

Nov. 22, 1960

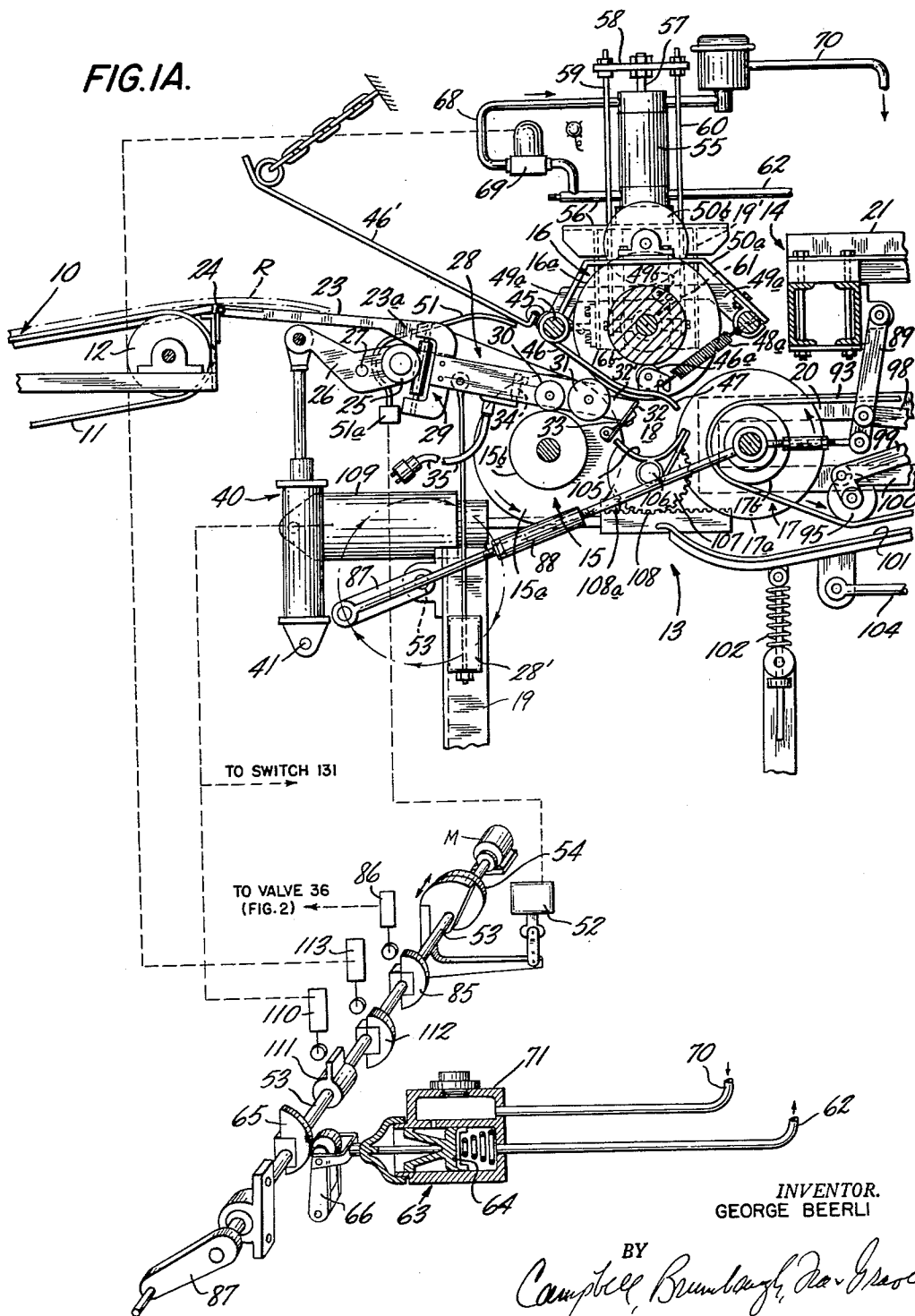
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RUG PACKAGING APPARATUS

2,961,182

Filed Jan. 23, 1956

5 Sheets-Sheet 1

FIG. 1A.



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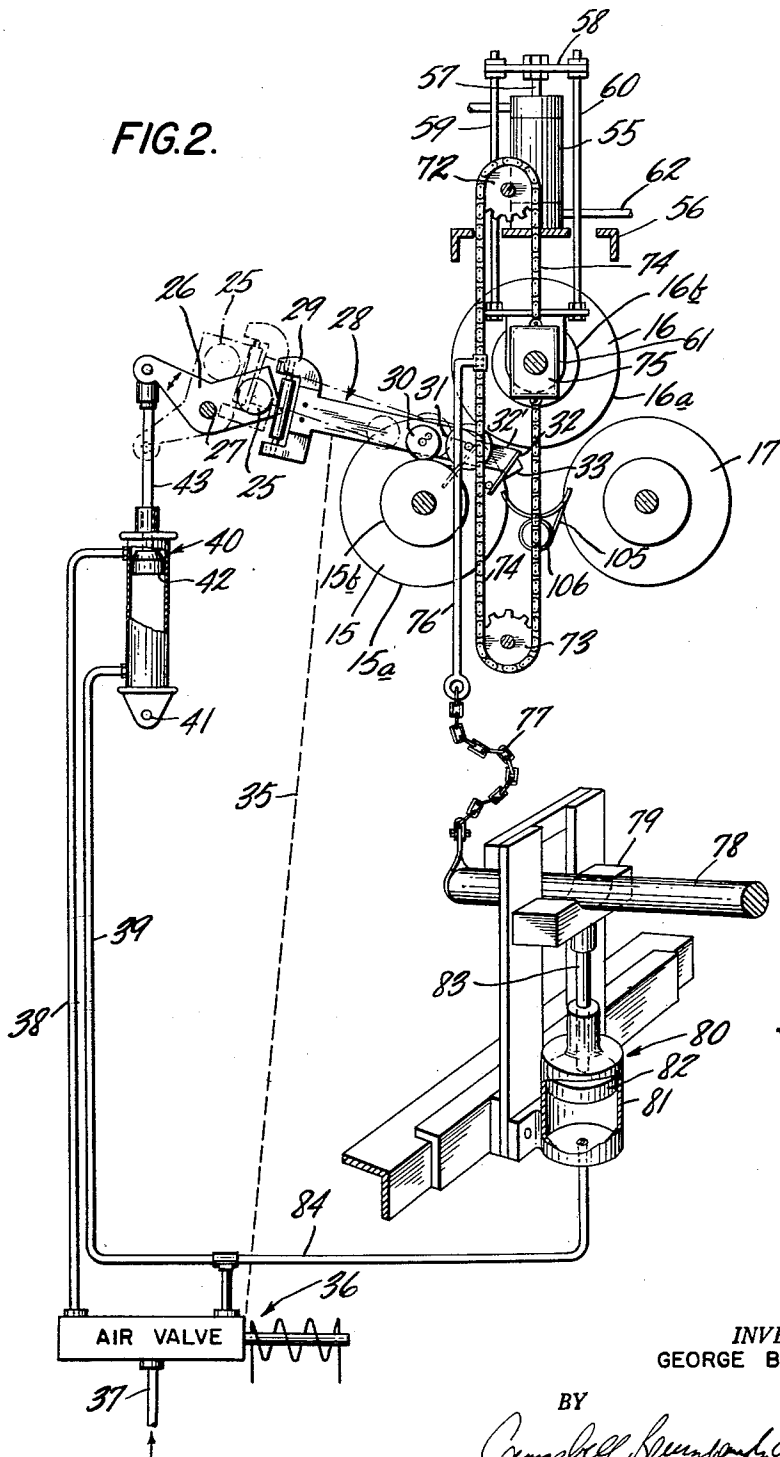
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RUG PACKAGING APPARATUS

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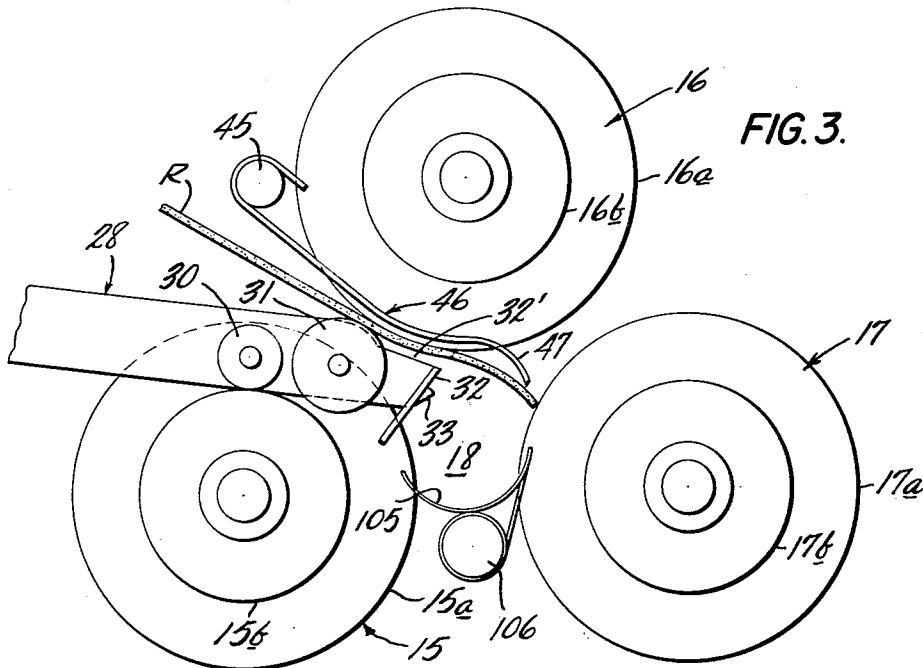


FIG. 3.

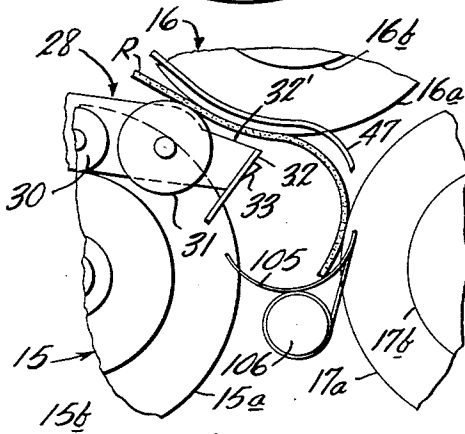


FIG. 4.

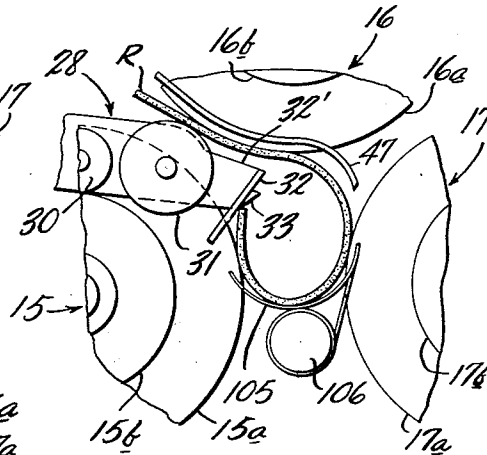


FIG. 5.

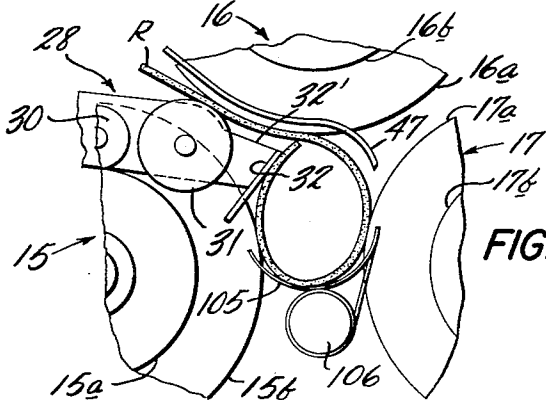


FIG. 6.

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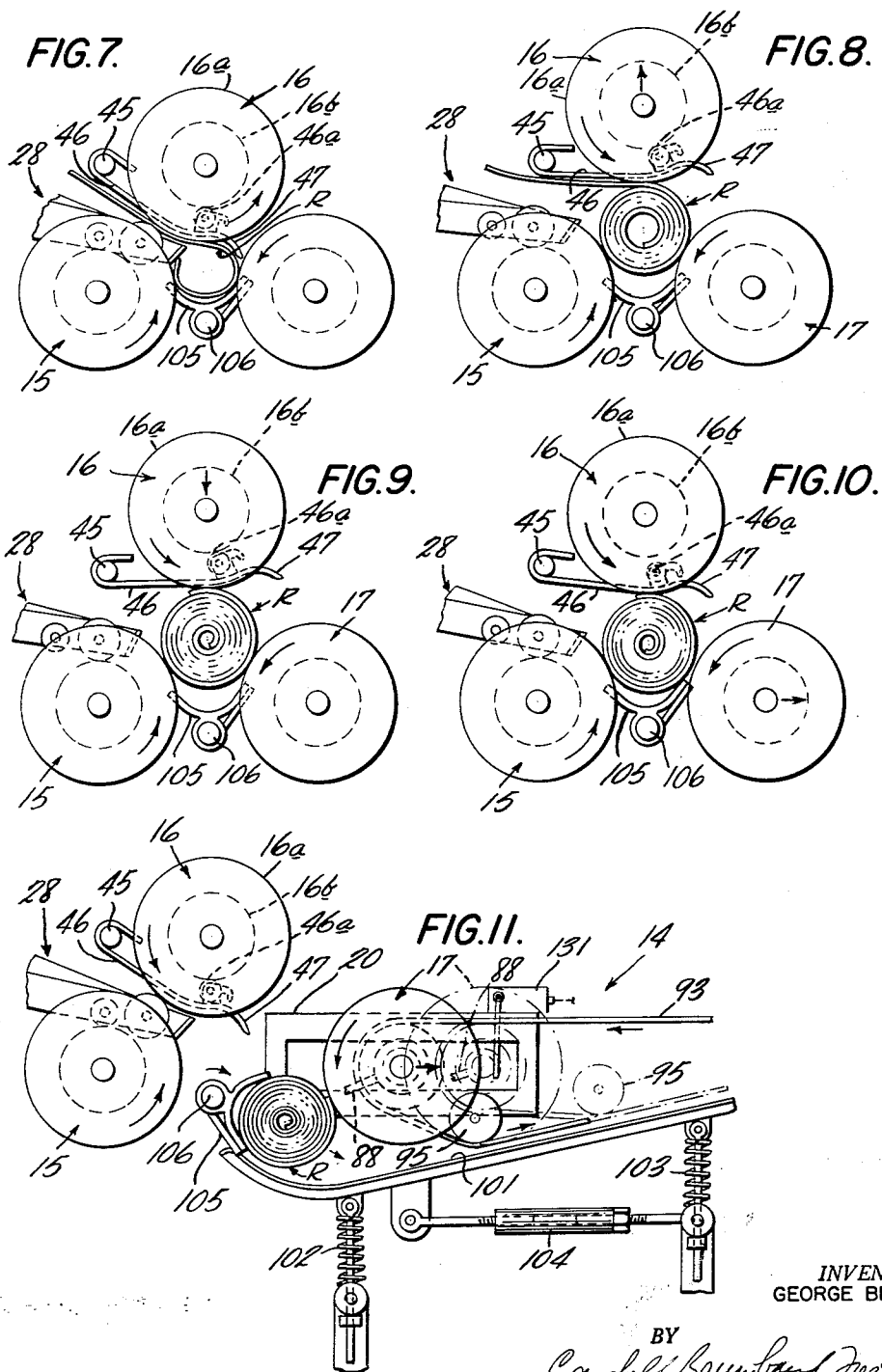
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RUG PACKAGING APPARATUS

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2,961,182

RUG PACKAGING APPARATUS

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27 Claims. (Cl. 242—66)

This invention relates to rug packaging apparatus. More particularly, it relates to apparatus for rolling up and presenting for wrapping rugs which can be of greater than average stiffness including, for example, hard surface rugs.

To meet demands of both consumers and manufacturers for greater efficiency in the shipping, handling and selling of rugs, apparatus has been devised for rolling up the rugs, preferably without cores, into trim packages. The apparatus includes driven roller clusters into which is fed the leading edge of a rug to be turned in upon itself to form a convolution which is then rotated under radial compression until the rug roll is completed. While such apparatus has proven particularly adaptable for use with loomed rugs, which are soft and pliant, it has not been entirely satisfactory for use with less pliant rugs such as those having hard durable wear-surfaces including linoleum, printed felt base, and the like. Hard surface rugs are not designed to withstand abnormal impact on their edges or the rubbing and flexing which have been found to occur in the operation of this conventional rug rolling apparatus. Purchasers of hard surface rugs must, therefore, bear a packaging overhead cost which is proportionately if not actually greater than that which obtains in the case of more costly rugs.

Accordingly, it is one object of the present invention to provide rug packaging apparatus which can be used to roll rapidly rugs having slightly frangible, hard surfaces and having relatively high body stiffness.

Another object of the invention is to provide hard surface rug packaging apparatus for turning out a rug roll in which the wear-surface is presented outwardly, facilitating preliminary examination by a purchaser without unrolling the rug.

Still another object of the invention is to provide rug packaging apparatus including a rug rolling section which can roll a rug under precisely controlled radial compression to control flexing during rolling as well as the diameter of the roll throughout the rolling operation.

In accordance with the present invention, there are provided a cluster of driven primary rollers and interposed guide members closely defining a roll up space into which the leading edge of a rug is fed from a nip, which can in turn be approached, if desired, by a powered inrun. In the roll up space, the rug edge is turned in upon itself by the cooperative action of the several guides and rollers to form a relatively generous convolution about which the rest of the rug is rolled. The guides and rollers are relatively movable under both controlled power actuation and the forces generated by the growing rug roll to clear guides from the roll up space, to shift the roll axis laterally during rolling, and to bring about controlled expansion and compaction of the convolutions of the continuously rotating rug roll. At the completion of the rolling cycle, the rollers and guides are brought into complementary motion to pass the roll to a discharge section, which can be integrated with one of the rollers and which is arranged to present the roll at a wrapping station.

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A representative embodiment of the invention from which the above and other features and objects will be readily apparent is described below having reference to the accompanying drawings in which:

5 Figure 1A is a side view partly diagrammatic in nature showing essential parts of the first stages of rug packaging apparatus formed in accordance with the present invention;

10 Figure 1B is a side view, similar to Figure 1A, showing the latter stages of the rug packaging apparatus, and intended to be viewed side by side therewith;

Figure 2 is a side view diagrammatic in nature of mechanism for controlling the pressure applied to the rug roll by the upper primary roller and also for controlling 15 the position of guide means which operate to form the initial convolution of a rug to be rolled;

Figures 3-6, inclusive, indicate diagrammatically the advancement of the leading edge of a rug to be rolled into the roll up space defined by the three primary rollers 20 and the action of the several guide means to form the first convolution of the rug; and

Figures 7-11, inclusive, are a series of diagrammatic side views showing the action of the rug rolling section of the apparatus to discharge a rolled rug from the roll up 25 space to the delivery end or outrun preparatory to packaging.

Figure 12 is a fragmentary top view of the upper main roller of the apparatus, showing also the supporting frame for one series of guides.

30 Referring to Figures 1A and 1B placed side by side, the illustrated rug packaging apparatus includes broadly an inrun or feed section 10 including a driven endless belt 11 working around pulleys, one of which, indicated by the numeral 12, is shown in the drawing. The inrun can be 35 bounded on its sides by suitable guide walls (not shown) adjustable to the width of the rugs to be rolled and to maintain the rugs in the proper orientation for rolling. Suitable means forming no part of the present invention can be provided at the inrun for trimming, cutting and otherwise preparing the rugs for rolling. A web of rug 40 material can be drawn from a master or storage roll and advanced up the inrun to be cut into measured lengths. Advancing from the inrun section 10, moving from left to right as viewed in the drawing, there is a rolling section, 45 identified generally by the numeral 13, followed by an outrun or delivery section 14 and a packaging or wrapping station 14a, all as described in detail below.

The rolling section 13 comprises a cluster of at least three primary rollers 15, 16 and 17 having laterally 50 spaced substantially parallel axes to define, cooperatively, a roll up space 18. The rollers are journaled for rotation in suitable end supports (not shown) which are part of a frame 19, and suitable drive means such as shown by the patent to Dyken, No. 2,706,094, dated April 12, 1955, 55 are connected to the several primary rollers to rotate them in complementary fashion to roll up upon itself a rug which is properly introduced into the roll up space 18. In the illustrated arrangement the primary rollers are turned in the same hand of rotation or counterclockwise 60 as seen in the drawings.

The primary roller 15, also known as the main drive roller, is mounted on a fixed axis while the rollers 16 and 17 are mounted on movable axes, the former being movable vertically in translation toward and away from the roll up space 18 and the latter being movable horizontally toward and away from the roll up space. The vertical translatory motion of the roller 16 can be accommodated by means for example of vertically slotted end guides 19' which fit in girthwise grooves 16' (Fig. 12) in the roller axle, and the horizontal translatory motion of 70 the roller 17 can be accommodated by means of a horizontally slotted end guide 20. The parts associated with

the roller 17 which form the delivery end or outrun 14 include, broadly, a cantilevered support frame 21 and a swinging frame assembly 22 carried thereby and adapted to be swung outwardly to the right as the roller 17 is shifted to the right. The means for shifting the rollers 16 and 17 in their supports and the timing of their respective movements in a roll up cycle are described below.

Bridging the gap between the inrun 10 and the roll up space 18 is infeed means comprising a battery of arms 23, preferably formed of hard wood, hinged at 24 and resting by their free ends on a movable carrier shaft 25. The shaft 25 is supported at its ends by lever means which can take the form of bell cranks 26 mounted on fixed pivots 27 and movable between two positions shown respectively in full and dotted lines in Figure 2. Pivotaly attached to the carrier shaft 25 through suitable lost motion or free floating coupling means 29 affording limited vertical translational movement are a battery of feed finger means 28. The feed finger means 28 extend forwardly into the roll up space 18 between parallel, laterally spaced circular flanges 15a, preferably formed of friction material such as rubber, and which, together with a central hub 15b, comprise the primary roller 15. The design of each of the rollers 15, 16 and 17 is basically the same, Figure 12 showing a fragmentary top view of the roller 16 as illustrative of this design.

Journalled in the several feed finger means 28 are a first series of idler or support rollers 30 adapted to rest on the central hub portion 15b of the primary roller 15 between adjacent flanges 15a. Also journalled, as can be best seen in Figures 3-6, in the feed finger means 28 adjacent their free ends are a second series of idler rollers 31, called nip rollers, adapted to bear against the periphery of the corresponding circular flanges 16b of the upper primary roller 16. The friction flanges 16b of the roller 16 are juxtaposed laterally with respect to those of the companion roller 15 to align with the hub portion 15b thereof. With the upper roller 16 bearing downward on the nip rollers 31 and the roller 15 bearing upward against the support rollers 30, a clockwise turning moment is placed on the feed finger means which tends to deflect the carrier shaft 25 upward through the lost motion means 29. This deflection can be offset and the respective roller means urged toward their primary rollers by yieldable means such as weights 28' acting near the outer ends of the finger means. If desired the two sets of roller means 30 and 31 can be mounted in the feed finger means 28 for relative yielding movement opposed by spring means, also to accommodate variations in roller diameters and rug thicknesses. The free or inner ends of the feed finger means 28 carry inclined guide surfaces 32 (facing the roll up space 18) and 32' (facing the periphery of the roller 16) to pilot the advancing leading edge of the rug in its first convolution, all as described below.

Mounted in the guide surface 32 of the feed finger means 28 at at least one point along the length of the roll up space 18 is a feeler 33 connected by means (not shown) to a switch 34 connected in turn through an electrical cable 35 to a solenoid operated air valve 36 (Figure 2). The solenoid operated air valve 36 is connected by a conduit 37 to a source of pneumatic pressure and by conduits 38 and 39 to opposite ends of a cylinder 40. The cylinder 40, which is pivotally mounted to the frame at 41, has a piston 42 coupled by a connecting rod 43 to one arm of the bell crank lever means 26, which controls the position of the feed finger means 28.

The air valve 36 is normally arranged to supply pressure to the bottom end of the cylinder 40 driving the piston 42 upwardly to rock the bell crank lever 26 in clockwise direction to urge the feed finger means 28 to their inner position closely adjacent the roll up space 18. Upon actuation of the feeler 33 to actuate the switch 34 and operate the air valve 36, pressure is applied to the upper

side of the cylinder 40 and relieved on the lower side to drive the piston downwardly, thereby rotating the bell crank lever means 26 counterclockwise to withdraw the feed finger means 28.

The upward displacement of the carrier shaft 25 causes the bridging arms 23 to swing upwardly about their pivots, although this motion can be minimized to a certain degree by means of the inclined camming surface 23a at the free ends which rest on the shaft 25.

Also disposed adjacent the infeed and nip area is a fixed shaft 45 to which are pivotally mounted a series of guide arms 46 converging downwardly toward the opposing upper face of the feed finger means 28 and passing between spaced flanges 16a of the primary roller 16 to terminate in a curved guiding tip 47 between the rollers 16 and 17. Each guide arm 46 is provided with an idler roller 46a on its upper surface to engage the hub portion 16b of the primary roller 16, the arms being biased to swing upwardly in a counterclockwise direction about the support shaft 45 by springs 48a. The springs 48a are secured to a shaft 48 which is supported for vertical movement in a swinging framework (Figs. 1 and 12) including, at either end, arms 49a pivotally attached to the fixed shaft 45 and resting by means of rollers 49b on the axle ends 61a of the roller 16. The shaft 48 is additionally supported at its center by a pair of arms 50a, also pivotally attached to the fixed shaft 45 and which have journalled therein a wheel 50b which rides on the hub portion 16b of the roller 16. As the primary roller 16 rises and falls, as described below, its motion will, therefore, be followed by the guide arms 46.

Extending upwardly and to the left from the pivoted end of the guide arms 46 is guide means 46' defining an inwardly converging opening to pilot the leading edge of an approaching rug down into the nip. Disposed in the mouth of the nip is a feeler finger or actuator 51 connected to actuate a switch 51a for operating a solenoid 52 (seen in the lower portion of Figure 1A) to operate a clutch 54 which couples a suitable motor M to drive a control cam shaft 53 through a single rotation. The cam shaft 53, as described below, programs the discharge operation for each rolled rug. The actuator 51 is so arranged that the cam shaft 53 is set into operation when the trailing edge of a rug being rolled passes beyond the actuator 51 into the nip.

As stated, the primary roller 16 partakes of vertical motion. This motion derives from two sources, one being from a hydraulic control to be described which raises the roller 16 at the time of discharge of the rolled rug and the other deriving from expansion of the rug as it rolls up in the roll up space 18. The latter motion is brought about by the control means illustrated by Figure 2, whereas the lift during the discharge cycle is brought about by mechanism shown by Figures 1A and 2. The hydraulic lift includes hydraulic cylinders 55 supported at either side of the apparatus by a cross beam 56 and having piston rods 57 extending upwardly to engage yokes 58 secured in turn by tension rods 59 and 60 to bearing means 61 in which the axle ends 61a of the roller 16 are journalled, as can be seen in Figure 12.

Pressure is introduced into the cylinder 55 through a conduit 62 deriving its pressure from a pressure source which can take the form of a pump 63, seen at the lower left hand portion of Figure 1A, the piston 64 of which is actuated by a cam 65 on the cam shaft 53, working through follower means 66. The piston 64 is biased by spring means 67 toward its left hand position. Moving to the right the piston 64 drives fluid into the cylinder 55 to raise the yoke 58 and thereby force the primary roller 16 upwardly. In order to facilitate free, although hydraulically damped movement of the piston in the cylinder 55 during one portion of the rug rolling cycle and also to facilitate rapid dropping of the roller 16 upon completion of the rug roll discharge cycle, a bypass conduit 68 including a solenoid operated valve 69 is provided. The

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valve includes by pass orifices (not shown) to leak some fluid as would be necessary to accommodate relatively slow movement of the piston in the cylinder 55 due to the gentle rising and falling of the roller 16 as the rug rolls up. In addition, the solenoid is actuated at the completion of the cycle to open fully the bypass to release the pressure in the cylinder 55, allowing the piston to drop to its initial position under the influence of the weight of the primary roller 16. An overflow return conduit 70 leads to a master cylinder 71 adjacent the pressure source 63.

The mechanism for controlling the effective weight of the primary roller 16 will now be described having reference to Figure 2, showing one end of the rollers. Mounted on fixed axes to the frame respectively above and below the primary roller 16 and adjacent each end thereof are pairs of sprocket wheels 72 and 73 around which pass endless chains 74. Joined to the chains 74 are bearings 75 in which the axle ends 61' of the roller 16 are journaled. The bearings 75 are laterally offset from the bearings 61, as seen in Figure 12.

As the roller 16 rises and falls in its slotted end guides 19', under control of the cylinder 55 working through the bearings 61, the chains are free to move with it. Joined to the chains on the opposite limbs from those which carry the roller 16 are links 76 coupled through flexible means such as chains 77, for example, to a counter-balance weight 78, the weight of which is slightly less than that of the primary roller 16. The weight 78 can take the form of a pivoted beam beneath the free or swinging end of which is disposed a lift platform 79 driven by a jack 80 which can take the form, for example, of an air actuated piston assembly including a cylinder 81, a piston 82, coupled to the lift by a shaft 83, and a pressure conduit 84 leading to the solenoid actuated air valve 36. Normally, when the feed finger means 28 are disposed in the active or "in" position, pressure is applied beneath the piston 82 to raise the lift 79 so that the weight 78 is, by virtue of the flexible coupling 77, released from the endless chain 74. This allows the full weight of the roller 16 to bear downwardly toward the roll up space 18. Actuation of the air valve 36 through the agency of the feeler 33 in the feed finger means 28, the switch 34 and the cable 35 causes the pressure in the cylinder 81 to be released allowing the lift 79 to drop so that the full weight of the counterbalance 78 is felt by the chain 74, thereby to lighten the downward pressure of the primary roller 16.

The feed finger means 28 are driven inwardly to their active positions and the counterbalance 78 is removed from the roller 16 after a rolled up rug is discharged from the roll up space 18 by means of a cam 85 on the cam shaft 53 actuating a follower controlled switch 86 which is also coupled to the solenoid operated air valve 36.

The primary roller 17 including the rolled rug delivery section 14 is carried on the swinging frame 22. The swinging frame affords motion of the assembly away from the roll up space 18 in a horizontal direction. This motion is effected by means of a crank 87 which turns with the cam shaft 53 and which is coupled by an adjustable connecting rod 88 to the axle of the primary roller 17. When the cam shaft 53 starts to turn, the crank revolves in a clockwise direction as viewed in the drawing to drive the assembly 14 to the right to the position indicated in dotted lines in the diagrammatic side view of Figure 11. Connecting means 88a are provided between the axle of the primary roller 17 and the swinging frame assembly 22.

The swinging frame assembly 22 includes a series of depending pivotally mounted pairs of arms 89, 90 and 91, only one arm of each pair being visible in the drawing. A roller or pulley 92 is journaled at the free end of the arms 90 and a series of narrow endless belts 93 pass around the roller 92 and the central hub portion 17b of the primary roller 17 between the flanges 17a to be driven thereby. The arms 89 and 90 are joined near their lower

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ends by links 98 and the arms 90 and 91 are joined at their upper ends by an adjustable link 94, all three arms thereby swinging as one. The arms 89 are in turn joined by adjustable links 88a to the axle of the primary roller 17 to be swung outwardly to the right as the roller slides in its slotted end pieces 20. Interposed between the primary roller 17 and the roller 92 are idler rollers 95 and 96 supported on a rocking frame indicated generally by the numeral 97 and including the links 98, which join the free ends of the arms 89 and 90 and, pivotally connected thereto, swinging arms 99 carrying the idler roller 95 near their free end. The idler roller 96 is in turn carried at the free ends of swinging arms 100 pivoted at the ends of the arms 99 adjacent the idler roller 95. Thus, the idler rollers can rock independently while maintaining tension on the belts 93.

Underlying the endless belts 93 is a discharge runway or support 101 upturned at its inner end beneath the primary roller 17 and inclining upwardly to the packaging station 14a. The support 101 is mounted for rocking motion on a pair of resilient supports 102, 103 and is held against longitudinal movement by a swinging brace 104. A rug roll dropped onto the support 101 in accordance with means described below will, therefore, be rolled first by the primary roller 17 and then by the belts 93 up the support 101. The support rocks as necessary to accommodate the rug roll and the idler rollers 95 and 96 yield on their rocking frame 97 to insure close contact between the belts 93 and the rug roll to prevent unrolling.

Disposed beneath the primary rollers 15 and 17 is a combination guide member and cradle 105 mounted on a pivot shaft 106 for tilting movement between the up-standing positions, shown in Figures 1A and 7, for example, and the fully tilted, rug roll discharging position of Figure 11. To this end the shaft 106 has affixed thereto a pinion gear 107 engaged by a slidably mounted rack 108, including a stop 108a, which is reciprocated by drive means 109 which can take the form of a fluid jack, for example, powered from the pressure source 37 through suitable solenoid actuated valve means (not shown) controlled by switch means 110 actuated by a cam 111 on cam shaft 53. Thus, as the cam shaft 53 is turned under the control of the switch actuator 51 adjacent the nip, the jack 109 is subsequently actuated to tilt the cradle 105 toward the discharge support 101.

The cam shaft 53 also carries a cam 112 which actuates switch means 113 connected to the solenoid which operates the quick opening valve 69 in the bypass line 68 around the cylinder 55, to release the roller to allow it to drop under its own weight to its initial, lowered position.

The packaging station 14a as seen in Figure 1B includes a hold-down belt 114 which runs around the roller 92 and a roller 115 journaled at the free end of the arms 91. The hold down belt 114 engages the roller 92 between the narrow belts 93. Disposed beneath the hold-down belt 114 are spinner roller pairs 122 and 123, each of which can comprise, for example, a pair of closely spaced rubber tired wheels journaled in a common vertically slidable frame assembly 124 supported in a stationary frame 125. The vertically sliding frame 124 is moved up and down by fluid jack means 126 and the roller pairs 122 and 123 are driven in a clockwise direction as viewed in the drawing by a motor 127 carried by the sliding frame 124. In operation, the rug roll is delivered by the belt means 93 and 114 (shifted to the right as shown in dotted lines) from the run-in 101 and a run in guide 116, onto the roller pairs 122 and 123 with either end of the rug roll projecting in cantilever fashion laterally outwardly therefrom. At this point, either manually or by apparatus forming no part of the present invention, wrappers in the form of tubes can be pushed over each end of the rug roll. The forcing of the last tube over

the end of the rug and pushing it to a point adjacent the roller pairs 122 and 123 actuates a switch 128 which energizes the jack 126 to lower the frame 124, carrying with it the roller pairs.

Carried by the stationary frame 125 and flanking either side of the support rollers are stationary run-outs 129 having bumper wheels 130 at their lower end. Thus, lowering the frame 124 deposits the partially packaged rug roll on the run-out 129 allowing it to run down to the bumpers 130. At this point, the two tubes can be pushed together, as permitted by the wheels 130, for the remaining distance they were held apart by the support rollers, and the package sealed for shipping.

To return the guide member and cradle 105 to its initial upright position for receiving the next rug, a switch 131 is interposed in the path of travel of the roller 17. The switch 131 is connected to the solenoid operated jack 109 to drive the rack 108 to the right to rotate the tilted cradle 105 to an upright position.

In operation, referring now to Figures 3-6, a rug to be rolled is moved up the infeed section 10 and its leading edge advanced across the bridging arms 23 and into the converging channel defined by the arms 23 and the guide 46' to enter the nip defined by the flanges 16a of primary roller 16 and the nip rollers 31. At this point, the nip takes over the infeed of the rug, advancing it at a higher speed into the roll up space. The upwardly facing guide surface 32' on the feed finger means 28 and the roller 16 direct the leading rug edge against the gently curving tip 47 of the guide means 46 as seen in Figure 3. The tip 47 imposes a downward component of motion to the leading edge which is in the same direction as the motion of the periphery of the primary roller 17 next to be engaged. In this fashion, the damaging impact of the flat rug moving in its own plane against the primary roller 17 is minimized and fracturing of the hard surface of the rug is prevented.

The primary roller 17 continues to drive the leading edge of the rug downwardly as seen in Figure 4 into the guide member and cradle 105 which is gently curved through a relatively wide angle to pilot the leading edge in the direction of the periphery of the primary roller 15, which it subsequently engages moving in the same direction. To facilitate the sliding of the leading edge of the rug in the cradle 105, a hard smooth plastic liner such as Teflon can be used. The primary roller 15 drives the leading edge upwardly as seen in Figure 5 against the inner guide face 32 of the feed finger means 28, this surface also preferably being formed of a smooth hard material.

The guide face 32 directs the leading edge of the rug back on itself to engage the underside of the rug passing through the nip to complete the first convolution. In completing its first convolution, the leading edge of the rug actuates the feeler 33 which projects from the surface of the guide 32 to actuate the solenoid operated air valve 36 to cause the feed finger means 28 to be retracted from the roller space 18 through the agency of the fluid jack 40 and the bell crank linkage 26. In retracting, it will be observed that the nip roller 31 is able to disengage from the periphery of the flanges 16a of the roller 16 and engage the hub 15b of the roller 15 to ride outwardly thereon. Meantime, referring to Figure 2 the upper primary roller 16 will have been at its maximum weight by virtue of the lift 79 holding the counterweight 78 disengaged from the endless chain 74. This insures a maximum pressure at the nip for introducing the leading edge of the rug into the roll up space. With the air valve 36 actuated, however, the counterweight is applied to the roller 16 through the agency of the fluid jack 81 lowering the lift 79. It will be recalled that the counterweight removes the major portion but not all of the weight of the roller 16.

Reducing the weight of the upper primary roller 16

allows the force of the growing rug roll (cf. Figures 7 and 8) to drive the roller 16 upwardly so that the axis of the rug roll is also displaced upwardly, the roll lifting from the cradle 105 to be suspended between three line contacts on the cluster of substantially equidistant primary rollers 15, 16, 17. As the rug roll approaches completion, as shown in Figure 8, the pressure of the roll continues to drive the roller 16 further upwardly and, after three or four convolutions, the displacement is sufficient to lower counterweight 78 onto its lift support. In this fashion, the upper roller again bears downward with its full weight to compact the roll to a minimum outside diameter, which occurs during the interval between the intervals illustrated by Figures 9 and 10.

The trailing edge of the rug, in passing over the switch actuator 51, causes the solenoid 52 to be energized to operate the clutch 54 to set the cam shaft 53 into operation for one rotation. Rotation of cam shaft, through the crank 37 and its connecting rod 88 drives the primary roller 17 horizontally outwardly, slowly at first, to cause the rug roll R to drop down into the cradle 105 engaged all the while by the upper primary roller 16 which is able to drop downwardly with it. In certain cases the downward movement of the roller 16 will cause the counterweight 78 to be reapplied so that the downward pressure of the roller becomes lessened. The rug roll R being completed, however, this decrease in pressure has no significant effect. Meantime, the cam 111 actuates the switch 110 to energize the fluid jack 109 to cause the cradle 105 to tilt through the rack and pinion connection 107, 108. In tilting the rug roll R brushes against the guiding tips 47 of the guide fingers 46, which help to preserve its rolled condition.

Meantime, the cam 65 working against the follower 66 drives the piston 64 to the right in its cylinder 63 to introduce pressure into the cylinder 55 to raise the piston and with it the upper roller 16. This disengages the upper roller from the rug roll R, allowing the cradle to revolve the rug roll R to the right first against the guiding tips 47 and then against the retreating primary roller 17 and finally, as seen in Figure 11, down onto the support 101. The primary roller 17 moves the rug roll R up the support 101 where it transfers to the belts 93, which move it past the idler rollers 95 and 96, with attendant rocking motion of the idlers and the support, and then to the holding belt 114, to the packaging station, the operation of which has been described above.

When fully retracted, the primary rug roller 17 actuates the switch 131 to control the cylinder 109 to return the cradle to its initial vertical position. About the same time the cam 111 on the shaft 53 actuates the switch 110 to actuate the valve 36 to raise the lift 79 to relieve the counterweight on the top primary roller 16. The actuation of the air valve 36 also sends the feed finger means 28 inwardly to receive the fully weighted upper roller 16, reestablishing a nip between the rollers 31 and the flanges 16a, to receive the next rug advancing from the infeed section 10. The swift dropping of the upper primary roller 16 to its feeding or nip establishing position is expedited by the action of the cam 112 on the switch 113 to open the bypass valve 69 in the bypass conduit 68 around the cylinder 55. After the cam shaft 53 has completed one rotation, it is stopped by the clutch mechanism 54, at which time the primary roller 17 is again disposed in its working position proximate to the roll up space 18.

It will be understood that apparatus of the magnitude of that described above is often attended by several operators positioned at the several stations along its length. At each station, therefore, suitable safety switch control means (not shown) are provided for shutting down the apparatus in the event of malfunctions, and other switch means, preferably under the control of a master

operator, are provided for setting the apparatus into motion.

By means of the present invention rugs having high stiffness characteristics and relatively frangible surfaces can be rolled upon themselves at an extremely high rate of speed without damage. It will be understood, moreover, that the several sections of the apparatus described above can take various forms and shapes within the scope of the invention which should not, therefore, be regarded as limited except as defined in the following claims.

I claim:

1. In rug packaging apparatus, a frame, a cluster of at least three primary rollers rotatably mounted on the frame on substantially parallel, laterally spaced axes and cooperatively defining a roll up space, means to rotate the rollers in complementary fashion to roll up upon itself a rug introduced into the space, and a cluster of at least three guide members respectively interposed between successive pairs of primary rollers and arrayed about the roll up space to pilot the leading edge of the introduced rug progressively from roller to guide member in sequence into a closed convolution about which successive convolutions can be wound, one of the guide members serving the dual purpose of guiding the leading edge of a rug to be rolled into the roll up space through the gap defined between a pair of the primary rollers and guiding the leading edge of the rug across a different gap defined between a pair of primary rollers, the said guide member including a guiding surface which extends through the gap between a pair of the primary rollers and having an extension including a deflecting surface which is interposed across a different gap defined between a pair of the primary rollers, all of the primary rollers and all three of the guide members cooperating to gently guide the leading edge of the rug to form its initial loop, and means for mounting at least two of the guide members for retractable movement to make room for the increase in diameter of the roll.

2. In rug packaging apparatus, a frame, a cluster of at least three primary rollers rotatably mounted on the frame on substantially parallel, laterally spaced axes and cooperatively defining a roll up space, means to rotate the rollers in complementary fashion to roll up upon itself a rug introduced into the space, and infeed means comprising a carrier mounted on the frame adjacent the roll up space for movement toward and away therefrom, drive means for the carrier, feed finger means extending from the carrier toward the space between a pair of primary rollers, supplemental roller means mounted on the feed finger means to yieldably engage one of the primary rollers to define a nip for seizing an approaching rug and directing it into the roll up space, guide means mounted on the inner end of the finger means to pilot the rug in its first convolution, and feeler means responsive to the first convolution to actuate the drive means to move the carrier away from the space.

3. In rug packaging apparatus, a frame, a cluster of at least three primary rollers rotatably mounted on the frame on substantially parallel, laterally spaced axes and cooperatively defining a roll up space, means to rotate the rollers in complementary fashion to roll up upon itself a rug introduced into the space, guide means entering the roll up space and mounted for movement between operative and inoperative positions, drive means for the guide means, and means responsive to a rug in the roll up space to actuate the drive means to move the guide means to its inactive position.

4. Rug packaging apparatus as set forth in claim 2, said feed finger means including support roller means to engage the other of said pair of primary rollers, and lost motion means between the carrier and the feed finger means.

5. Rug packaging apparatus as set forth in claim 2, 75

said drive means for the carrier comprising fluid jack means, a source of fluid pressure for the jack means; and a solenoid operated valve to control the jack means; said feeler means comprising a switch to operate the solenoid.

6. Rug packaging apparatus as set forth in claim 2, said feed finger means including support roller means spaced outwardly of the roll up space from said supplemental roller means to engage the other of said pair of primary rollers, lost motion means between the carrier and the feed finger means, and yieldable means to urge the supplemental and support roller means against their respective primary rollers.

7. Rug packaging apparatus as set forth in claim 2, said feed finger means including support roller means to engage the other of said pair of primary rollers, lost motion means between the carrier and the feed finger means to accommodate dimensional variation in the nip and lateral translational movement of the feed finger means while the latter is being moved toward and away from the roll up space, said other primary roller including an inner hub portion and a series of laterally spaced circular rug engaging flange portions, said feed finger means entering the roll up space through spaces between the laterally spaced flange portions, and said support roller means riding on the inner hub portion thereof.

8. In rug packaging apparatus, a frame, a cluster of at least three primary rollers rotatably mounted on the frame on substantially parallel, laterally spaced axes and cooperatively defining a roll up space, means to rotate the rollers in complementary fashion to roll up upon itself a rug introduced into the space, said primary rollers being disposed with the axes of two in a substantially horizontal plane and the axis of the third above and centered between the two, a concave guide member in the space between the two, said guide member being adapted to pilot the advancing leading edge of the rug in its first convolution and to cradle a completed rug roll, means to move said two lower primary rollers relatively apart when the rug is substantially rolled, and means to tilt the concave guide member to discharge the rug roll from the roll up space between the two lower primary rollers, and sensing means responsive to substantial completion of the rug roll, said means to tilt the concave guide member being responsive to said sensing means.

9. Rug rolling apparatus as set forth in claim 8, including a discharge ramp for the rug roll, and sensing means responsive to the presence of a discharged rug roll to return the cradle to its initial position.

10. Rug rolling apparatus as set forth in claim 8, including a pivot shaft for said guide member and cradle, and rack and pinion means to tilt the guide member and cradle on the pivot shaft.

11. In rug packaging apparatus, a frame, a cluster of at least three primary rollers rotatably mounted on the frame on substantially parallel, laterally spaced axes and cooperatively defining a roll up space, means to rotate the rollers in complementary fashion to roll up upon itself a rug introduced into the space, means to mount the third primary roller in the frame for vertical translatory motion toward and away from the roll up space, and means to vary the downward pressure of the third primary roller comprising a counter-balance weight operatively connected to the third primary roller to partially offset the weight of the roller, support means for the counterbalance weight, and means to selectively control the support means to afford a light weight for the roller during the first part of the rolling operation to shift the roll axis upwardly and a heavy weight thereafter to compact the roll.

12. In rug packaging apparatus, a frame, a cluster of at least three primary rollers rotatably mounted on the frame on substantially parallel, laterally spaced axes and cooperatively defining a roll up space, means to rotate the rollers in complementary fashion to roll up upon it-

self a rug introduced into the space, means to move at least one of the primary rollers in lateral translation away from the roll up space to facilitate discharge of the roll, and delivery means to receive the discharged roll comprising a supporting runway along which the rolled up rug is adapted to be rolled away from the three primary rollers, an endless belt having its lower span disposed above the supporting runway, guide means for the belt carried by the movable primary roller, guide means for the belt spaced from said movable primary roller, and a framework to move both guide means with said movable primary roller.

13. Rug rolling apparatus as set forth in claim 12 including yielding support means for said runway.

14. Rug rolling apparatus as set forth in claim 12, including a rocking support for said run way to accommodate transferal of the rug roll from the primary roller to the belt.

15. Rug rolling apparatus as set forth in claim 12 including a wrapping station to receive the rug roll from the run way, including driven support wheels and an endless movable hold down belt complementary thereto.

16. Rug rolling apparatus as set forth in claim 15 including a discharge outrun, and means responsive to wrapping of the roll to lower the support wheels to deliver the wrapped roll to the outrun.

17. Rug rolling apparatus as set forth in claim 14 including weighted idler pulleys along the path of travel of the belt, and rocking support means for the idler pulleys.

18. In a rug packaging apparatus, a frame, a cluster of at least three primary rollers rotatably mounted on the frame on substantially parallel laterally spaced axes and cooperatively defining a roll-up space, means to rotate the rollers in complementary fashion to roll up upon itself a rug introduced into the space, an infeed gap defined between two of said primary rollers, guide means mounted to the frame outside the roll-up space and including a length outside the roll-up space for guiding the leading edge of the rug toward the infeed gap, means engageable with the opposite surface of the rug to keep the rug in contact with one of the primary rollers defining the infeed gap, and rug edge deflecting means resiliently connected to the guide means at the end opposite the mounted end and interposed between the primary roller against which the rug is brought into contact as it passes through the infeed gap and the adjacent primary roller remote from the infeed gap, the portion of the guide means intermediate the mounted end and the rug edge deflecting end being located closer to the axis of rotation of the primary roller against which the rug is first brought into contact than the outer periphery of said roller to permit the roller to engage and feed the rug and the deflecting means resiliently deflecting the leading edge of the rug to guide the leading edge of the rug from engagement with the surface of said primary roller forming the infeed gap and against which the rug is first brought into contact to engagement with the surface of said adjacent primary roller remote from the infeed gap.

19. A rug packaging apparatus as set forth in claim 18 including deflecting means connected to the said means engageable with the opposite side of the rug, the said last-mentioned deflecting means being interposed in the path of the leading edge of the rug to complete the first convolution and to prevent the leading edge from passing outwardly through the infeed gap.

20. A rug packaging apparatus as set forth in claim 19 including means for moving said last-mentioned deflecting means outwardly after the first convolution is completed.

21. In a rug packaging apparatus, a frame, a cluster of at least three primary rollers rotatably mounted on the frame on substantially parallel laterally spaced axes

and cooperatively defining a roll-up space, means to rotate the rollers in complementary fashion to roll up upon itself a rug introduced into the space, means to mount at least one of the primary rollers for translatory motion toward and away from the roll-up space, means responsive to the first convolution of a rug being rolled to reduce the force necessary to allow the rug roll to displace the said roller outwardly of the roll-up space, and means operative to increase the force exerted on the rolled up rug by said roller after a plurality of convolutions, thereby to compact the roll.

22. In a rug packaging apparatus, a frame, a cluster of at least three primary rollers rotatably mounted on the frame on substantially parallel laterally spaced axes and cooperatively defining a roll-up space, means to rotate the rollers in complementary fashion to roll up upon itself a rug introduced into the space, a rug edge deflecting means interposed in the path of travel of the leading edge of the rug to assist in forming the first convolution of the rug and means responsive to the engagement of the rug with the deflecting means to displace the deflecting means automatically to a position out of contact with the rug.

23. A rug handling apparatus comprising a frame, a cluster of at least three primary rollers rotatably mounted on the frame on substantially parallel, laterally spaced axes and cooperatively defining a roll-up space, means to rotate the rollers in complementary fashion to roll up upon itself a rug introduced into the space, means to mount one of the rollers in the frame for translatory motion toward and away from the roll-up space, supplemental nip rollers against which the movable roller bears when it is in position closest to the roll-up space, the nip rollers cooperating with the movable primary roller to feed a rug into the roll-up space, means to vary the inward force exerted by the movable roller, and means engageable with the rug to render operative the force varying means to cause the movable roller to impart greater force to compact the roll after initial roll up of the rug.

24. A rug handling apparatus comprising a frame, a cluster of at least three primary rollers rotatably mounted on the frame on substantially parallel, laterally spaced axes and cooperatively defining a roll-up space, means to rotate the rollers in complementary fashion to roll up upon itself a rug introduced into the space, means to mount the third primary roller in the frame for translatory motion toward and away from the roll-up space, a cradle beneath the third primary roller and between the other two primary rollers, means to raise the third primary roller in translation to disengage it from the roll, means responsive to completion of the roll to actuate the raising means, means to mount at least one of the other primary rollers for movement in translation away from the roll-up space, and means responsive to completion of the roll to actuate the last said means to displace said other roller to drop the roll onto the cradle for discharge.

25. A rug handling apparatus as set forth in claim 24 including guide means between the third primary roller and said other primary roller to engage the periphery of the roll as it drops to the cradle to maintain the rolled condition, said guide means also serving to pilot the leading edge of the rug in its initial convolution.

26. A rug handling apparatus as set forth in claim 24 including means to mount the cradle for roll discharging tilting action, means responsive to completion of the roll to tilt the cradle, and means to receive the rolled rug including means to maintain the rolled condition.

27. A rug handling apparatus comprising a frame, a cluster of at least three primary rollers rotatably mounted on the frame on substantially parallel laterally spaced axes and cooperatively defining a roll-up space, means to rotate the rollers in complementary fashion

to roll up upon itself a rug introduced into the space, an infeed gap defined between two of the primary rollers, means engageable with one side of the rug to keep the rug in contact with one of the primary rollers defining the infeed gap as the rug is fed therethrough, deflecting means interposed in the path of travel of the leading edge of the rug as it completes its first convolution to prevent the leading edge from passing outwardly through the infeed gap, and means responsive to the engagement of the

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rug with said deflecting means for moving the deflecting means outwardly out of contact with said rug.

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