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MATERIAL HANDLING APPARATUS

2,332,005

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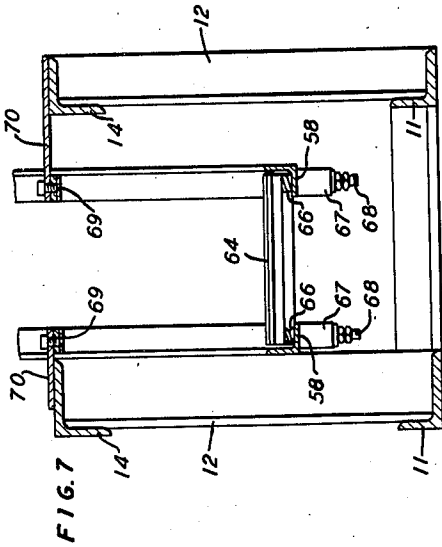
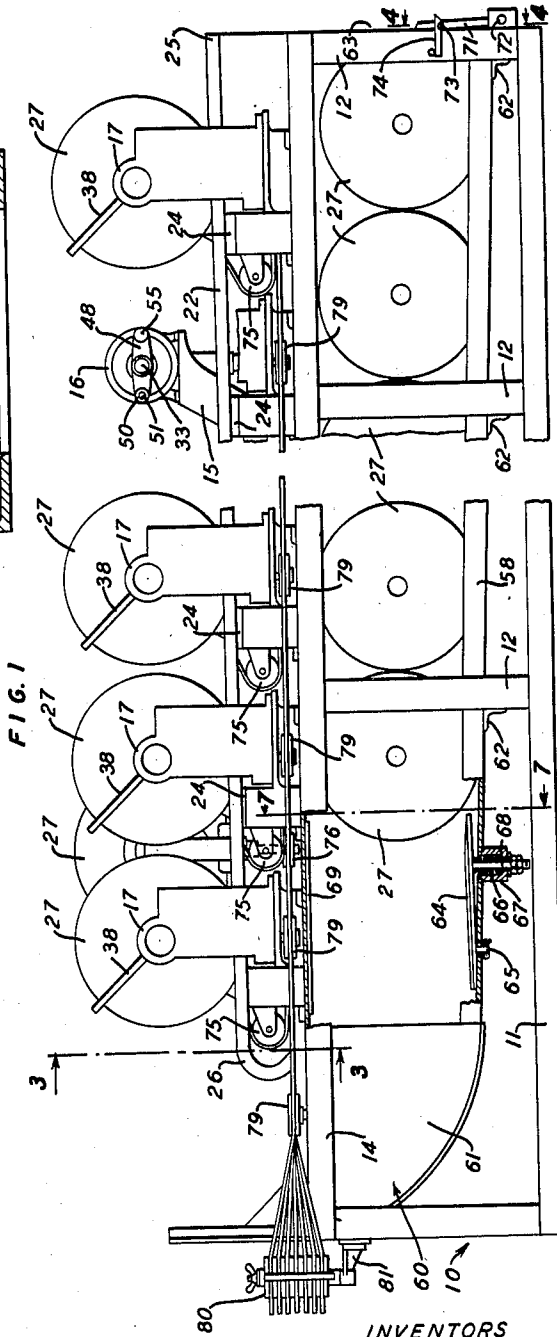
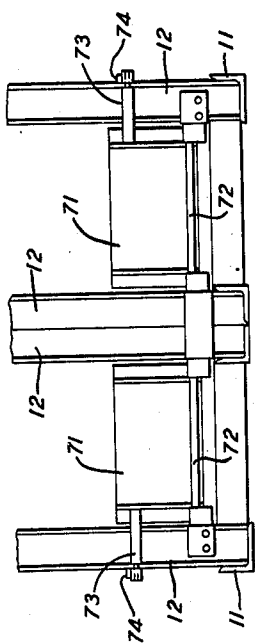


FIG. 4



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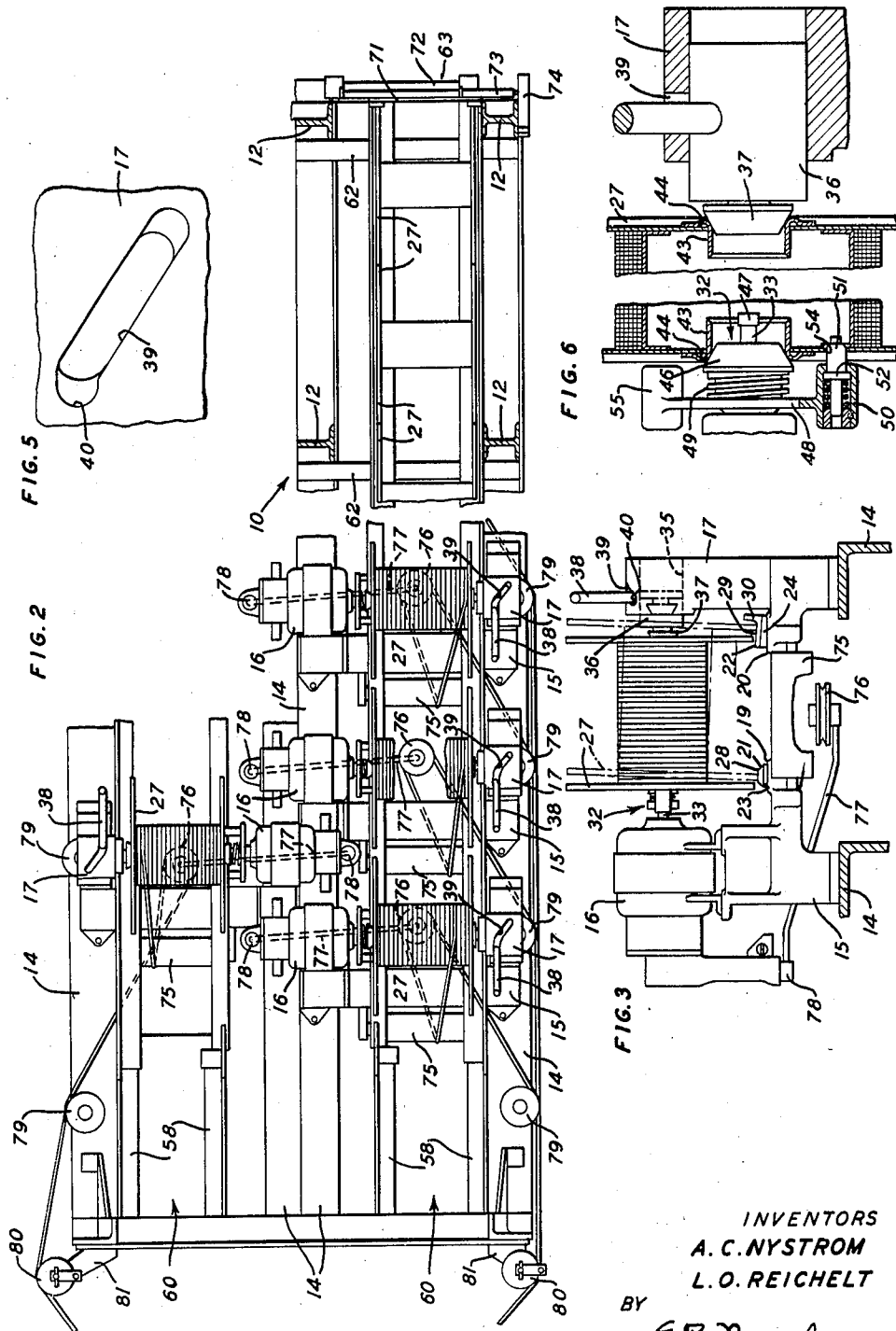
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# UNITED STATES PATENT OFFICE

2,332,005

## MATERIAL HANDLING APPARATUS

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10 Claims. (Cl. 242-131)

This invention relates to material handling apparatus, and more particularly to apparatus for supplying reels of wire for a cable stranding machine.

Stranding machines used in the process of forming cables receive a plurality of insulated electrical conductor wires or pairs of wires from supply reels and twist them into a circular rope-like cable unit to be later covered with a protective sheath to form a small cable or to be twisted with similar cable units to form a larger cable. A full reel of wire to be supplied to a stranding machine is quite heavy and difficult to handle other than by rolling. The reel must, however, be mounted for rotation, which necessitates lifting the reel until it is thus mounted, in addition to other reel handling steps in the process of positioning the reel for mounting. When numerous reels of wire are used for each stranding operation, such procedures are greatly multiplied in addition to the required handling of the empty reels.

An object of the invention is to provide an apparatus which is simple in construction and highly efficient in not only positioning full reels for mounting with little effort, but in the removal of empty reels.

With this and other objects in view, the invention comprises a pair of feeding tracks formed for the free rolling of full reels thereon to points adjacent their mounting elements, the latter being adapted upon actuation to move their respective reels free of the tracks and into rotatable positions, other tracks being positioned relative to the feeding tracks to receive the reels when empty and deliver them successively to an outlet.

Other objects and advantages will be apparent from the following detailed description when taken in conjunction with the accompanying drawings, wherein

Fig. 1 is a side elevational view of the apparatus;

Fig. 2 is a fragmentary top plan view of the apparatus, portions thereof being shown in section;

Fig. 3 is an enlarged sectional view taken along the line 3-3 of Fig. 1;

Fig. 4 is an end elevational view taken substantially along the line 4-4 of Fig. 1;

Fig. 5 is an enlarged fragmentary top plan view of one of the cone-actuated units, illustrating the contour of the cam-like aperture therein;

Fig. 6 is an enlarged fragmentary detailed view

of another cone unit, illustrating the mounting of a reel thereon, and

Fig. 7 is an enlarged vertical sectional view taken along the line 7-7 of Fig. 1.

Referring now to the drawings, attention is first directed to Figs. 1 and 2, which illustrate the apparatus as having a main frame, indicated generally at 10, formed rigidly of horizontal angle members 11 of a base portion of the frame. Vertical I-beams 12, or members of other formation, are secured to the base members 11 and support at their upper ends other horizontal angle members 14, forming what might be called table portions for the mounting of brackets 15, upon which motors 16 and cone units 17 are secured. By viewing Fig. 2, it will be observed that in the present embodiment there are four horizontal table members 14, there being also a like number of base members 11 with interposed vertical members 12.

The formation of the brackets is illustrated in Fig. 3, these brackets being identical in structure excepting that some might be termed right-hand brackets and others left-hand brackets. For example, by viewing Figs. 1 and 2 it will be observed that the sets of motors 16 and their respective cone units 17 are alternately disposed in staggered relation, certain of these being on brackets 15 mounted upon one pair of table members 14, the others being on brackets 15 mounted on the other pair of table members 14.

The central portions of the brackets 15 in each row have aligned embossed portions 19 and 20 for supporting tracks 21 and 22. The tracks 21 and 22 are mounted on the respective embossed portions with suitable spacing members 23 and 24, respectively, of varying thicknesses (Fig. 1) so that the tracks, that is their upper surfaces, will be inclined longitudinally from the entrance or feeding end 25 to an exit end 26 sufficient for the free rolling of full reels or spools 27 to positions adjacent their respective motors and cone units.

Attention is again directed to Fig. 3 illustrating the cross-sectional contour and the relative positioning of the tracks 21 and 22. The track 21 has a flat upper surface 28 or this surface may, if desired, be inclined laterally to lie in a plane with upper surface 29 of the track 22, the latter being positioned angularly and at a slightly lower level than the surface 28 to cause the reels to ride along the inside or the lowest portion of the track 22 against a guard rail 30. This eliminates the necessity of a guard rail for the surface 28 and permits lateral movement of

the reels free of the surface 23 when being mounted for rotation.

The means for mounting the reels for rotation includes the cone units 17 and other cone units, indicated generally at 32, upon motor shafts 33 of the motors 16. Due to the fact that the motors and the cone units are all identical in structure, a description of the single structure illustrated in Fig. 3 will be considered applicable to all the other structures. In this figure, assisted by Fig. 6, the cone unit 17 consists mainly of a housing having a cylindrical opening 35 therein in axial alignment with the shaft 33 of its motor 16. A piston-like element 35 is movably disposed in the cylindrical opening 35 and supports a cone member 37 fixed thereto. The means for moving the element 35 consists of a handle 38 having its inner end fixed to the piston member and projecting through an elongate cam-like aperture 39 in the housing portion of the unit, the aperture being of a contour, as illustrated in Fig. 5, to cause axial movement of the piston element 35 and its cone 37 upon movement of the handle 38 therein. The aperture also includes a portion 40 extending at an angle from the center line of the main portion of the aperture to serve as a locking portion to hold the handle 38 in the inner or mounting position. The reels 27 may be of the conventional type, having apertured hub portions 43 with rounded outer surfaces, as illustrated at 44, so that the cone 37 may find its way into the hub without being axially aligned therewith.

Attention is now directed to the cone units 32, which include a cone member 46 movable longitudinally of the motor shaft 33, limited by head portion 47 of the shaft. A connecting element 48 is mounted upon the shaft 33 for rotation therewith and serves as an abutment for one end of a spring 49, the other end of which engages the cone member 46 to normally urge the latter outwardly, to the right, toward the head portion 47. One end of the element 48 includes an integral housing 50 in which a spring pressed plunger 51 is disposed, the plunger being of the contour illustrated in Fig. 6, limited in its outward movement by an annular flange 52 and adapted to be received in an aperture 54 of the adjacent head of the reel 27 to serve as a positive connection between the reel and the motor to assure driving of the former by the latter. The other end of the element 48 has a portion 55 similar in contour to the housing 50 but of a solid structure to serve as a counter-balance weight for the housing, these end portions being diametrically opposed.

Returning now to Figs. 1 and 2, it will be noted that the exit ends of the tracks 21 and 22 are bent arcuately to direct the reels 27, when empty and freed from their cones 37 and 46, downwardly to pairs of tracks 58. The pairs of tracks 58 curve arcuately at their entrance ends, indicated generally at 60, the radii of the tracks at this position being taken from substantially the same centers as the arcs of the tracks 21 and 22 at the exit ends 26, the tracks at this position being supported by side plates 61. At portions throughout the length of the tracks 58, angle members 62, fixed to the vertical frame members 12, support the tracks in angular positions so that the empty reels 27 will roll freely to an outlet indicated generally at 63.

Near the entrance ends of the tracks 58 a braking means is disposed to check the rapid movement of the reels in rolling from the tracks 21 and 22 and down the curved portions of the

tracks 58. This means includes a plate 64 extending between the tracks 58 with integral pins 65, extending through apertures (Fig. 1) in the tracks to form a somewhat loose pivotal connection between the plate and the tracks. The forward end of the plate 64 is normally urged upwardly by a pair of compression springs 66 positioned in cups 67 of the tracks 58 and disposed concentric with pins 68 fixed to the plate with adjusting nuts threadedly disposed on the lower ends thereof to adjust the normal height of the forward end of the plate. Strips 69 (Figs. 1 and 7) fixed to plates 70 carried by the frame 10 are positioned to be engaged by the peripheries of the reel heads under the force of the springs 66 through the plate 64 to apply a braking force to each reel entering the tracks 58.

Doors 71 (Figs. 1 and 4) are provided for the outlets of both sets of tracks 58, these doors being hinged at 72 and provided with arms 73 projecting toward their respective outer sides of the frame 10, where latches 74 are provided for engagement therewith to hold the doors in the upper or closed positions. When the doors are in the closed positions the reels on the tracks 58 are held against removal therefrom, this being desirable during the removal of empty reels from the cone members, allowing the empty reels to pass on to the tracks 58 but to retain them in this position until the apparatus is again loaded with full reels, and operating, at which time the operator may give his attention to the empty reels. By opening the doors 71 the empty reels are free to roll toward and through the outlet 63, the doors serving as runways for the reels as the reels pass from the outlet.

For each reel unit, including the motor 16, the cone units 27 and 32 and the reel supported therebetween, a roller 75 supported by its respective bracket 15 guides the strand or wire from its reel to a sheave 76 carried by a tension arm 77, the latter being supported by a tension element 78 from its motor 16 to apply a predetermined tension to the wire. From the sheave 71 the wire passes to a sheave 79 and thence to one of a plurality of sheaves 80 supported by a bracket 81 fixed to the end of the frame 10. From these sheaves the wires pass on to a stranding machine not shown.

Upon conditioning the apparatus to feed wires or electrical conductors to a stranding machine, let it be assumed that the apparatus is free of both full and empty reels. The operator may then load full reels successively on the tracks 21 and 22 of each side of the apparatus. Let it also be assumed that the operator loads full reels on first one side of the apparatus and then the other. The first reel placed on the tracks 21 and 22 will roll freely down the tracks, maintaining its position against the guard rail 30 and caused to stop in general alignment with the cones 37 and 46 of the innermost unit. When in this position the reel will be tilted slightly at an angle relative to the axes of the cones 37 and 46 to position the hub 43 adjacent cone 46 for registration therewith. The operator may then move the handle 38 of the respective cone unit 17 from right to left (Fig. 2), during which movement the cam-like aperture 39 will act on the handle 38 to cause the piston-like element 36 to move inwardly, moving its cone member 37 to a position where it will start to enter the adjacent hub 43. Further movement of the cone 37 acts on the hub of the reel to lift the adjacent head of the reel face of its track 22 and move

the reel axially as well as upwardly, freeing both heads of the reel from their tracks 21 and 22 for rotation of the reel by the motor and causing mounting of the reel on the cones 37 and 46. During this action of the piston-like element 33 to move its cone 37, the cone 46 is caused, by the spring 43, to retain its engagement with its hub 43 but is allowed to move on the shaft 33. The plunger 51 of the element 43 may or may not register with the aperture 54 of the reel during the mounting of the reel on the cones, but during the first revolution of the motor 15 the plunger will be brought into registration with its aperture to bring about the positive connection for the rotation of the reel with the motor. Furthermore, the operator may rotate the reel on the cones the necessary distance to align the aperture 54 with the plunger 51 during the mounting of the reel. The other reels are mounted in a similar manner and the wire from each reel is threaded over its respective roller 70 and sheaves 71, 74 and 75 to the stranding apparatus. The apparatus is then in condition for operation, the motors 16 being included in an electrical circuit to operate in synchronism with the stranding machine to unwind the wires from the reels at the speed desired. If the reels contain the same amount of wire it is apparent that the reels will become empty at the same time. Therefore, the stranding machine may be stopped and the motor 16 may be deenergized so that the apparatus may again be conditioned for operation. This requires, however, that the empty reels be removed and full reels again mounted between their respective cones.

The apparatus is freed of its empty reels in very simple manner, requiring that the operator merely actuate the handles 38. It is recommended, however, that the handles 38 be actuated in successive order beginning with the position nearest the exit end 26. In this manner the removal of the cone 37 from each reel frees the spring 49 associated therewith to move its reel by the movement of the respective cone 46, so that the reel will again come to rest on the tracks 21 and 22 and be allowed to roll thereon, controlled by the guard rail 30 until its reaches its exit end 26, at which time the reel will drop onto the tracks 53 and there the angular or sloping positions of the tracks will cause the reel to move toward the outlets 64, stopped by its door 65 or the reel preceding it. The speed of movement of each reel in entering the tracks 53 is reduced through the combination of the spring pressed plate 64 and brake strips 69, the latter being of suitable structure such as conventional brake lining material. This braking force eliminates damage to the reels by eliminating their rapid movement into engagement with each other.

Although the tracks 21—22 and 53 are separate, their combined functions provide a continuous route for the reels from the entrance end 25 to the outlet 63. The empty reels on each side of the apparatus may be successively released in but a few seconds and they will travel unassisted to the lower tracks, making way for more full reels. Full reels may again be mounted in the apparatus, after which the empty reels may be allowed to pass from the lower tracks aided by the doors 71, after the latter have been moved into open position.

The embodiment of the invention herein disclosed is merely illustrative and may be widely modified and departed from in various ways without departing from the spirit and scope of

the invention as pointed out in and limited solely by the appended claims.

What is claimed is:

1. In a material handling apparatus, a plurality of units to rotatably support reels, a set of feeding tracks disposed adjacent the units and inclined from a feeding end to an exit end to cause the reels to roll to positions adjacent the units, the units including means to singly move the reels free of the tracks for rotation, another set of tracks disposed beneath the feeding tracks and formed to receive the reels from the exit end of feeding tracks, and braking means to check the reels entering the lower set of tracks.

2. In a material handling apparatus, a plurality of units having reel engaging elements rotatable about their respective axis, means to support the units with the axes of the elements lying in a common inclined plane, a track disposed adjacent the units parallel with the said plane to effect rolling of the reels thereon to positions adjacent the respective units where the reels may be supported by the said elements, and means to cause relative movement of the elements of the units to cause the elements to rotatably support their respective reels.

3. In a material handling apparatus, a plurality of units having reel engaging elements rotatable about their respective axis, means to support the units with the axes of the elements lying in a common inclined plane, tracks disposed adjacent the units substantially parallel with the said plane and extending from feeding positions to exit positions to cause reels, fed thereto at the feeding positions, to roll thereon relative to the units to respective positions thereadjacent, and means to cause relative movement of the elements of the units to cause the elements to rotatably support their respective reels.

4. In a material handling apparatus, a plurality of units having reel engaging elements rotatable about their respective axis, means to support the units with the axes of the elements lying in a common inclined plane, tracks disposed adjacent the units substantially parallel with the said plane and extending from feeding positions to exit positions to cause reels, fed thereto at the feeding positions, to roll thereon relative to the units to respective positions thereadjacent, means to cause relative movement of the elements of the units to cause the elements to rotatably support their respective reels, and other tracks, extending from positions adjacent the said exit positions to an outlet, to receive the reels from the first mentioned tracks and direct the reels to the outlet.

5. In a material handling apparatus, a plurality of units having reel engaging elements rotatable about their respective axis, means to support the units with the axes of the elements lying in a common inclined plane, means to cause relative movement of the elements of each unit to rotatably support a reel therebetween and to free the reel, and tracks disposed adjacent the units substantially parallel with the said plane to cause the reels, when disposed thereon, to roll to their respective units and to cause the reels to roll from their units when free therefrom.

6. In a material handling apparatus, a plurality of units having reel engaging elements rotatable about their respective axis, means to support the units with the axes of the elements lying in a common inclined plane, means to cause relative movement of the elements of each unit to

rotatably support a reel therebetween and to free the reel, tracks disposed adjacent the units substantially parallel with the said plane to cause the reels, when disposed thereon, to roll to their respective units and to cause the reels to roll from their units when free therefrom, other tracks positioned to receive the reels from the first tracks and having outlet ends, and a door to close the outlet ends of the last mentioned tracks to the rolling of the reels thereon.

7. In a material handling apparatus, a plurality of units having reel engaging elements rotatable about their respective axis, means to support the units with the axes of the elements lying in a common inclined plane, means to cause relative movement of the elements of each unit to rotatably support a reel therebetween and to free the reel, tracks disposed adjacent the units substantially parallel with the said plane to cause the reels, when disposed thereon, to roll to their respective units and to cause the reels to roll from their units when free therefrom, other tracks positioned to receive the reels from the first tracks and having outlet ends, and a door to close the outlet ends of the last mentioned tracks when in a closed position and to serve as a runway for the reels leaving the tracks when in an open position.

8. In a material handling apparatus, a plurality of units having reel engaging elements rotatable about their respective axis, means to support the units with the axes of the elements lying in a common inclined plane, tracks disposed adjacent the units substantially parallel with the said plane and extending from feeding positions to exit positions to cause reels, fed thereto at the feeding positions, to roll thereon relative to the units to respective positions thereadjacent,

means to cause relative movement of the elements of the units to cause the elements to rotatably support their respective reels, other tracks, extending from positions adjacent the said exit positions to an outlet adjacent the feeding positions, to receive the reels from the first mentioned tracks and direct the reels to the outlet, and a door movable into closed position to close the outlet and movable into an open position to free the reels to roll on the door from the outlet.

9. In a material handling apparatus, a plurality of units having reel engaging elements, inclined tracks disposed at different levels for free rolling of the reels thereon relative to the units, a guide rail for one of the tracks for the rolling of the reels thereagainst to accurately position the reels between the elements of their units, and means for each unit movable into an operative position to cause relative movement of the elements thereof to cause the respective reel to move laterally free of the rail and tracks.

10. In a material handling apparatus, a plurality of units having reel engaging elements, inclined tracks disposed at different levels for free rolling of the reels thereon relative to the units, a guide rail for one of the tracks for the rolling of the reels thereagainst to accurately position the reels between the elements of their units, and means for each unit movable into an operative position to cause relative movement of the elements thereof to cause the respective reel to move laterally free of the rail and tracks and to cause the elements to return their respective reel laterally onto the tracks and against the rail when moved into an inoperative position.

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