Feb. 12, 1952 J. G. JONES ET AL 2,585,250

MACHINE FOR APPLYING TAPE TO CYLINDRICAL CONTAINERS

Filed May 24, 1950 2 SHEETS—SHEET 1

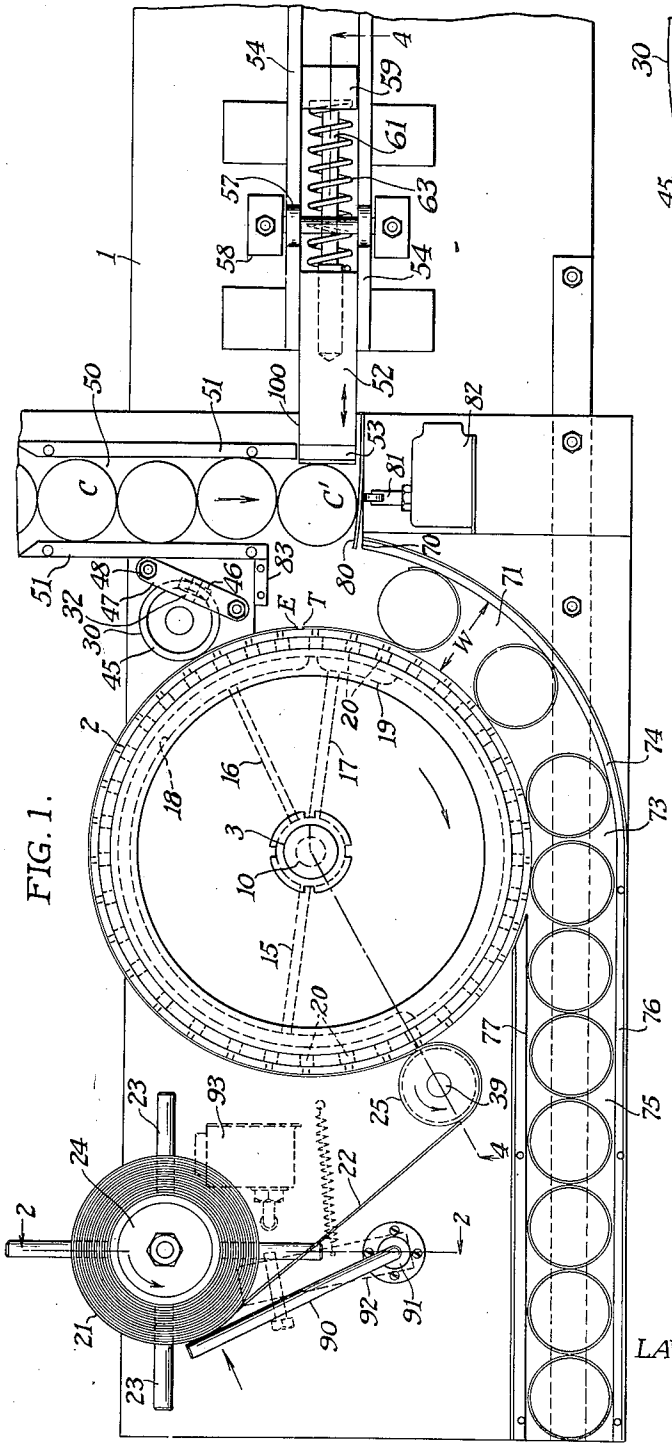

FIG. 1.

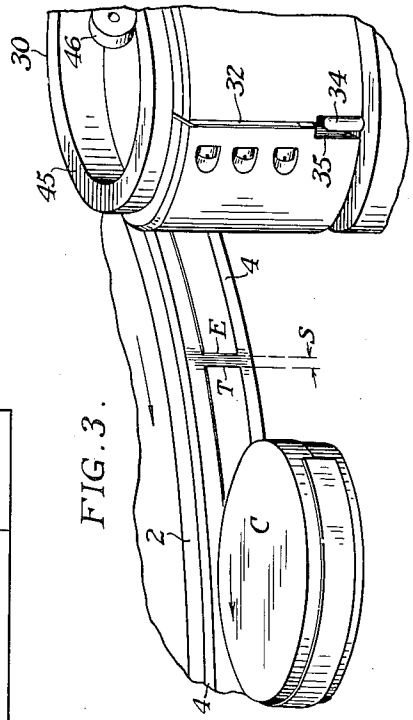

FIG. 3.

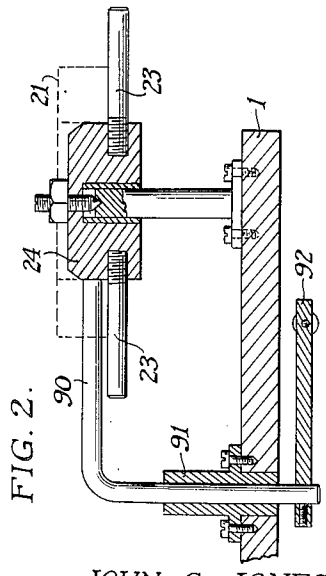

FIG. 2.

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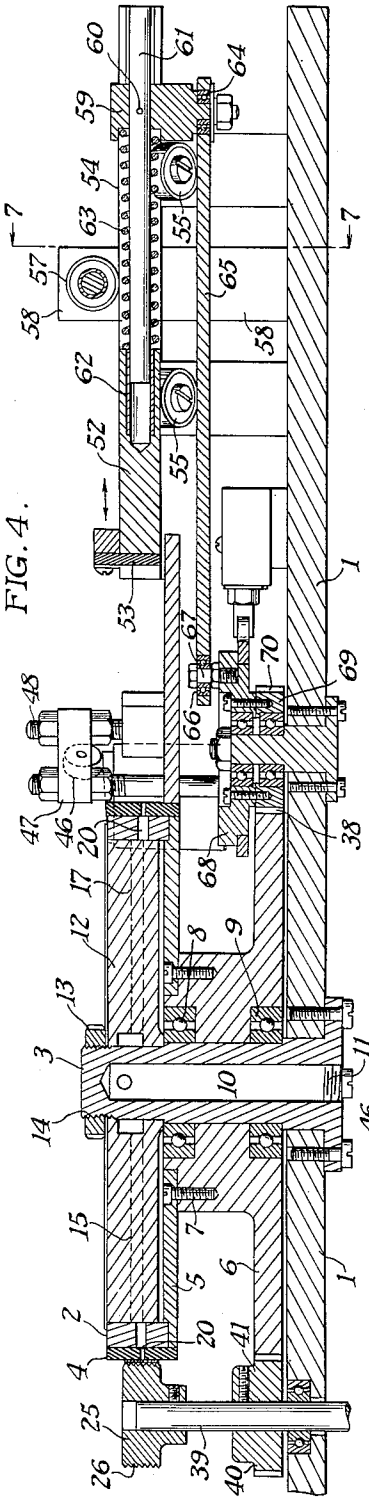

FIG. 4.

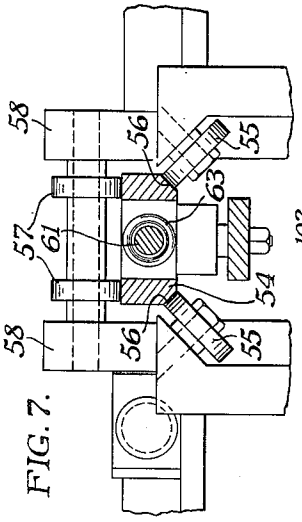

FIG. 7.

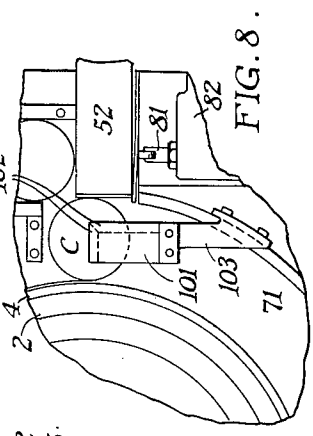

FIG. 8.

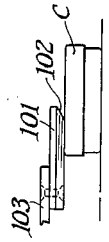

FIG. 9.

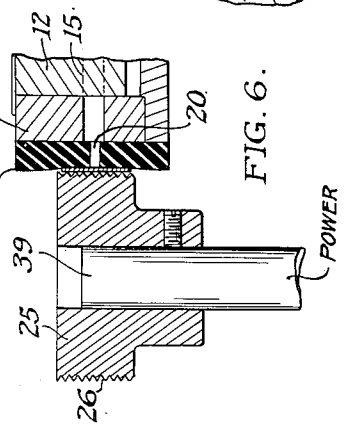

FIG. 6.

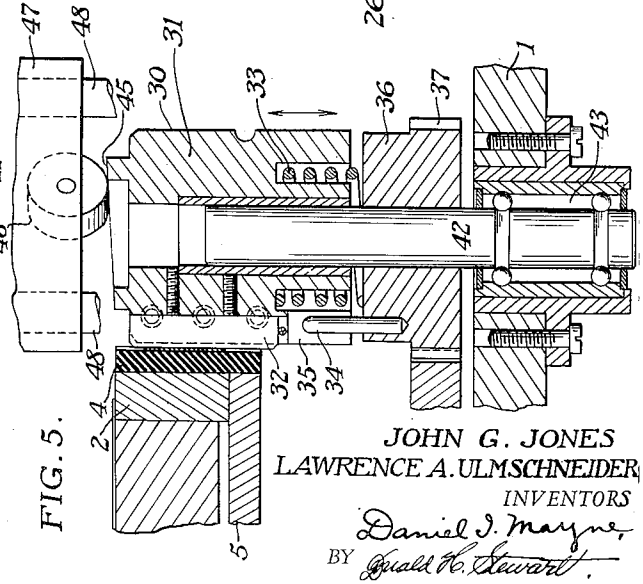

FIG. 5.

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2,585,250

MACHINE FOR APPLYING TAPE TO CYLINDRICAL CONTAINERS

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Application May 24, 1950, Serial No. 163,898

8 Claims. (Cl. 216—21)

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This invention relates to a machine for applying tape to cylindrical containers. One object of our invention is to provide a machine for automatically applying a strip of tape around a cylindrical portion of two container sections, one constituting a body portion and one constituting a cover, to hold the cover on the body. Another object of our invention is to provide a machine for applying such tape under a predetermined stress, so that the tape may be tightly and smoothly attached in the proper location. A still further object of our invention is to provide a means for supplying severed lengths of tape to an applying drum and to feed the containers into frictional contact with the drum under pressure such that the tape is smoothly pressed while being stretched taut against the periphery of the container. Another object of our invention is to apply a tape strip to a cover and body portion of a container to make a substantially moisture-proof connection therebetween.

A still further object of our invention is to provide a means for insuring that the cover is completely on the container before the tape is applied thereto. Other objects will appear from the following specification, the novel features being particularly pointed out in the claims at the end thereof.

Coming now to the drawings wherein like reference characters denote like parts throughout:

Fig. 1 is a top plan view of a machine for applying tape to cylindrical containers, constructed in accordance with and embodying a preferred form of our invention;

Fig. 2 is a fragmentary detail taken on line 2—2 of Fig. 1, showing a holder for the tape to be applied to the can. This view is a part side elevation and part section.

Fig. 3 is a fragmentary perspective detail showing a portion of the tape-carrying drum and the tape-severing means;

Fig. 4 is a fragmentary sectional view taken on line 4—4 of Fig. 1;

Fig. 5 is a fragmentary sectional view taken through the tape-severing mechanism and showing a portion of the tape-supporting drum;

Fig. 6 is a fragmentary sectional view showing the serrated or grooved roller for applying tape to the surface of the drum;

Fig. 7 is a fragmentary sectional view showing the reciprocating slide for moving containers into contact with the drum;

Fig. 8 is a fragmentary plan view showing a portion of the feeding mechanism for advancing containers toward the tape-applying drum; this

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view being a modification which includes a means for insuring that the covers are properly seated on the can bodies; and

Fig. 9 is a fragmentary side elevation showing the can cover pressing member shown in Fig. 8.

In packaging photographic films, such as motion picture films, it is necessary to prevent the leakage of air into the film package. Since the moisture content of air may vary, causing the film to dry out, or to become too moist unless air is definitely excluded, it is customary to package rolls of film in metal containers after wrapping the film in suitable and preferably moisture-tight material, and it is, of course, desirable to also close the can against the entrance of air after the film is once packaged. It is, therefore, desirable to apply a length of adhesive tape, preferably of the type frequently referred to as "surgeon's tape," which tape has a pressure adhesive which remains tacky on one side of the tape, and, when applied with suitable pressure, such tape adheres quite tenaciously and is substantially moisture-proof. Our present invention is particularly directed to an automatic machine for rapidly and accurately taping metal containers for film under the desired pressure and under standardized conditions so that the tape will be properly applied to exclude moisture. It is customary to use flat cylindrical containers of the so-called "pill-box" type wherein a cover of a relatively flat cup-shaped cylindrical member is applied to a body member of similar shape, but of a slightly less diameter, so that the cover flange may be applied over the body flange. It is obvious that such a machine is also suitable for other material to be packaged in cylindrical containers and that the containers may vary in shape although they must be cylindrical to pass through our improved machine.

Referring to Fig. 1, the machine may consist broadly of a support 1 on which a drum 2 is mounted to rotate about an axis 3. The drum 2, as best shown in Fig. 4, includes a rubber-like ring 4 extending around the drum, this material being of a springy nature and being capable of being compressed. Rubber, or artificial rubber such as Koroseal or the like, may be used for this purpose. The drum member 2 is a flange-like extension from a disk 5 which is carried by a gear 6 being attached thereto by suitable screws 7. The gear 6 may turn on both bearings 8 and 9 about the fixed axis 3 which is here shown as a shaft having an air opening 10 in the center with a threaded area 11 to which an air line may be attached to create a slight vacuum in this tube.

There is a fixed disk 12 carried on the upper end of the shaft 3 being held in position by a nut 13 attached to the threaded area 14 of the shaft 3. This disk is provided with a series of air channels 15, 16, and 17.

Referring to Fig. 1, channels 15 and 16 lead to an arcuate air groove 18 and channel 17 leads to a short arcuate air groove 19.

As indicated in Fig. 4, the drum 2 is provided with spaced air apertures 20 which apertures, by being moved opposite the air grooves 18 and 19, permit suction to pass through these apertures to hold tape on the periphery of the drum. This tape 21 may be supplied in coils, as shown in Fig. 1, with the adhesive side 22 inside the coil. This coil may be supported on a plurality of arms 23 extending outwardly from a core 24 over which the coil of tape 21 may be placed. The tape is drawn from the coil over a guide roller 25 which, as shown in Fig. 4, carries a serrated or grooved edge 26. This edge contacts with the adhesive side 22 of the tape 21 and presses the tape against the drum 2, pressing it firmly against the resilient periphery 4, as shown in Fig. 6. The pressure is such that a portion of this resilient periphery 4 is pressed inwardly, as shown in Fig. 6, and the pressure, due to the vacuum through the apertures 20, holds the tape upon the drum from its point of application shown in Fig. 1 until after the tape passes to a position in which it will be applied to the container. The tape is held by the air groove 18 and the air apertures 20 until it passes a severing mechanism best shown in Figs. 3 and 5. This severing mechanism designated broadly as 30 may consist of a tubular member 31 carrying a knife 32 which may make one revolution for each length of tape to be severed. The tubular member 30 is pressed upwardly by the spring 33 and a pin 34 operable in a groove 35 insures rotation of member 30 with a gear 36, the teeth 37 of which mesh with the teeth 38 of the gear 6 which drives the drum 2. The applying wheel 25 is carried by a shaft 39 and carries a gear 40 having teeth 41 also meshing with the teeth 38 of gear 6. Shaft 39 is a power-driven shaft which may be connected in the usual manner through a gear reduction to a motor, not shown. Therefore, the tape-applying wheel 26, the drum 2, and the severing knife 32 are all driven in proper timed relation through this drive. Shaft 42 which is attached to turn the gear 36 is preferably supported in a ball-bearing support 43 to turn freely on the support or base member 1. Each time the knife is brought into its cutting position shown in Fig. 5, the slidable member 30 is moved axially of the shaft 42 by a cam 45 on the top of the slidable member. This cam contacts with a roller 46 which is fixedly mounted on a bracket 47 carried by two posts 48 which are supported by the mechanism plate or base 1. Thus, at each revolution, at least that portion of the stroke of the knife 32, which cuts the tape, occurs while the knife is moving a short distance axially; this being an important feature because it makes a smooth, quick cut through the tape.

It should be pointed out here that when the tape is severed because the tape has been applied to the resilient surface 4 of the drum 2, the ends separate, as shown at S in Fig. 3. The reason for this is that since the periphery 4 of the drum 2 is compressed, the resilient surface 4 of the drum is held compressed until the tape is cut. This relieves the compression on at least a portion of the resilient member 4 and the separation S occurs as the resilient member expands. This is important because as the tape is wound about one container, a second container will be moved into contact with the drum, and this second container must strike the end E of the tape which has been severed, and which is now spaced a distance S from the take-up end T which has been severed and which is already being wound about a container. If this spacing did not occur, it would be difficult, if not impossible, to position the cans accurately enough so that one can would not overlap that portion of the tape which has been cut, and thus endeavor to wind the tail-end of one strip instead of the leading end of the opposite strip on the can.

The support 1 is provided with a channel-shaped guideway 50 through which the containers C may be fed by a moving belt, or in any suitable manner, so that these containers will move between the guiding rails 51 of the guideway in the direction shown by the arrow, Fig. 1. A convenient way of accomplishing this is to provide a belt which moves the containers into this guideway.

In Fig. 1, the machine is about ready to apply a fresh container C to the drum to pick up the leading end E of a length of tape which will be severed as soon as the knife 32 completes a revolution to bring the knife into contact with the tape. The advancing movement is accomplished by a reciprocating slide 52 which, as best shown in Fig. 4, may consist of a section 52 having a container contacting face 53 mounted between a pair of side rails 54. These rails 54 may be carried by anti-friction rollers 55 which may engage beveled edges 56 of the rails and the rails may be held against the rollers 55 by means of a second set of rollers 57. These rollers may be rotatably supported by the brackets 58 which are supported by the base 1. The reciprocating slide includes a slide member 59 which is pinned at 60 to a shaft 61. This shaft passes a short way into a bearing 62 carried by the slide member 52 so that it may move in this bearing. A spring 63 lies between the slide members 52 and 59 and this spring is adapted to be compressed at the end of each stroke, as will be later described. The slide member 59 is connected through a ball-bearing 64 to a crank 65, this crank being connected through a second ball-bearing at 66 to a pin 67 driven through a disk 68 which disk carries a gear 69 with teeth 70 meshing with the teeth 38 of the gear 6. Thus, this crank is driven in timed relation to the rotation of the drum 2. Each stroke of the crank 65 moves the slide member 52 through the spring 63 and the slide member 59 in a direction shown by the arrows in Figs. 1 and 4. When moving inwardly from the position shown in Fig. 1, it is obvious that the container C will be moved into contact with the drum and the timing is such that the end E of the severed tape will contact with the periphery of the can C whereas the separated end T will not engage the periphery of the container and thus will pass on and be wound around the advancing container.

As the slide 52 moves inwardly, it presses the container firmly against the end E of the tape and a predetermined degree of pressure is obtained by the spring 63, because the total stroke of crank 65 is greater than the movement of the slide section 52. This causes the slide member 59 which moves with the same stroke as the crank 65 to compress the spring 63 at each advancing stroke of the plunger. The plunger will momentarily remain in its innermost posi-

tion because of the compression of the spring 63, and, since the drum is constantly rotating, the can will be moved, first, against the contact block 53 of member 52, and thence against the curved wall 70 of the arcuate pathway 71 formed between the curved wall 70 and the resilient rim 4 of the drum. The curved wall 70 may be rigid, or it may have a resilient lining facing the drum, but in any event the total width W between the guideway wall 70 and rim 4 is less by a small amount than the diameter of the container plus the thickness of the tape. This causes frictional contact, so that as the drum rolls, the containers will roll, and as the containers roll, the tape will be wound firmly and smoothly about the container until completely wound thereon. The pressure exerted between this winding will always be the same because of the spacing of the wall 70 and resilient periphery 4.

It will be noticed that the air slot 19 will retain the severed section of the tape 21 upon the surface of the drum as the tape is being wound on a container, but as the last part of the winding occurs, the end T of the tape will pass the end of the air groove 19 and thus be released for complete winding on the container. After the containers have been completely taped, as occurs toward the end 73, the distance between the end 74 of the curved wall and the resilient periphery 4 of the drum may be greater as there is no longer need to apply pressure to the sides of the container. The containers may then pass through a guideway 75 having walls 76 and 77 spaced a sufficient distance to permit the containers to move freely as they pass from the taping machine.

It will be noticed from Fig. 1 that there is a spring arm 80 extending upwardly and contacting with the container C. This tends to hold the container in the position shown in Fig. 1 until the plunger 52 moves it and, when moving it, it may operate an arm 81 of a microswitch 82 which may be arranged to shut off the machine if no containers are present. This feature is not being claimed herein and need not further be described, except to point out that the spring arm 80 serves to position the container and to cause it to contact with an accurately located wall 83 during its inward movement toward the drum to accurately position the can on the severed end E of the advancing tape.

We also prefer to provide an arm 90 resting on an outer convolution of the tape, as shown in Fig. 1; this arm swinging in a bearing 91 to actuate an arm 92 which may contact with a microswitch 93 to signal to an operator when the roll of tape 21 becomes exhausted.

The operation of our machine is extremely simple. In starting, the machine tape 21 is led from the roll carried by the supporting core 24 about the grooved edge 26 of the applying roller 25 which is carried by the power-driven shaft 39. The tape is pressed firmly by this roller against the periphery 4 of the drum 2, and is held thereagainst by suction through the spaced apertures 20 extending about the drum periphery. This suction will hold the tape against slipping and will carry the tape around the drum, after which it is passed between the knife-carrying roller and the drum periphery. After severing a length of tape and pulling the severed length from the machine, the machine is ready to start. Since a single power-driven shaft 39 drives all of the operating parts of the machine, they have to be operated in the proper timed relation. The first

stroke of the plunger 52 moves the container into contact with the end E of the tape. The plunger momentarily remains in contact with the container holding it against the drum until the drum advances the container into contact with the guide rail 70. This rail continues to press the can at a predetermined pressure against the resilient periphery 4, while the severed length of tape is rolled on the can, the drum rolling the can against the guideway 70. This quickly and smoothly winds the tape on the can. While the plunger remains momentarily in its furthermost position toward the drum, due to the compression and the release of some of the compression on the spring 33, the advancing container rides on the edge 100 of the plunger, and, consequently, cannot move into the position shown by the container C_1 in Fig. 1. However, as soon as the plunger 52 is retracted to its Fig. 1 position, the container moves forwardly and is now ready to be moved into contact with the drum.

In Figs. 8 and 9 we have shown a modification which may sometimes be useful, although it is not essential for most work. If there is any liability of the can cover not being properly seated on the can, as may sometimes occur, we prefer to provide a presser member 101 having beveled edges 102 and positioned on a spring arm 103 in the path of the container C so that as the plunger 52 advances the containers, they will have to pass under this spring-pressed pad 101 which presses the covers down tightly as the can is contacted with the tape and as the can moves downwardly through the guideway 71 it will continue to press down the cover for a short distance, or until the cover will be held down by the tape being applied to the periphery of the can. We find, however, that such an arrangement is only necessary where some material is put in the can in such a manner that it tends to thrust outwardly upon the can cover. For most purposes we do not find such a can cover pressing arrangement necessary.

In the above specification we have pointed out a preferred embodiment of our invention which successfully carries out the objects of our invention. It is obvious that various modifications may suggest themselves to those skilled in the art, and we consider as within the scope of our invention all such modifications as may come within the scope of the appended claims.

Having thus described our invention, what we claim is new and desire to secure by Letters Patent of the United States is:

1. A machine for applying tape to cylindrical containers comprising a chute, an intermittent feed for moving containers one at a time from the chute, a drum having a flexible periphery, a power drive for the drum, interconnected with the intermittent feed for moving the containers a supply for tape having an adhesive side, a roller for rolling the tape tightly against the drum compressing the flexible periphery and with the adhesive side out, a vacuum chamber and a vacuum shield inside of the drum, spaced apertures in the flexible periphery of the drum for holding the tape thereon by vacuum with the flexible periphery held under compression by the tape, a reciprocating knife intergeared to the drum operable to cut off a length of tape, the compressed flexible periphery of the drum immediately expanding as the tape is cut to separate the severed ends thereof, the intermittent feed moving a container from the chute and into pressure contact

with the severed end of the length of tape carried by the drum and in timed relation to the drum, an arcuate wall forming with the drum a curved path of less width than the diameter of the container whereby said container may be rolled by the drum to wind the severed tape thereon through the curved path, and an exit channel through which the containers may pass from the drum.

2. A machine for applying tape to a cylindrical container as defined in claim 1 characterized in that the drum is in the form of a ring carried by a disk and rotatable about a central fixed post, said post, and a fixed disk inside the ring including air passageways through which a reduced pressure may be applied to arcuate chambers lying against the inside of the ring, whereby the apertures in the drum may have suction applied to hold the severed lengths of tape thereon through a limited portion of its movement.

3. A machine for applying tape to a cylindrical container as defined in claim 1 characterized in that the flexible periphery of the drum is of rubber-like material and the means for applying tape thereto is a corrugated roller compressing the rubber-like material as the tape is pressed against the roller placing the tape and the flexible periphery both under tension.

4. A machine for applying tape to a cylindrical container as defined in claim 1 characterized in that the flexible periphery of the drum is of rubber-like material and the means for applying tape thereto is a rigid roller compressing the rubber-like material as the tape is pressed against the roller placing the tape and the flexible periphery both under tension, the reciprocating knife cutting the tape releasing the compression of both the tape and the flexible periphery by severing the tape as the knife passes through the tape and into the rubber-like material on the drum whereby expansion of the periphery of the drum may immediately separate the ends of the tape to facilitate applying the container to the severed tape.

5. A machine for applying tape to a cylindrical container as defined in claim 1 characterized in that the flexible periphery of the drum is of rubber-like material and the means for applying tape thereto is a corrugated, rigid roller compressing the rubber-like material as the tape is pressed against the roller placing the tape under tension, gearing interconnected with the drum power drive for turning the reciprocating knife at the peripheral speed of the drum, the reciprocating knife cutting the tape releasing the compression by severing the tape as the knife rotates whereby expansion of the periphery of the drum may separate the ends of the tape, to facilitate applying a container to the severed end of the tape for rolling the container to apply the tape thereto, whereby the rotating container may be pressed against the spaced end of the severed tape and the severed tape may be rolled upon the container as the drum moves the container.

6. A machine for applying a length of tape about the peripheries of cylindrical containers, comprising a power drive, a feeding channel of a width to freely receive a container and of a length to hold a series of containers, a resiliently surfaced drum having perforations in the periphery, a vacuum line connected through to said apertures to hold tape thereon, a pressure roller for applying tape to the flexible periphery while compressing the flexible periphery to be held compressed by the applied tape, a knife operable from the power drive for severing a length of tape whereby the expanding flexible periphery may separate the severed ends of the tape, an intermittent feed for advancing a container and pressing it against the end of the severed length of tape on the drum, the drum, knife and intermittent feed all being connected to the power drive to be actuated in timed relation thereto, a curved wall and a portion of the periphery of the drum forming a tape applying channel, the wall and drum being so spaced that both may be frictionally engaged by a container whereby the drum may roll the container as the tape is rolled thereon, and a third channel including spaced walls through which a container may freely pass from the tape applying drum.

7. The machine for applying a length of tape about the peripheries of cylindrical containers defined in claim 6 and characterized in that the intermittent container feed includes a resilient contact member for engaging a container, holding the container resiliently against the severed end of the tape on the drum momentarily until the revolving drum rolls the container into frictional contact with the curved wall spaced from the periphery of the drum and forming therewith the tape applying channel.

8. The machine for applying a length of tape about the peripheries of cylindrical containers defined in claim 6 and characterized in that the intermittent container feed includes a contact member, a coiled spring for positioning the contact member on a reciprocating carriage driven by the power drive whereby the coiled spring may press the contact member into engagement with a container moving the latter to and holding it against the drum while the latter rolls the container into contact with the curved wall of the tape applying channel.

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