, a presser drum mounted in the lower portion of said frame above said bed with its axis in a plane parallel to the bed, means for continuously driving said drum, means carried by said frame for feeding a tape strip downwardly into the space between said drum and bed including a driven tape feed roller geared to said drum and an auxiliary feed roller mounted for movement on said frame into and out of a tape feeding position in which it presses the tape against said driven roller, spaced trips successively actuated by each box blank during its movement along said bed, means controlled by the trip first actuated by the blanks for moving said auxiliary feed roller to tape feeding position, means controlled by the other of said trips for moving said auxiliary feed roller away from said driven roller to discontinue the tape feed, tape severing means carried by said frame between said driven roller and said drum, and means for actuating said severing means to sever the tape strip substantially simultaneously with the movement of said auxiliary feed roller away from said driven roller.

2. A machine for applying tape to paperboard box blanks comprising a supporting bed along which box blanks may be moved, means for feeding a tape strip endwise toward said bed including a pair of feed rollers mounted for relative bodily movement to grip or release the tape and means for continuously driving one of said rollers, means for moving blanks along the bed and for pressing the leading end of the tape strip against the blanks when the strip is advanced by said feed rollers, a reciprocable cutter blade mounted to have a retracting stroke and a cutting stroke and engageable with said strip between said feed rollers and bed to sever the same, cutter actuating means comprising a reciprocating pneumatic motor having a piston connected to said blade to move the same away from said strip upon movement of the piston in one direction and into engagement with the strip to sever the same upon movement of the piston in the opposite direction, a valve controlling application of fluid pressure to said piston, spaced trips positioned to be successively engaged by each blank moving along said runway, means controlled by the trip first actuated by each blank for moving said valve to a first position to cause pressure to be applied to said piston in a direction

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to move said blade away from the path of said strip, means controlled by the other of said trips for moving said valve to a second position to cause pressure to be applied to the piston in a direction to impart a cutting stroke to said blade, and means actuated by said piston for causing relative movement of said feed rollers to grip said tape strip and to advance the leading end thereof past said blade during the retracting stroke of the blade and to release said tape strip during the cutting stroke of the blade and substantially simultaneously with severance of said tape strip.

3. A machine for applying tape as defined in claim 2 wherein valve means is provided to adjust the rate of flow of fluid to said piston when said valve is in one of said first and second positions so as to vary the speed of said piston.

4. A machine for applying tape to paperboard box blanks comprising a supporting bed along which blanks may be moved, a pair of opposed tape feed rollers above said bed, one of said rollers being mounted for movement toward or away from the other into and out of tape gripping position, a lever connected to said shiftable roller to shift the same, a tape reel and means for guiding a tape strip from said reel and between said rollers, means for advancing box blanks along said bed, means for applying tape to said blanks, means for continuously driving one of said feed rollers, a reciprocating pneumatic motor connected to said lever to actuate the same, a valve controlling the supply of pressure fluid to said motor, trip means positioned to be engaged by each blank traveling along said supporting bed for moving said valve to a first position wherein fluid pressure is applied to said motor in a direction to shift said movably mounted roller into tape gripping position and for moving said valve to a second position wherein said movably mounted roller is moved out of tape gripping position, a cutter between said feed roller and said bed for severing the tape, means connecting said motor to said cutter to actuate the same during movement of said lever and the roller connected thereto, and a resiliently yieldable stop in the path of said lever for limiting the movement thereof by said motor in the direction to shift the movable roller to tape gripping position, said stop being adjustable to different positions so as to vary the amount of movement of said motor, the distance between the opposed feed rollers, and the pressure of the rollers on the tape when said valve is in said first position, pressure of the fluid admitted to said motor by said valve causing yielding of said stop until a force is built up by said stop in opposition to said motor to counterbalance the force of said motor on said lever, the force of said stop on said lever facilitating rapid reversal of said motor when said valve is moved away from said first position so that the movable roller is quickly moved out of tape gripping position.

5. In a machine for applying tape to a moving piece of work, a tape feeding and cutting mechanism for alternately feeding and cutting controlled tape lengths comprising in combination a pair of feed rollers mounted for

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relative bodily movement alternately to grip and to release the tape, means for rotationally driving at least one of said rollers, a movably mounted cutter having a cutting stroke and a retracting stroke, a pneumatic motor and linkage means operating upon said cutter and feed rollers, a valve means controlling the action of said motor and linkage means upon said cutter and rollers, an automatic timing and valve means actuating device comprising a first trip means positioned to be actuated by the moving piece of work for causing said valve means to be moved to a first position for causing said cutter to be moved into retracted position and said feed rollers into tape gripping position in response to said motor and linkage means operation, and a second trip means positioned further along in the path of travel of said piece of work to be actuated by said piece of work for causing said valve means to be moved to a second position for causing said cutter to be moved into tape cutting position and said feed rollers into tape releasing position in response to said motor and linkage means operation, and means for guiding cut tape lengths onto said work.

6. In a machine for applying tape to a moving piece of work, a tape feeding and cutting mechanism for alternately feeding and cutting controlled tape lengths comprising in combination a pair of feed rollers mounted for reciprocable relative bodily movement to alternately grip and release the tape, means for rotationally driving at least one of said rollers, a reciprocably mounted cutter having a retracting stroke and a cutting stroke, a linkage interconnecting said feed rollers and cutter synchronizing movement of said rollers into tape gripping position with movement of said cutter into retracted position and movement of said rollers into tape releasing position with movement of said cutter into tape cutting position, a pneumatic motor means actuating said linkage for reciprocating said cutter and feed rollers, a valve means controlling operation of said pneumatic motor means, an automatic timing and valve means actuating device comprising a first trip means positioned to be actuated by the moving piece of work for causing said valve means to be moved to a first position for causing said feed rollers to be moved into tape gripping position and said cutter into retracted position, and a second trip means positioned further along in the path of travel of said piece of work to be actuated by said moving piece of work for causing said valve means to be moved to a second position for causing said feed rollers to be moved into tape releasing position and said cutter into tape cutting position, and means for guiding cut tape lengths onto said work.

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