March 15, 1955 E. W. NORD ET AL 2,704,168

TAPE APPLYING MACHINE

Filed Jan. 5, 1952 4 Sheets-Sheet 1

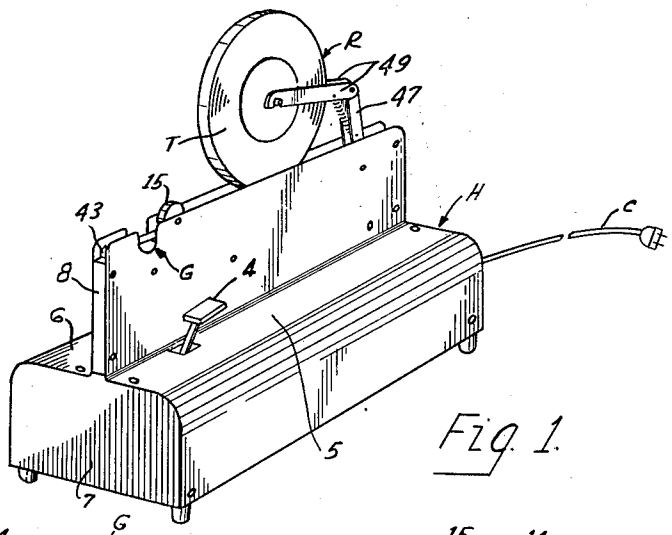


Fig. 1.

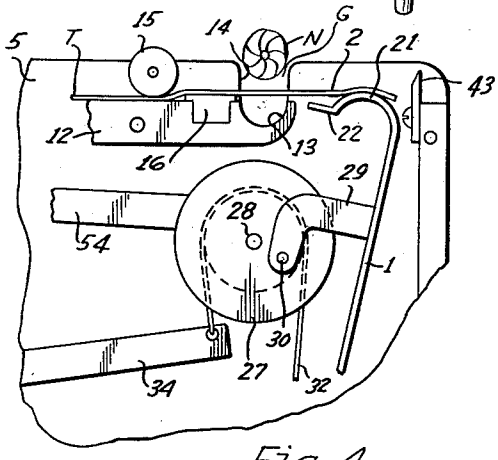


Fig. 4

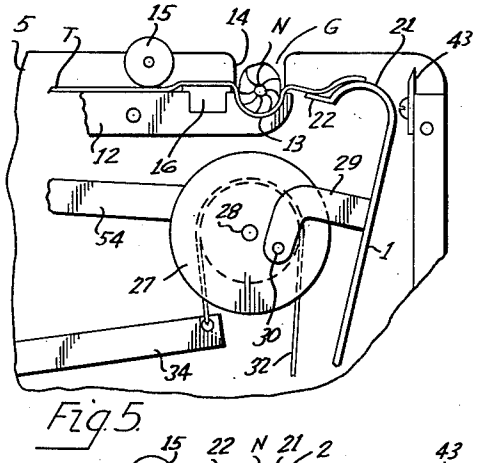


Fig. 5

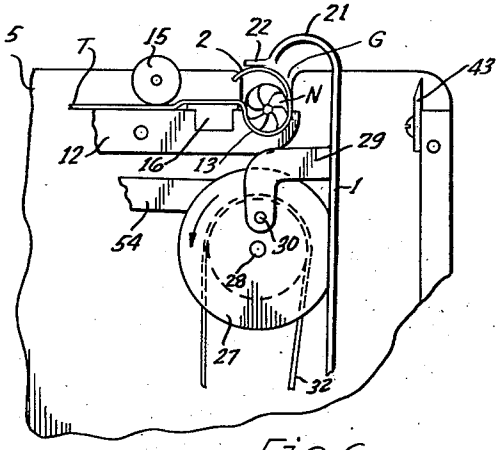


Fig. 6.

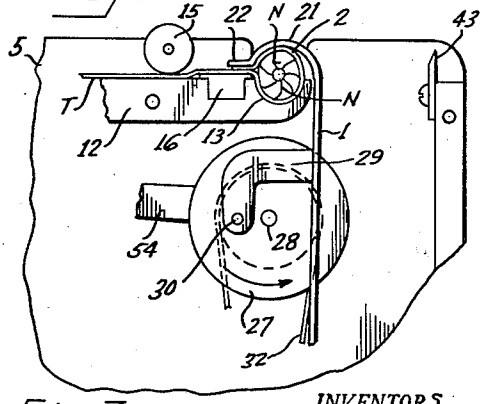


Fig. 7.

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TAPE APPLYING MACHINE

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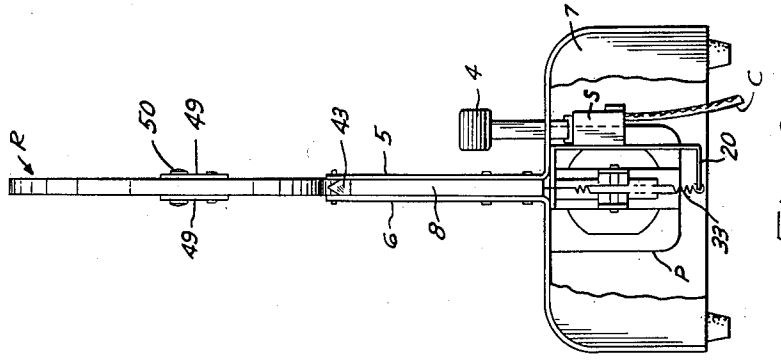


Fig. 3.

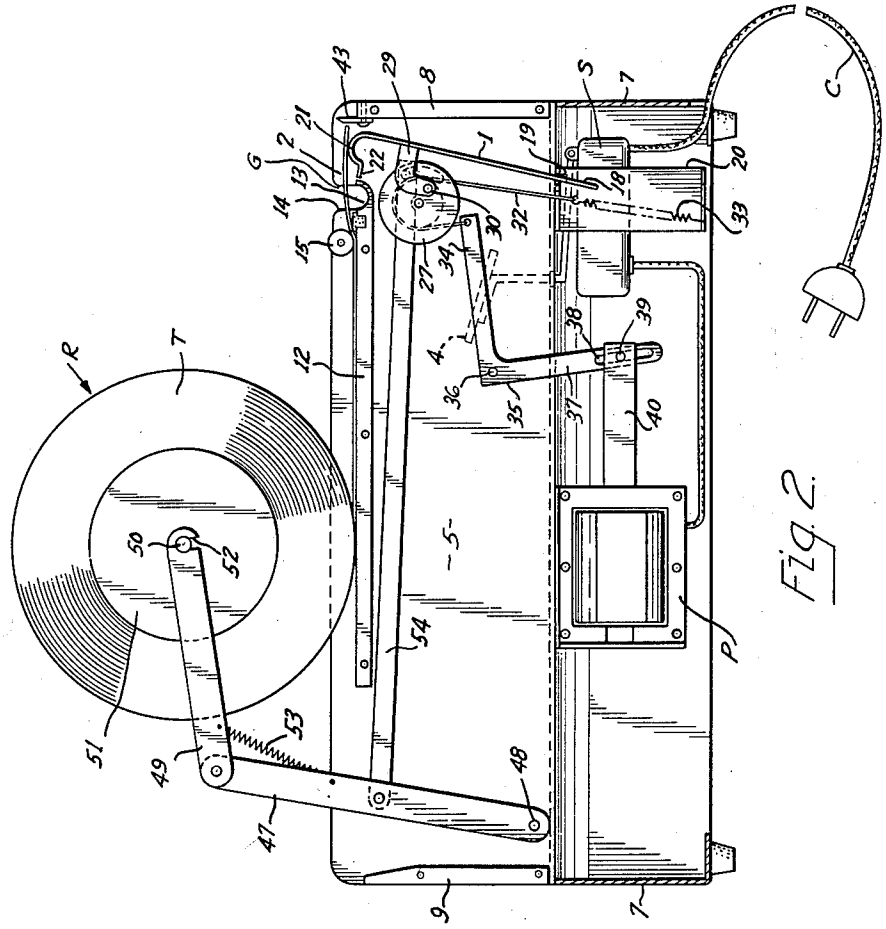


Fig. 2.

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TAPE APPLYING MACHINE

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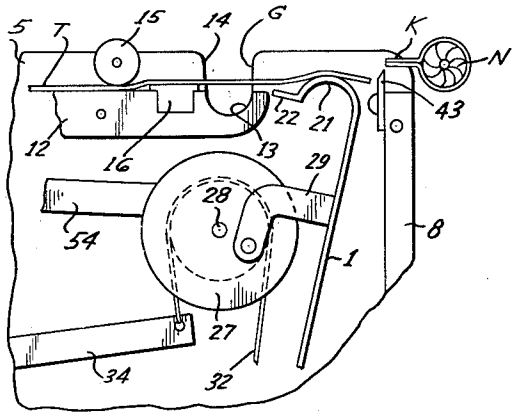


Fig. 8.

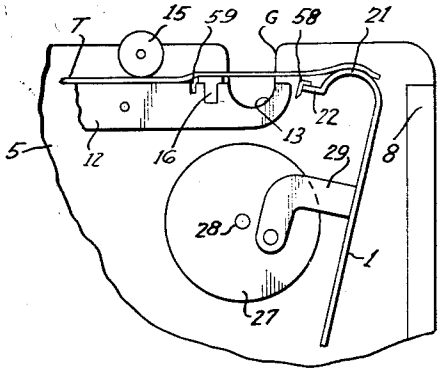


Fig. 11.

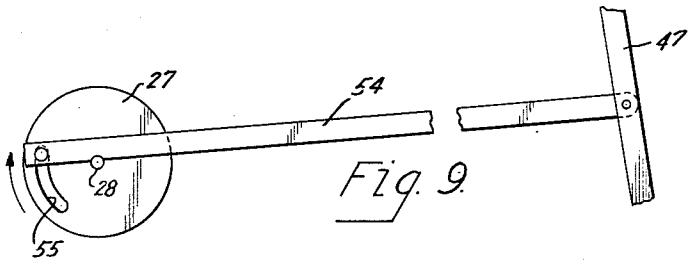


Fig. 9.

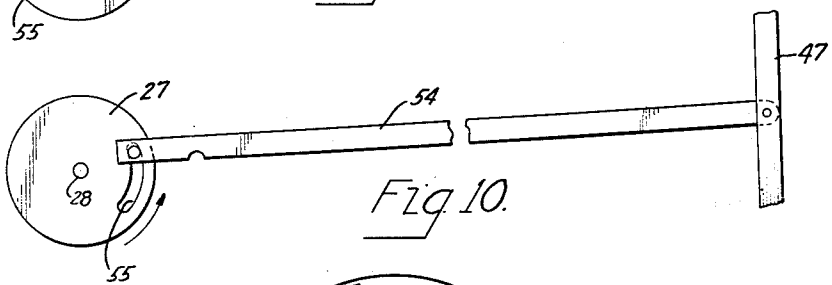


Fig. 10.

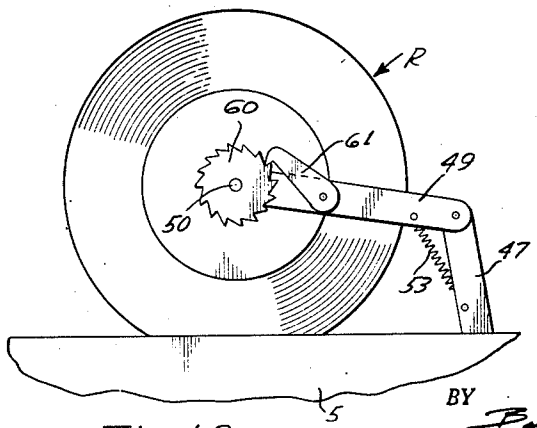


Fig. 12.

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TAPE APPLYING MACHINE

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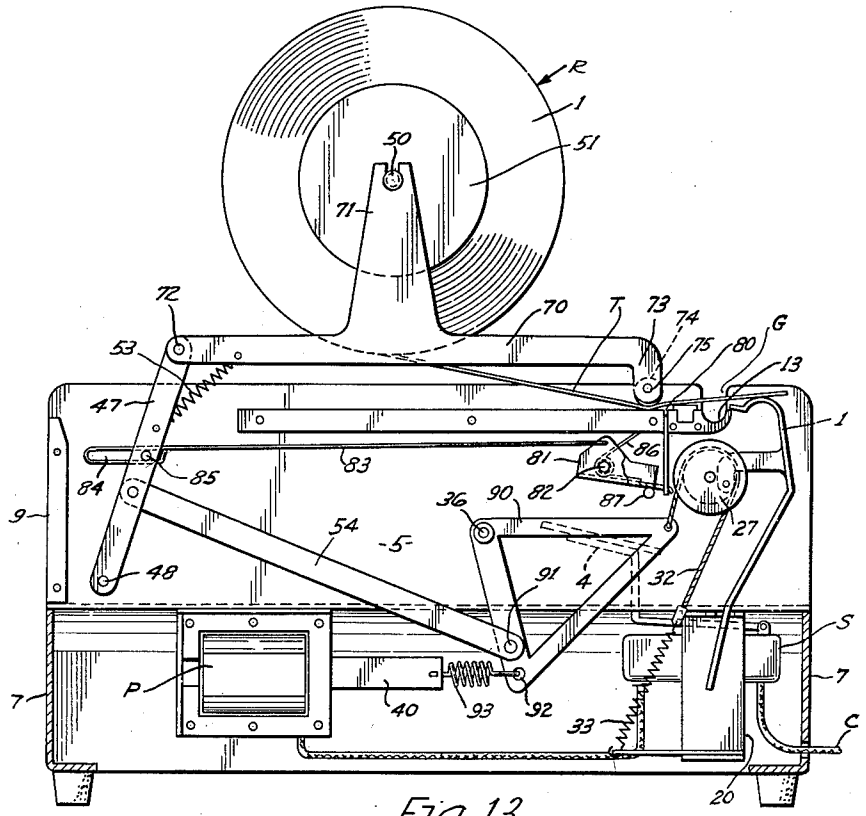


Fig. 13.

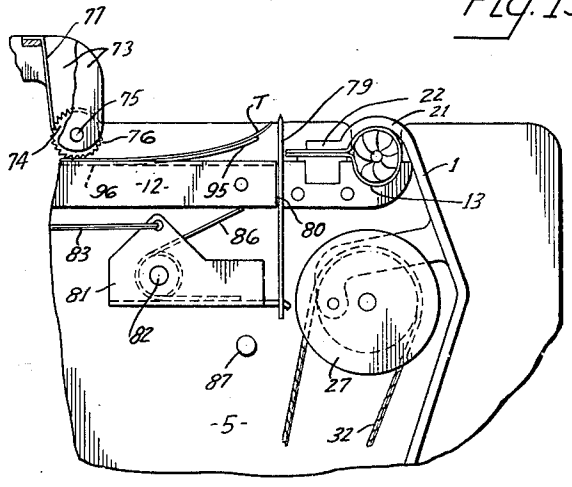


Fig. 14

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2,704,168

TAPE APPLYING MACHINE

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Application January 5, 1952, Serial No. 265,174

18 Claims. (Cl. 216—29)

This invention relates to tape applying machines and in particular to machines that are adapted to automatically apply pressure-sensitive tape to various objects.

Our invention is concerned with the application of an adhesive tie to a variety of objects with especial utility in fastening such ties to generally elongated cylindrical objects. By way of example, the machine embodying our invention is particularly adapted to tying and labeling the twisted necks of bags, such as transparent moisture-proof bags in which vegetables and similar produce are marketed in retail stores. In this instance the bag should be tightly sealed in order to retain the moisture within the bag and thus preserve the food. Also, the tie may conveniently serve as a label marked to identify the contents of the bag and/or the price thereof especially in the case of "cellophane" bags which do not readily admit of exterior marking. The tremendous volume of food sold in bags makes the operation of bagging food an important one from the cost standpoint and so it is essential that tying and labeling steps be effected in a minimum of time and with least expense. Our invention facilitates the accomplishment of this purpose.

While we have referred to the application of adhesive ties to bags as illustrative of the utility of the machine embodying our invention, we wish it to be understood that our invention is not limited to this field of use. Adhesive ties may readily be applied according to the precepts of our invention to many other objects of varying sizes and shapes. Ties of this nature have been successfully affixed to wire for labeling purposes. We have chosen to illustrate and describe our invention in this specification in connection with tying the twisted neck of a bag but this is only by way of illustration and not by way of limitation.

A primary object of this invention is to provide a machine which is capable of applying an adhesive tie quickly and automatically around a generally elongated object. A more specific object is to provide a bag tying machine which wraps pressure-sensitive tape around the twisted neck of a bag to seal the contents of same and to permit labeling of the contents. Another object is to provide a machine for applying adhesive ties to objects in which the proper length of pressure-sensitive tape is initially automatically peeled from a roll on which it is stored to reduce the amount of manual effort required of the operator to unpeel and draw the tape through the machine. Another object is to provide a machine for wrapping pressure-sensitive tape around a generally elongated object which positively presses the tape into adhesive engagement with substantially the whole periphery of the object being tied or taped. Another object of our invention is to provide an adhesive tie applying machine that is sturdy in construction, simple to operate, economical to manufacture and one which may be quickly and conveniently disassembled and assembled for repair or replacement of parts.

These and other objects of our invention will become apparent from the following description of preferred embodiments thereof reference being had to the accompanying drawings in which: Figure 1 is a perspective view of the complete machine; Figure 2 is a side elevation of a machine with one of the sides thereof removed to show the details of construction; Figure 3 is an end view of the machine, the base end wall having been removed; Figures 4–8 inclusive are fragmentary side views of the tape applying mechanism showing the successive positions of various parts during the operation of wrapping

the neck of a bag with tape; Figures 9 and 10 are fragmentary detail views showing the successive positions of tape roll shifting parts which are actuated to shift the roll and automatically peel a length of tape therefrom; Figure 11 is a fragmentary elevation showing a modified form of our invention wherein the cutting blade is movable relative to the housing; Figure 12 is another fragmentary elevation showing a modified tape roll spool construction for use with the mechanism of Figure 11; Figure 13 is a side elevation of another modified form of our invention having the automatic tape cutting feature; and Figure 14 is an enlarged fragmentary detail of the mechanism of Figure 13.

Our invention in its preferred form comprises generally a cabinet or housing H, see Figure 1, which houses most of the operating mechanisms for quickly and automatically wrapping a pressure-sensitive tape T, such as the well-known "Scotch" tape or the like, around various objects such as the twisted or gathered end or neck of a bag when same is properly positioned crossways of the machine in a groove G in the top of the cabinet. A single strip of this tape T preferably peeled from but still connected to a roll R of such tape carried on the cabinet, is extended across the groove G with the adhesive side facing upwardly so that, for example, the gathered end of a bag preferably twisted about a half turn to a somewhat cylindrical shape to fit into the groove will be adhesively engaged by the tape as the same is pressed inwardly to the bottom of the groove. The tape is thus initially adhesively applied to about half the periphery of the bag neck when the latter is positioned in the groove G. Thereafter, in response to a source of power energized by a control switch S, see Figure 2, actuated by arm or extension 4, a tape looping and sealing arm 1 which is initially disposed underneath the front portion 2 of the tape extending beyond the groove G is caused to move upwardly in an arcuate path of about 180° over the groove G and the neck of the bag disposed therein. As the arm is moved upwardly and over the bag neck, the portion 2 of the tape lying on the top of arm 1 is carried with the arm and is looped backwardly over and then pressed into adhesive contact with the exposed part of the bag thereby binding and tying the bag tightly and securely. The length of the portion 2 of the tape is greater than the circumference of the neck which it engages so that the free end of the tape when fully folded back will extend beyond the neck and overlie a short length of the tape on the other side of the groove against which it is ultimately adhesively pressed and sealed. This results in the formation of a tab K, see Figures 7 and 8, which projects radially from the bag neck and facilitates removal of the tie when the bag is to be opened. When the power source is deenergized, the arm 1 is caused to return to its initial position, the leading part of the tape drawn from the roll R is again extended across groove G over the top of arm 1 and is severed adjacent the tab K and the machine is ready to receive another object and to repeat the tying cycle.

It will be noted our machine is especially convenient to operate since the groove G in the upper part of the housing and the switch actuating arm 4 projecting from the base are close to each other. This permits the operator to use both hands to insert the particular object into the groove G and if desired or necessary while holding the object in this position with both hands to press the arm 4 to close the switch S thereby actuating the mechanism to apply the adhesive to the tie. The roll R of tape is sufficiently spaced from the working end of the machine so as not to interfere with the tying operation while the other moving parts of the machine are enclosed in the housing. The machine runs on 110 volt 60 cycle or equivalent power and may be provided with a cord and plug C to provide a connection with a suitable outlet.

The housing H preferably is made of sheet metal and has a pair of side walls 5 and 6 and end walls 7 which are fastened together by sheet metal screws. The upper parts of the side walls are substantially parallel to and spaced from each other by an amount substantially equal to the width of the tape being used while the lower parts of the walls extend away from each other and then downwardly to form in conjunction with the end walls 7 an

enlarged base portion which provided a stable support for the machine and an enclosure for certain components of the mechanism. Flanges 8 and 9 formed on the front and rear ends respectively of the upper parts of one of the side walls space the side walls apart and receive the screws for fastening same together and also serve to close off the ends of the machine.

The general arrangement of the working parts of our machine is shown in Figure 2. The tape roll R is supported on an elongated rail member 12 which extends longitudinally of the housing and is secured to and between the side walls 5 and 6 thereof slightly below the extreme upper edges of these walls. The rail 12, among other things, constitutes a runway over which the roll R is caused to roll longitudinally of the machine to unpeel tape therefrom, which operation will be described in greater detail later in this application. The extreme forward (rightward as viewed in Figure 2) end of the rail 12 is provided with an upwardly opening recess 13 which is aligned with slots 14 in the top edges of the side walls 5, 6 to form the bag neck receiving groove G of the machine. A strip of tape T peeled from the bottom of roll R with the adhesive surface thereof facing upwardly is disposed to extend along the top of rail 12 and across the recess 13, and thus when the neck of the bag is inserted into and ultimately bottomed in the recess 13 the tape drawn into the recess will be pressed into adhesive engagement with the underside of the neck. Guide wheel 15 is provided above the rail adjacent the recess 13 to prevent the tape from kinking and to cause the tape to feed across the recess close to the plane of the top of the rail. The rail preferably is fitted with a resilient pad 16 secured thereto between guide wheel 15 and recess 13 and extending slightly above the plane of the rail 12 for the purpose of facilitating the pressing of the leading end of the tape against rearward parts of the tape to form tab K.

The tape looping and sealing arm 1 which has the appearance of a shepherd's crook has a straight shank the lower part 18 of which is disposed in a transverse slot 19 located in the top of a channel shaped anchor member 20 secured to the lower part of the housing. The slot 19 permits the arm 1 to slide vertically with respect to member 20 but prevents longitudinal movement of the lower end 18 thereof and so that the arm in essence has a sliding pivotal connection with the anchor member 20. The upper end 21 of arm 1 is hook shaped and has an extension 22 projecting therefrom which, as will be seen below, presses the leading end of the tape against the rearward parts thereof to form the tab when the arm is positioned with its hooked end over the object disposed in recess 13.

In order to induce the arm 1 to loop the front part of the tape backwardly over the recess 13 we provide preferably a rotatable element or pulley wheel 27 located directly below the recess 13 in the rail 12 and mounted for rotation about a transverse pin 28 which extends through and is supported by the side walls of the housing. The tape looping arm 1 is pivotally connected to the pulley 27 by an integral support member 29, the pivotal connection thereof to the pulley being indicated at 30. The pivotal connection 30 is radially spaced from the axis of rotation of the pulley so that when the pulley rotates in a counterclockwise direction as viewed in Figure 2 through about one-half a revolution, member 29 will move upwardly and rearwardly through an arcuate path. Consequently the hooked end 21 of arm 1 will be moved through a similar path over the recess 13 and the object disposed therein when pulley movement is initiated, the arm pivoting about its lower end 18. It will be apparent that the arm 1 needs to be moved only through an arc of about 180° in order to apply the tie to the particular object and therefore the pulley 27 is required to rotate only through one-half revolution to effect this desired movement of the arm.

The preferred means for driving the pulley for rotation about its axis includes a cord 32 which is wound around and frictionally grips the pulley and has one end tied to a spring 33 fastened to the anchor member 20. The other end of the cord 32 is fastened to an arm 34 of a crank 35 which is adapted to pivot about transverse pin 36 secured to the side walls of the housing. The other arm 37 of the crank 35 is slotted as at 38 remote from the pivotal axis of the crank for slidingly receiving a pin 39 which connects crank 35 to the bifurcated end of the armature 40 of a solenoid P. When the solenoid is energized its armature is moved to the left as viewed in Figure 2. This causes crank 35 to rotate in a clockwise (as viewed in Figure 2) direction about pin 36 pulling cord 32 around the pulley against the pressure of spring 33 and thus ultimately causing the pulley to rotate about its axis. The length of stroke of the armature of the solenoid P is such as to cause the pulley to rotate through about a half revolution. Control of solenoid P is effected through switch S. Thus, when switch arm 4 is depressed, the switch is closed and current is allowed to pass to the solenoid the armature of which is shifted longitudinally to the left as viewed in Figure 2 to move the pulley 27 through one-half revolution. When the switch arm 4 is released, the circuit is open and all parts are returned to their initial positions by the action of spring 33 connected to pulley cord 32. It will be understood that other drive means may be used to actuate the desired movement of arm 1 and as will appear below, the tape roll, for example, a spring cocked motor which is adapted to impart limited rotational movement against the action of a spring to driven objects may be connected directly to the rotatable element or pulley 27.

The operation of our machine will be understood by reference to Figures 4 through 8 which illustrate the sequence of position of the parts of our machine when applying the tie, for example, to the twisted neck of a bag. In Figure 4 the neck N of the bag is shown partially inserted in slots 14 in the side walls and above the tape which extends across recess 13 in the rail member. The tape looping arm 1 is positioned ahead of the neck receiving groove in the machine, the front portion 2 of the unpeeled tape lying loosely on top of its hooked upper end 21. The bag is then moved downwardly into the recess as shown in Figure 5. This draws the tape into the recess and into adhesive contact with the portion of the bag neck disposed therein. Next, arm 4 of the switch S is depressed, energizing the solenoid which drives the pulley in a counterclockwise direction moving the arm 1 upwardly and rearwardly to the position shown in Figure 6. The leading portion 2 of the tape, pivoting about the forward part of the bag neck has been looped backwardly and is positioned somewhat under the hooked end of the arm 1.

As the pulley continues to rotate, the hook 21 moves back and downwardly over the neck of the bag pressing the tape firmly against the upper portions of the bag neck as shown in Figure 7. At the extreme limit of movement of arm 1, the extension part 22 thereon presses the leading end of the tape and the rearward parts thereof against the resilient pad 16 sealing same and forming the tab K.

Next the switch S is opened through release of arm 4 which deenergizes the solenoid P and permits spring 33 to return the parts to their initial position. Thereafter, the operator removes the bag from the groove, draws it longitudinally out of the machine, at the same time pulling with it the tape which is still connected to the roll R, and finally severs the tape on a knife blade 43 preferably pointed as shown in Figure 3 and mounted vertically on flange 8 of the side wall. The bag tying operation is then complete and the machine is ready to receive another article to be wrapped or tied.

Pressure-sensitive tape has a tendency to adhere to itself when wrapped in roll form thus offering appreciable resistance to tape peeling operations which resistance must be overcome by the operator as he draws the tape from the roll prior to cutting it. To reduce this resistance to peeling and the effort required of the operator, we have provided a mechanism for automatically peeling a suitable length of tape from the roll prior to the time when the operator is called upon to pull the tape out of the machine. Referring now to Figures 2, 9 and 10, this mechanism comprises a rigid member 47 pivotally connected at its lower end 48 to the side walls of the housing for movement in the plane of the tape and at its upper end to a pair of bars 49 which engage the axle 50 of tape spool 51 on either side thereof in slots 52. Spring 53 between member 47 and bars 49 urges the latter downwardly which in turn retains spool axle 50 releasably in slots 52 and thus bars 49 may be conveniently raised to permit replacement of the roll when necessary.

A link 54, see Figure 2, which extends a greater part of the length of the machine is connected at one end to the pivot member 47 mid-way between its ends and at the

other end is pivotally and slidably engaged in an arcuate slot 55 formed in the side of pulley member 27, see Figures 9 and 10, the length of the slots being less than 180 degrees. When the solenoid is energized and the pulley rotated through one-half revolution as described above link 54 through its connection in slots 55 will be shifted rearwardly pivoting member 47 in the same direction and causing roll R of tape to be moved rearwardly thereby peeling a length of tape therefrom. The initial position of the roll shifting parts is illustrated in Figure 9 while in Figure 10 they are shown at their extreme limit of rearward movement. The forward ports of the tape are firmly anchored in the recess 13, see Figure 5, at the time when the roll of tape is shifted rearwardly, the resulting tension causing the desired length of tape to be peeled from the roll. After the roll has been retracted and the tape unpeeled, the roll will advance to its initial position in response to rotation of the pulley in the opposite direction and the tape which had been peeled therefrom will be wound again on the periphery of the roll. However, the initial bond between this length of peeled tape and the rest of the tape on the roll will have been broken and thus very little effort on the part of the operator will be required to again peel this portion of tape when the bag is withdrawn from the machine.

As mentioned before, a variety of different sizes of elongated objects may be tied conveniently in our machine. As suggested in the drawings the twisted neck of a bag which substantially fills the whole recess 13 in the rail illustrates one kind of object. Other objects having a much smaller diameter than the span of the recess, such as single strand of insulated wire, may also be effectively tied with adhesive tape even though the crook of the arm 1 does not press the tape directly into adhesive contact with the periphery of the object. In the case of small diameter wire to be tagged or labeled as with printed adhesive strips, we have found that satisfactory results can be obtained by positioning the wire on top of the tape and in the lower forward portion of the recess 13. This puts the tape slightly in tension and causes same to tightly adhere initially to a substantial portion of the periphery of wire. The arm 1 when actuated loops and seals the free end of the tape on the other side of the recess to complete the tie as described above.

The above described tape peeling apparatus may, with some modification, be made to complete the tying operation substantially automatically, eliminating the necessity of the step of the operator manually pulling the new length of tape from the roll. The modified apparatus is illustrated in Figures 11 and 12 wherein the forwardly projecting extension 22 on the hooked end of arm 1 is shown fitted with a downwardly extending cutting blade 58. The rail 12 on the opposite side of the recess 13 is also modified to the extent that it has a knife receiving slot 59 adjacent pad 16 and having a depth slightly greater than the length of the knife blade 58 extending below extension 22. When the hooked end of arm 1 is caused to move over the object disposed in recess 13 to seal the tape therearound as described above, knife 58 will be brought into cutting contact with the portion of the tape extending over slot 59 when the parts are in position shown in Figure 7, thereby automatically severing the tape at the tab K.

In order to feed the tape from roll R into the position shown in Figure 11 after it has been cut during the preceding tying operation, we provide a one-way clutch comprising a ratchet 60 mounted on the axle of roll R and a pawl 61 pivoted on bar 49 and engageable with ratchet 60, which clutch permits the roll R to rotate about its axis only when the roll is withdrawn rearwardly, that is, clockwise direction as viewed in Figure 12, on the first step of the tying cycle. On the return movement during the second half of the cycle, the roll is caused to slide rather than rotate on rail 12 by the engagement of pawl 61 with ratchet 60 which prevents rotation in this direction and thus the length of tape peeled from the roll on the rearward stroke is pushed forwardly across recess 13 and over the top of the hooked end 21 of arm 1 as shown in Figure 11 on the forward stroke. We prefer that the pressure-sensitive tape used in this form of our invention be sufficiently stiff to permit same to be advanced through the machine in the manner described without bunching or kinking and yet be flexible enough to permit same to be wrapped and sealed tightly around the object being tied.

The modified form of our invention thus described requires only that the operator insert the particular object in the recess 13 as described above in connection with the machine of Figures 4 and 5, and press the arm 4 of switch 5. This initiates the operation of the machine to tie, seal and sever the tape requiring no further attention of the operator. When switch S is released, the parts return to their initial position, the leading part of the peeled tape is fed through the machine, and the same is then ready for the next tying operation.

In Figures 13 and 14 we have illustrated another modified form of our invention wherein provision is made for automatically severing and advancing relatively thin flexible pressure-sensitive tape which because of its light weight and flexibility would not tend to operate as satisfactorily as stiffer tape with the automatic cut-off mechanism described above in connection with Figures 1 and 2.

The spool 51 on which roll R of tape is mounted is supported by its axle 50 between a pair of elongated plates 70 which extend longitudinally of the machine above the rail 12 and which have vertically extending side parts 71 suitably recessed on their upper edges to receive the spool axle. The roll of tape so supported is free to rotate about the axle 50 and does not rest on the rail 12. The rearward, or leftward as viewed in Figure 13, ends of these plates 70 are pivotally connected at 72 to the member 47. In order to support the roll of tape for reciprocating movement longitudinally of the machine, the forward ends of plates 70 are provided with depending leg portions 73 between which a roller 74 is supported for rotation about a transverse pin 75 carried by the legs 73. The roller 74 is supported on the rail 12 with tape lying on the rail and under the roller; gravity and the springs 53 stressed between the plates 70 and member 47 adjacent the pivotal connection 72 force the roller 74 downwardly on the tape and rail 12 and give the roller a tractional grip on the tape.

The plates 70 comprise a carriage for the roll of tape supported for reciprocal motion on the link 47 at the rear and on the roller 74 at the front of the machine. The roller 74 is permitted to rotate only counterclockwise, as viewed, wherewith to roll on the tape, and on the rail, when the carriage is moved rearwardly and is held against rotation when the carriage is moved forwardly wherewith to grip the tape and feed it forwardly by sliding movement on the rail 12. To this end the surface of the roller 74 is grooved or knurled axially of the roller. Also there is provided a flexible metal strip 77 secured at one end to the plates 70 and disposed to engage knurled surface of the roller 74 in the manner of a pawl engaging a ratchet so as to permit the roller to rotate freely counterclockwise as viewed in the drawings but to prevent rotation in the opposite direction. Thus when the machine is operated and the roll supporting plates 70 are caused to move rearwardly away from recess 13 in the rail in the same manner as the roll is retracted in the above described form, roller 74 will rotate about its axis over the tape. However, on the return or forward movement of the plates 70 and the roll, the roller 74 is prevented from rotating by pawl 77 and so acts to push the tape forward along rail 12 with the leading edge of the tape advancing over recess 13 and on top of arm 1. The upper surface of the rail 12 is smooth and presents low frictional resistance to sliding movement of the "back" side of the tape and the knurled roller 74 acting on the sticky side of the tape insures the feeding movement of the tape along the rail commensurate with the forward movement of the roll and carriage.

In order to cause the tape to be cut automatically, we provide a flexible cutting blade 79 which is disposed in and guided for movement transversely of the tape by a slot or opening 80 in rail 12 adjacent pad 16. The lower end of the blade is connected to a crank 81 preferably formed out of channel stock and arranged to pivot about a pin 82 which extends through side walls of the crank and is supported by the walls of the housing. Pivoting of the crank about pin 82 is accomplished by a link 83 connected to the crank at one end and having at the other end preferably an elongated looped portion 84 disposed between members 47 and around a pin 85 carried by these members. The looped portion 84 of the link permits a certain amount of lost motion between the members 47 and the link 83 so that the blade supporting crank 81 will be actuated only when the arm 1 approaches the end of its tape looping and sealing movement as will be ex-

plained below. A spring **86** on crank **81** bears against the underside of the rail and urges the crank against a stop **87**, in which position of the crank the knife blade **79** will be withdrawn in opening **80** below the top surface of the rail **12**.

In other respects, this modified form of our machine in its essential characteristics is substantially the same as the machine shown in Figure 2. In the modified machine shown in Figure 13 we have chosen to use a triangular shaped main crank **90** instead of the L-shaped crank previously described. The forward end of the tape roll reciprocating link **54** is pivotally connected at **91** to the crank **90** instead of being connected to pulley **27**. It will be seen that the point of connection **91** of link **54** to crank **90** is close to the point of connection **92** of the crank to the solenoid armature **40** so that when the solenoid is energized the effort of the solenoid, inter alia, will work directly through link **54** and member **47** to retract the tape roll supporting assembly. Spring **93** interposed between the crank and armature cushions the shock of the initial armature movement when the solenoid is energized.

The operation of the machine is as follows: the object to be tied is placed crossways in the groove G and the recess **13** in the rail and into adhesive engagement with the portion of tape that initially extended across the recess. Arm **4** of switch S is then depressed causing the solenoid P to be energized and the armature **40** to be moved to the left as viewed in Figure 13 which in turn pivots crank **90** about its pin **36** and moves link **54** rearwardly and longitudinally of the housing. As described above, the motion of the crank **90** causes pulley wheel **27** to rotate which in turn causes arm **1** to move upwardly and rearwardly in an arcuate path over the object disposed in the recess, at the same time looping the forward free end of the tape over the object and back upon the object and itself. Simultaneously, the tape roll supporting carriage with the roll R of tape is moved rearwardly, to the left as seen in Figure 13, while the forward end of the tape is anchored to the object thereby peeling a fresh length of tape off the roll. As member **47** continues to pivot rearwardly pin **85** will move to the end of the looped portion **84** of link **83** and near the extreme end of the rearward stroke, will cause link **83** to move rearwardly and initiate upward cutting movement of the cutting blade **79**. The movement of link **83** rearwardly causes counterclockwise rotation of crank **81** about pin **82** which in turn moves cutting blade **79** sharply upwardly in opening **80** to sever the tape adjacent the point where the free end of the tape is turned back over the object. The severing takes place at approximately the time of extreme leftward, as viewed, movement of the carriage and roll and while the looped end of the tape is anchored in the recess **13** by the object, see Figure 14, and while the tape between the roll and the blade is held under the knurled roller **74** and tautened by the adhesion of the tape to the roll and the leftward movement of the roll and carriage.

The crank **81** has its short arm connected to the link **83** and its long arm connected to the blade **79** so that the last small increment of rearward movement of the carriage and the link **47** will induce a relatively large quick movement of the blade to sever the length of tape desired to be fed on the return stroke of the carriage. For a given movement of the carriage the feed of the tape may be modified by changing the length of the link **83** or by placing the pin **85** nearer or farther from the pivot **48** in the link **47**. It will also be understood that the stroke of the carriage may be changed by changing the points of connection between the link **54** and the crank **90** and link **47**. In the latter event the position of the pin **85** and the effective length of the link **83** will be modified or preserved to bring about the severing of the tape at the point in the stroke to produce the desired feed.

When switch arm **4** is released, the solenoid is deenergized and the parts are returned to their initial starting positions by the action of spring **33** on the end of pulley cord **32**. As this happens blade **79** is withdrawn into slot **80** below the top surface of rail **12**, and the new leading end of the tape is caused to advance forwardly by the motion of the tape supporting carriage and the knurled roller **74**. Since the object to which the adhesive tie has been applied may still be disposed in the recess **13** of rail **12**, the free end of the tape as it advances might engage and be deflected by the blade **79** or by said object if either were projecting above the top surface of the rail when the tape was being fed forwardly. To avoid this and to insure that the free end will advance freely and unobstructedly over the blade and/or over the top of arm **1**, a resilient band or strip **95** of spring steel or the like is fastened in a longitudinal recess **96** in the top of the rail **12** leftwardly of, as viewed, and adjacent the slot or opening **80**. The band **95** is secured in the recess remote from slot **80** and is formed so as to normally bow or curve gradually upwardly and forwardly to a point maximum height above the rail adjacent the slot **80**. This band underlies the tape at all times and is held flat for its whole length in the longitudinal recess **96** by the pressure of knurled roller **74** when the parts are in their initial starting position. However, when the tape supporting assembly and the roller **74** are moved rearwardly on the first half cycle of the machine, pressure on band **95** is reduced and it tends to rise upwardly as the roller is retracted. When the tape is severed by blade **79** the free end of the band **95** rises and the freshly cut end of the tape is then supported by band **95** in an elevated inclined position, Figure 14, above rail **12** so that when the tape is advanced forwardly it will pass freely over any obstructions and feed freely its whole intended length.

This form of our invention facilitates rapid and efficient tying operations with a desirable minimum manual effort, action or attention, guarantees the correct and selectable feed and feeding of the tape and automatic and correct severance of the "tied" tape from the supply thereof, and permits the satisfactory employment of a wide range of tapes differing in weight, stiffness and other characteristics without compensation or concern by the operator of the machine.

Modifications, changes and improvements to the above described and illustrated preferred forms and embodiments of our invention may occur to those skilled in the art without departing from the spirit and scope of our invention. We therefore do not wish to be limited to these preferred embodiments of our invention, nor in any manner inconsistent with the advance which our invention marks over the prior art.

We claim:

1. A mechanism for applying and sealing pressure-sensitive tape around an object comprising a housing, a rail supported on said housing having a recess therein at one end thereof adapted to receive said object, a roll of tape disposed in the plane of said rail and supported thereby, a portion of said tape being peeled from the roll and initially extending along said rail across said recess with the leading part thereof extending beyond the recess, the side of said tape facing away from said recess being coated with an adhesive substance, a rigid member connected at one end to said roll of tape and pivotally connected at the other end to said housing, a link connected to said member intermediate the ends thereof adapted to be moved substantially longitudinally of the housing whereby to pivotally move said member to cause said roll to advance and retract toward and away from said recess, a pulley mounted on said housing near said recess for limited rotation about an axis transversely of said rail, said link being connected to said pulley and movable longitudinally of the housing in response to rotation of said pulley, means to rotate said pulley comprising a cord frictionally engaging said pulley having one end resiliently anchored to said housing, a crank pivotally mounted on said housing and connected to the other end of said cord, power means for causing limited pivoting of said crank whereby to impart limited rotational movement to said pulley, a tape looping and sealing arm pivotally connected to said pulley and initially positioned beyond the end of said rail and underneath and in alignment with said leading parts of said tape, said arm having an extension at the end thereof adjacent said tape projecting therefrom toward said recess, said extension having a straight end part and an arcuately shaped part, means to limit movement of the other end of said arm in a direction longitudinally of said rail, switch means to energize said power means to rotate said pulley in one direction so that said roll of tape is retracted from said recess to peel tape therefrom and simultaneously said arm is caused to move in an arcuate path in the plane of said tape across the open part of said recess with said extension engaging the leading part of said tape and looping same backwardly around said object positioned in said recess and pressing said tape into sealing engagement therewith and with part of the tape on the other

side of the recess, said arm and said roll of tape returning to their initial positions under the influence of the resiliently anchored pulley cord when said switch means deenergizes said power means, and a knife blade for cutting said tape.

2. A mechanism for applying and sealing pressure-sensitive tape around an object comprising a housing, a rail supported on said housing having a recess therein at one end thereof adapted to receive said object, a roll of tape carried by said housing and disposed in the plane of said rail, a portion of said tape being peeled from the roll and initially extending along said rail across said recess with the leading part thereof extending beyond the recess, the side of said tape facing away from said recess being coated with an adhesive substance, a rotatable element mounted on said housing for rotation about an axis extending transversely said rail, means connected to said rotatable element and said roll of tape to cause said roll to advance and retract toward and away from said recess in response to rotation of said element, means to cause limited rotation of said element in one direction, a tape looping and sealing arm pivotally connected to said element and initially positioned beyond the end of said rail and underneath and in the plane of said leading part of said tape, said arm having an extension at the end thereof adjacent said tape projecting therefrom toward said recess, means to limit movement of the other end of said arm in a direction longitudinally of said rail, said element when rotated in said one direction causing said roll of tape to be retracted from said recess to peel tape therefrom and simultaneously causing said arm to move in an arcuate path in the plane of said tape across the open part of said recess so that said extension engages the leading part of said tape and loops same backwardly around the object positioned in said recess and presses said tape into sealing engagement with said object and with the part of the tape on the other side of the recess, means to rotate said element in the opposite direction by the same amount to return said roll of tape and said arm to their initial positions, and a knife blade for cutting said tape.

3. A mechanism for applying and sealing pressure-sensitive tape around a generally elongated object comprising a housing, said housing having a recess therein at one end thereof adapted to receive said object, a strip of said tape extending across said recess with fore and aft parts thereof extending beyond the sides of the recess, the side of said tape facing away from said recess being coated with an adhesive substance, an element rotatably mounted on said housing near said recess for rotation about an axis transverse the plane of said tape, means for causing reciprocating rotational movement of said element, and a tape looping and sealing arm pivotally connected to said element and initially positioned underneath and in alignment with the fore part of said tape, said arm having an extension at the end thereof adjacent said tape projecting therefrom toward said recess, said element when rotated in one direction causing said arm to move in an arcuate path across the open part of said recess with said extension engaging the fore part of said tape and looping same backwardly around said object positioned in said recess and pressing said tape into sealing engagement with said object and with the aft part of the tape on the other side of the recess, said element also when rotated in the opposite direction returning said arm to its initial position.

4. Mechanism for applying an adhesive tie to a generally elongated object comprising, a stationary member having a recess therein adapted to receive said object crossways of said member, a roll of adhesive tape supported for movement longitudinally of said member, a portion of said tape being peeled from the roll and extending along said member across said recess with the front part of the tape extending beyond the recess, the adhesive side of the tape facing upwardly, a tape looping and sealing arm disposed underneath said front part of said tape and supported for arcuate movement across the open part of said recess, a rotatable element connected to said arm for moving same, means to drive said element from an initial position through substantially 180° of rotation relative to said housing and means to return said element to its initial position, means connecting said roll of tape to said rotatable element to move said roll of tape away from and toward said recess simultaneously with said movement of said arm, said arm during said movement engaging said front part of the tape and looping same backwardly around said object into sealing engagement therewith and with the tape on the other side of said recess, the adhesive sides of the overlapped portions of tape engaging each other, and means to sever the looped portion of the tape from portions thereof on the roll.

5. The mechanism according to claim 4 in which said element has an arcuate slot therein, said last named means including a link engageable with said slot and being reciprocable longitudinally of the housing in response to reciprocable rotary movements of said rotatable element.

6. In an adhesive tie applying mechanism, a housing, a stationary member mounted on said housing having a recess adapted to receive an object to be tied, pressure-sensitive tape initially lying across said recess substantially mid-way between the mouth and bottom thereof with parts of said tape extending beyond each side of the recess substantially in the plane of the recess, the side of said tape facing away from said recess being coated with a pressure sensitive adhesive, said object when moved into said recess engaging the adhesive side of said tape and pulling the tape into said recess between said object and the bottom of the recess, a tape looping and sealing arm disposed under and in alignment with one of said parts of said tape and supported for movement in an arcuate path over said recess, means to actuate said movement of said arm, said arm during said movement engaging one part of said tape and carrying same from its position substantially the plane of said recess in a loop around said object and into overlapped engagement with the part of said tape on the other side of the recess, the adhesively coated sides of said tape engaging each other, and means for cutting said tape adjacent the overlapped parts thereof comprising a blade mounted on said arm adapted to move therewith to sever said tape at the same time said arm presses the overlapped parts of the tape together.

7. In a mechanism for applying an adhesive tie to an elongated generally cylindrical object, the combination of a housing, an elongated rail member mounted on said housing having a transverse recess therein for receiving said object when inserted therein crossways of the rail member, pressure-sensitive tape wound in a roll on a spool and supported on said rail, a portion of said tape being peeled from said roll and extending along the top of said rail across said recess with the free end of the tape projecting beyond the recess, a tape looping and sealing arm having a hook shaped end adjacent said recess and disposed under the free end part of the peeled tape, a rotatable element carried by said housing arranged to be rotated about an axis extending transversely of said rail member, drive means to rotate said element, said arm being connected to said element for movement in response to rotation thereof in an arcuate path over said recess, said free end of the tape being carried by said hooked end of the arm in a looping motion over the recess and the top of the object disposed therein and ultimately being pressed into adhesive engagement with said object, a rigid member pivoted at one end to said housing and connected at the other to said spool, a link connecting said rigid member and said rotatable element whereby rotation of said element effects motion of the axis of said roll of tape toward and away from said recess to peel a new length of tape therefrom, and a cutting blade for severing said tape.

8. The combination of claim 7 in which said spool has a one-way clutch thereon operative to restrain rotation of said roll when same is advanced toward said recess, said tape being sufficiently stiff to permit the peeled length thereof to be pushed along said rail member.

9. The combination according to claim 8 with a cutting blade mounted on the hooked end of said arm adapted to sever said tape when said arm is moved over said recess.

10. In a mechanism for applying an adhesive tie to an elongated generally cylindrical object, the combination of a housing, an elongated rail member mounted on said housing having an upwardly opening transverse recess therein for receiving said object when inserted therein crossways of the rail member, pressure-sensitive tape wound in a roll on a spool and supported on said rail, a portion of said tape being peeled from said roll and extending along the top of said rail across said recess with

the free end of the tape projecting beyond the recess, a tape looping and sealing arm having one end thereof disposed under the free end part of the peeled tape, a rotatable element carried by said housing arranged to be rotated about an axis extending transversely of said rail member, drive means to rotate said element, said arm being connected to said element for movement in response to rotation thereof in an arcuate path over said recess, said free end of the tape being carried by said one end of the arm in a looping motion over the recess and the top of the object disposed therein and ultimately being pressed into adhesive engagement with said object, and a cutting blade for severing said tape.

11. In an adhesive tape tying mechanism in which a length of tape is folded over and about a transversely disposed object and sealed upon itself to form a tab the improvement comprising in combination means supporting part of the said length of tape with said object resting on the tape and with a free end of the tape beyond the object unsupported, a crook-like element disposed with its shaft substantially normal to the plane of the object and the tape and with its hooked end underlying the unsupported end of the tape, means constraining the end of the shaft remote from the hook to move substantially in the direction of the shaft, and means imparting arcuate motion to the hooked end of the crook up and over said object.

12. In a mechanism for applying an adhesive tie to an object, the combination of an elongated member to support said object to be tied, a roll of pressure-sensitive tape having a portion of tape peeled therefrom extending under said object and beyond one end of the rail, a longitudinally reciprocable support for said roll, said roll being freely rotatable on said support, a tape feeding element carried at the end of the support proximate said end of the rail adapted to operably engage and feed said tape during movement of said support in one direction, a tape looping and sealing arm disposed adjacent said one end of the rail under the unsupported part of said tape, power means to move said arm in an arcuate path over said object to loop said tape therearound and seal same against portions of the tape supported on the opposite side of said object to form a tab, said rail having an opening therein adjacent said tab, a cutting blade disposed in said opening and movable therethrough to sever said tape, and means to actuate movement of said blade to cut said tape prior to movement of said tape roll support in said one direction.

13. The mechanism according to claim 12 in which said last named means comprises a crank connected to said blade operable to move said blade through said rail opening to sever said tape, an actuating member connected to said tape roll support and operable to reciprocate same, and connection means connecting said crank to said actuating member.

14. The mechanism according to claim 13 with operable connections between said power means and said actuating member to synchronize movements of said arm, said tape roll support and said cutting knife.

15. The mechanism according to claim 14 which includes a triangular shaped member pivotally supported at one corner thereof on said housing and connected to said power means at a second corner thereof, rotatable means connected to the third corner of said triangular shaped member adapted to actuate movement of said tape looping and sealing arm, and a link connected at one end to said actuating member and at the other end to said triangular shaped member proximate said one corner thereof.

16. A mechanism for applying an adhesive tie to an object comprising a housing, an elongated rail carried by said housing, said object being positioned at one end of said rail to receive said tie, a roll of tape disposed in the plane of said rail and spaced therefrom, a portion of the tape in its initial position being peeled from said roll extending under said object and beyond said one end of said rail, a tape looping and sealing arm disposed adjacent said one end of said rail under said tape, means to move said arm in an arcuate path over said one end of said rail and said object to loop said tape around and into adhesive engagement with said object and a portion of the tape on the opposite side of said object to form a tab, said rail having an opening therein adjacent said tab, means to support said roll of tape comprising support plates mounted on said housing for retracting and advancing movements longitudinally of said rail toward and away from said object to be tied, said plates carrying a knurled roller at the end thereof spaced from said object being tied and being adapted to move along said rail on the peeled portions of said tape, means to prevent rotation of said roller in one direction and thereby feed said tape during movement of said plates in said one direction, power means for reciprocating said plates and consequently said roll of tape longitudinally of said rail, automatic tape cutting means comprising a cutting element disposed in said opening in said rail and adapted to move therethrough to cut said tape, crank means pivoted to said housing and connected to said cutting element, a link connected at one end to said crank and at the other end having a lost motion connection to said power means whereby said cutting element is actuated to cut said tape only when said roll of tape has been substantially fully retracted, said roller being free to rotate when said plates are retracted from said object to be tied, means to lock said rollers against rotation when said plates are advanced toward said object whereby to grip said tape and feed same along said rail to the initial position thereof.

17. In an adhesive tape tying mechanism for dispensing tape from a roll and looping it around an object and back upon itself, the combination of means for reciprocating the roll of tape bodily toward and away from the object to be tied, means for looping the free end of the tape around the object and sealing the tape upon itself adjacent the object and toward the roll, means for cutting the tape adjacent the place where the extreme end thereof is sealed upon itself and means for synchronizing the bodily movement of the roll and the looping of the tape around said object.

18. The combination of claim 17 with feeding means reciprocating with said roll comprising a roller bearing upon the adhesive side of the tape and pivotally supported to roll over the tape when the roll is moved away from the object and constrained from rotation when the roll is advanced toward said object.

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