

Jan. 21, 1958

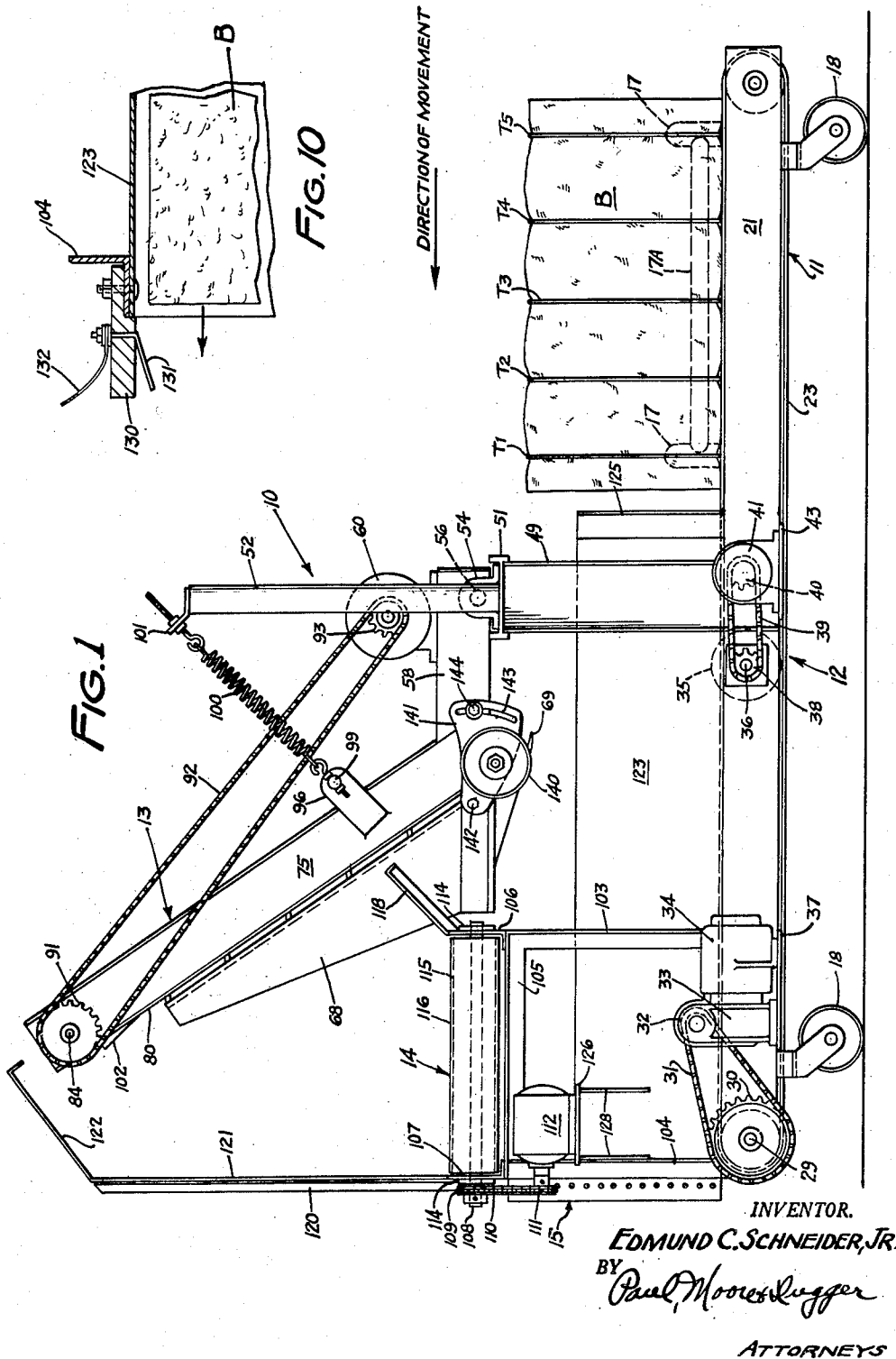
E. C. SCHNEIDER, JR

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APPARATUS FOR REMOVING TIES FROM PACKAGES

Filed Aug. 6, 1954

6 Sheets-Sheet 1



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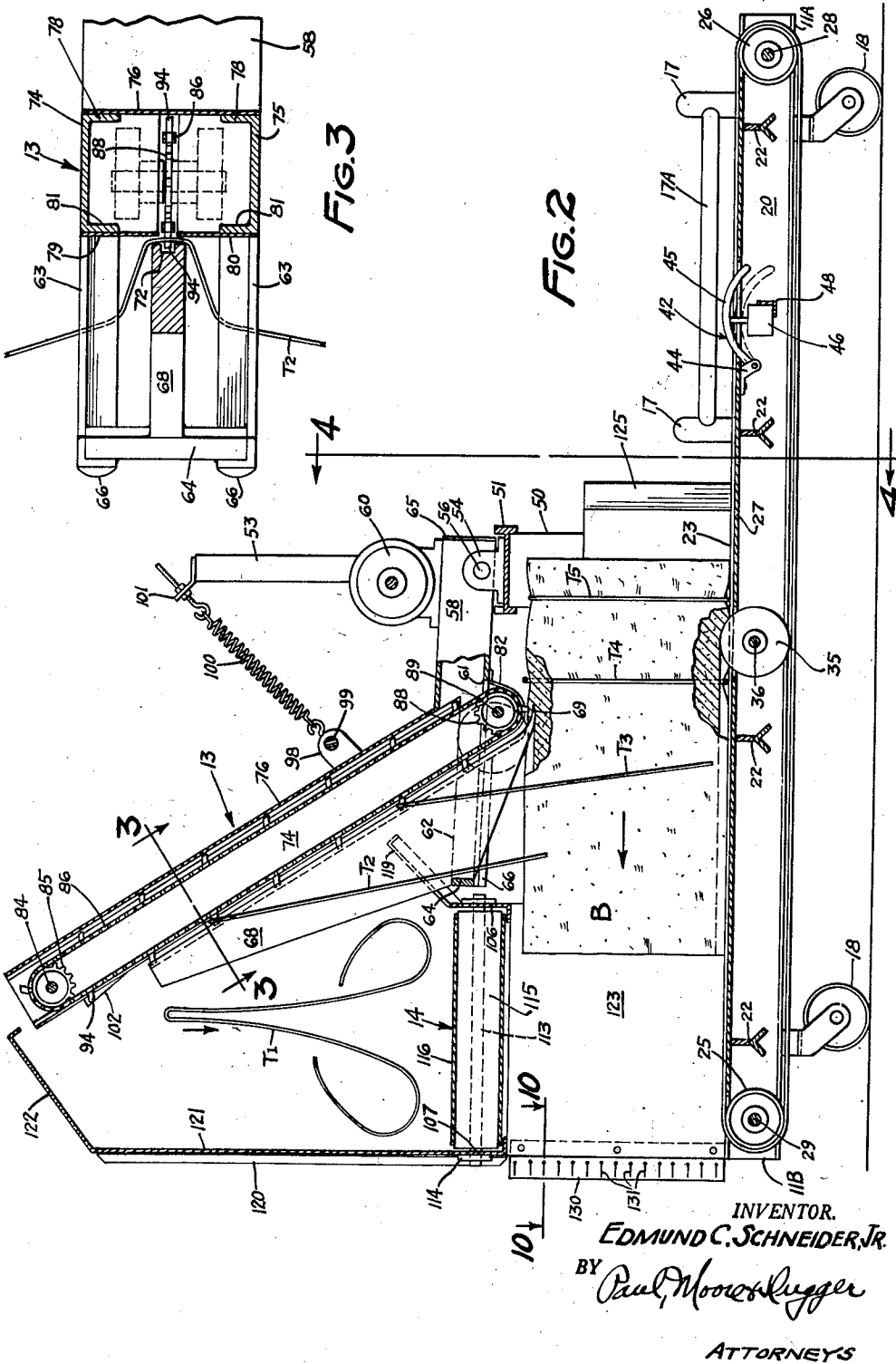
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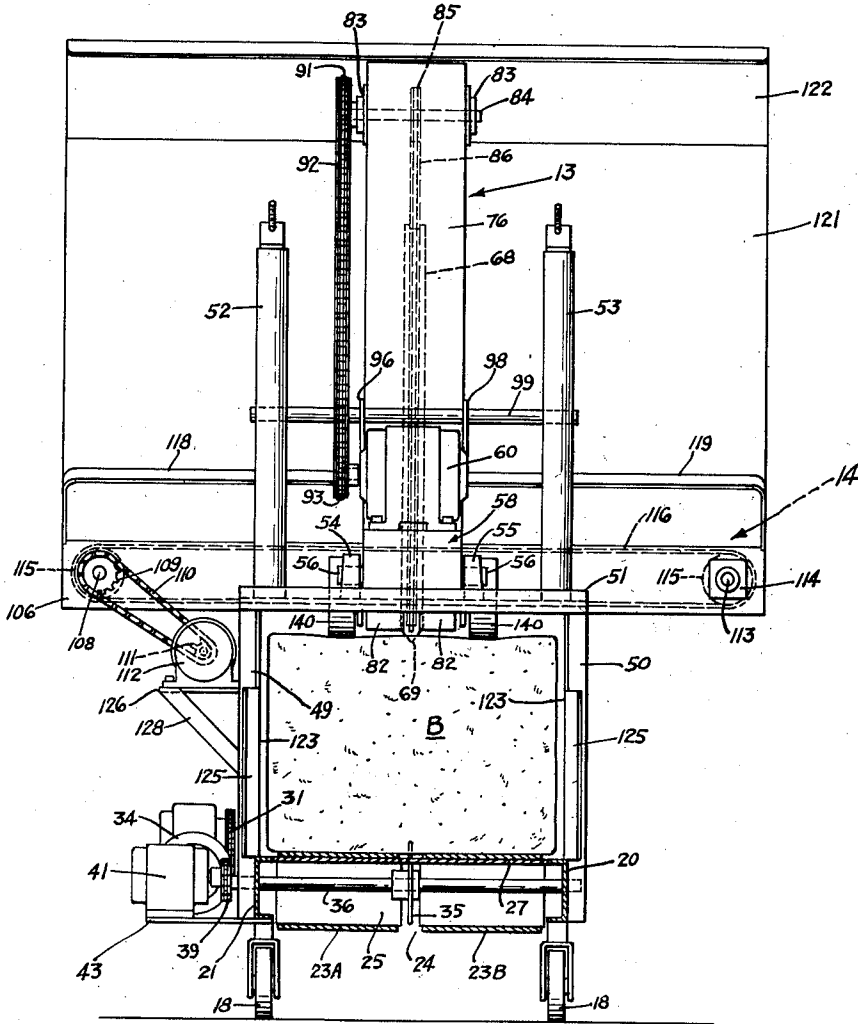


FIG. 4

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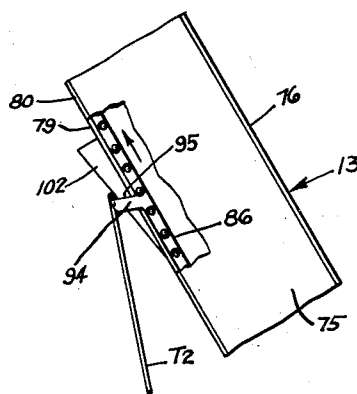
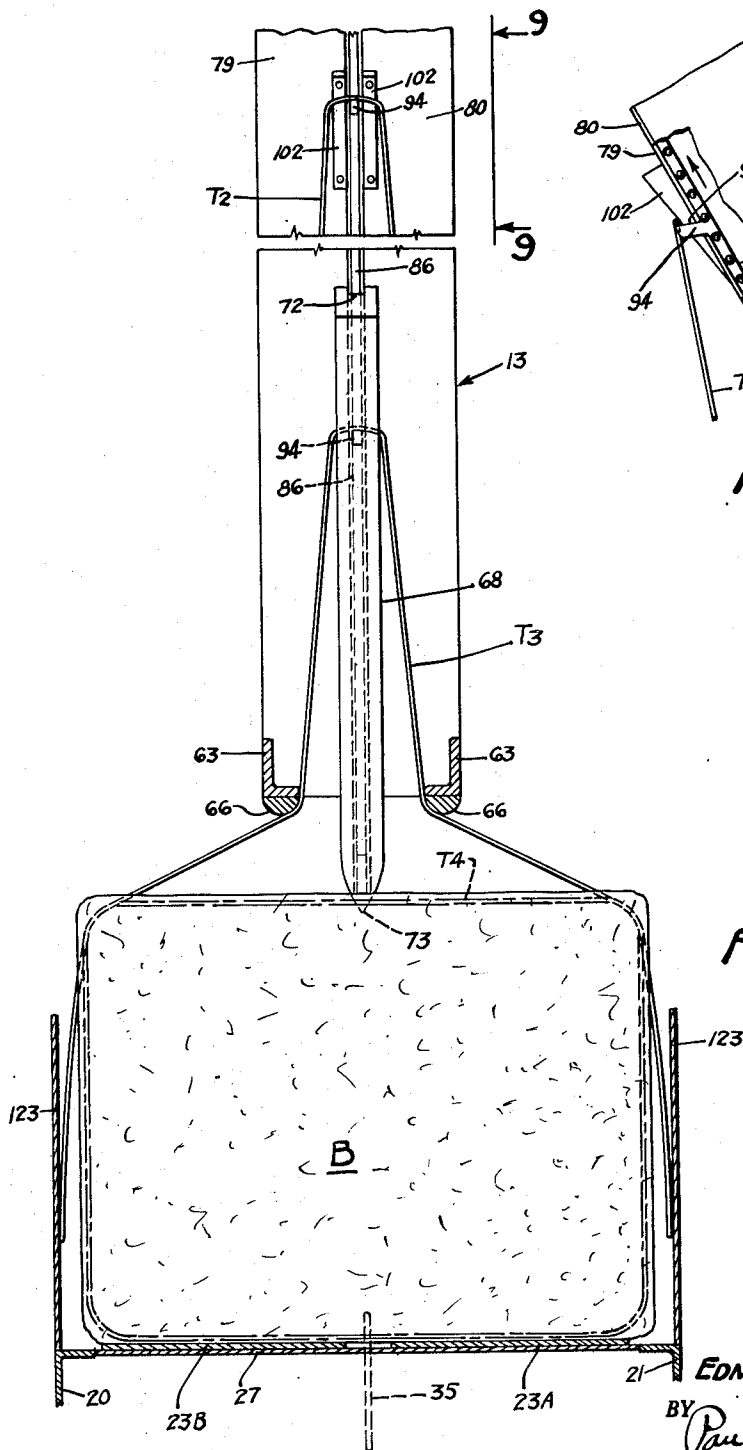
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APPARATUS FOR REMOVING TIES FROM PACKAGES

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6 Sheets-Sheet 5



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APPARATUS FOR REMOVING TIES FROM PACKAGES

Filed Aug. 6, 1954

6 Sheets-Sheet 6

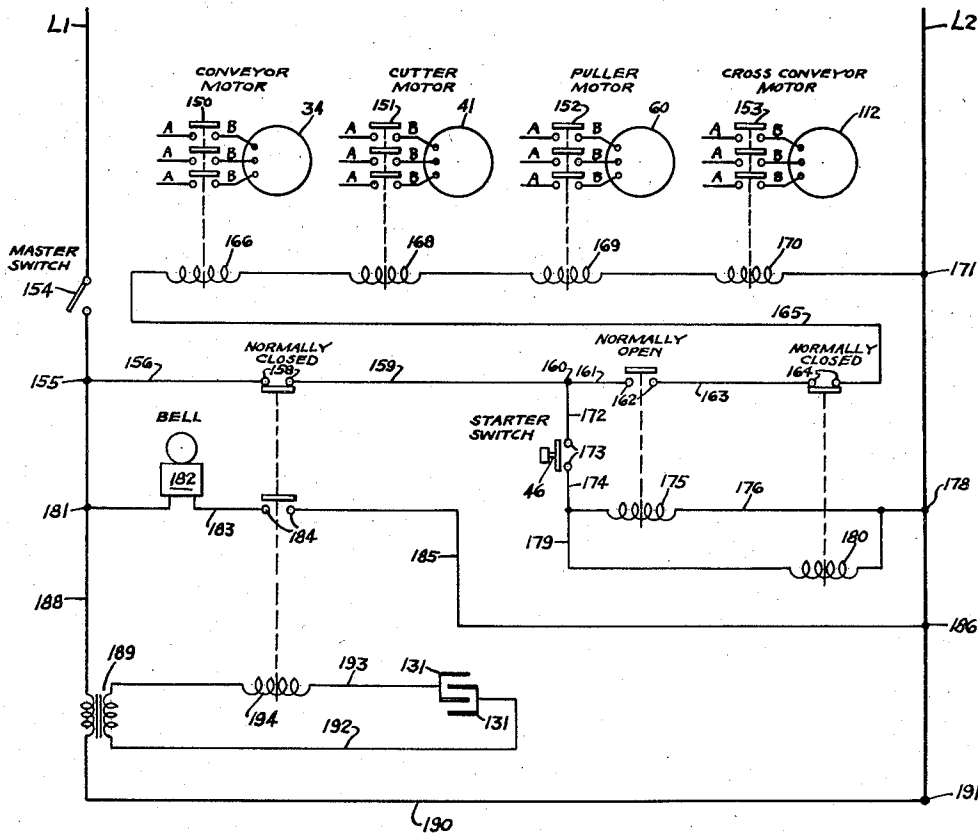


FIG. 11

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APPARATUS FOR REMOVING TIES FROM PACKAGES

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Application August 6, 1954, Serial No. 448,210

21 Claims. (Cl. 29—200)

This invention concerns new and useful improvements in method and apparatus for removing ties from packages. More particularly, it concerns new and useful improvements in method and apparatus for removing ties or bindings from large bundles of goods, such as large closely pressed packages of material, usually called bales.

In the packaging of merchandise and particularly in the packaging of agricultural fibers of various sorts, such as flax, cotton, hay, cork, shredded wood and the like, it is usual to aggregate the fibers into bundles or packages, usually rectangular, to provide modular units for easy storage and transportation. This is accomplished by various types of baling apparatus, usually serving to compress the material into a rectangular shape and to provide cords, laces, bands, or ties, usually flexible, and in many instances of metal, for retaining the compressed material in baled package form. The baled material is then shipped in this convenient form and when it is desired to use the material, the ties are removed and the packaged material then freed, separated into its individual components, and used as desired.

Thus, bales of hay are provided on the farm for convenient storage and shipment, as are bales of flax and other agricultural products. Furthermore, in industry, various raw, manufactured or semi-manufactured products are baled, specific examples being rags, usually utilized in the paper industry, reclaimed paper or other materials. As explained before, it is conventional to compress these materials into the bale and secure them in such compressed form by ties or binders.

The conventional formed bale provides a shape close to a square parallelepiped; although in recent years, it has become common, particularly in the baling of hay to provide right cylindrical bales. My method and apparatus, however is susceptible to use with various shaped bales.

In recent years, the quantity of baled material used has increased tremendously and in many factories or plants where large numbers of bales provide the material worked upon, it has become a problem to efficiently and inexpensively remove the bonds or ties from the baled material. Removal of the ties is usually done by hand and may occupy the labor of an entire crew of men, and is a particular problem where the ties are wire or metal straps as commonly used in confining material of many types.

It is to this problem of removing the ties from such packaged material that my invention is directed. Broadly speaking, the invention comprises new and useful improvements in method and apparatus for severing a tie (or ties) confining a package and removing the tie so that the material comprised in the package may be separated or further manipulated.

It is therefore an object of my invention to provide new and useful improvements in method and apparatus which provides the ready, efficient and inexpensive removal of ties from packages.

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It is a further object of this invention to provide a method of removing ambit ties from packages in which the packages are progressed along a conveyor, the tie is severed, and the tie is then removed by engagement at a point substantially opposite the position of severing.

A further object of this invention resides in the provision of a new apparatus for removing ties from bales in which the tie is automatically severed and then removed.

Still a further object of this invention resides in the provision of a tie removing apparatus in which the package from which the tie is removed is progressed along a conveyor, means is provided for automatically severing the tie and means is provided for then removing the tie from the package.

Still a further object of the present invention resides in the provision of means for determining that all ties have been removed from a package as it progresses through the tie removing apparatus.

A further object of this invention resides in the provision of a tie removing apparatus having means whereby metallic ties are drawn away from the package which they confine whereby they may be removed without danger to the peripheral surface of the package.

A further object of the invention resides in the provision of means for progressively conveying a tied package, automatic means for severing the ties on the package, removal means for engaging the severed ties and withdrawing them from the package as the package is progressed through the apparatus and second conveying means cooperating with the removal means for disposing of the removed ties.

Other and further objects of the invention reside in the structural details of my conveyor, time delay initiation switch, tie severing structure, tie removing structure, clearance lift means, height guide means, cross-conveyor and removal indication means.

Still other and further objects of this invention are inherent and apparent in the method and apparatus as described pictured and claimed.

To the accomplishment of the foregoing and related ends, this invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principles of the invention may be employed.

This invention will be described with reference to the drawings, illustrating an exemplary form of apparatus, in which corresponding numerals refer to the same parts and in which:

Figure 1 is an elevational view of my package tie removing apparatus; showing a bale in position to be moved therethrough;

Figure 2 is a view similar to Figure 1 but in vertical section and showing the bale in a further state of progress through the machine;

Figure 3 is a sectional view taken along the line and in the direction of the arrows 3—3 of Figure 2;

Figure 4 is a vertical sectional view taken along the line and in the direction of the arrows 4—4 of Figure 2;

Figure 5 is a fragmentary vertical sectional view taken along the line and in the direction of the arrows 5—5 of Figure 6; and showing details of my tie removal structure;

Figure 6 is a fragmentary vertical sectional view taken along the line and in the direction of the arrows 6—6 of Figure 5;

Figure 7 is a fragmentary isometric view showing my tie removal shoe;

Figure 8 is a fragmentary partly elevational and partly sectional view showing details of my tie removal means;

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Figure 9 is a fragmentary elevational view partially broken away taken along the line and in the direction of the arrows 9—9 of Figure 8;

Figure 10 is a fragmentary horizontal sectional view taken along the line and in the direction of the arrows 10—10 of Figure 2, and showing a bale just preparatory to engaging my removal indication means; and

Figure 11 is a wiring diagram showing an exemplary form of electrical circuitry connections for my invention.

Throughout the specification and claims, my invention will be described with reference to removing ties from "bales" it being understood that the term "bales" encompasses other tied packages and includes packages whether of compressed material or not and whether having a peripheral covering or not. Also, the term "tie" will be used, but this term contemplates other flexible fastenings such as bands, cords, or laces whether of metal, twine, synthetic resin, etc.

Referring now to the drawings, and particularly to Figures 1 and 2, the exemplary form of apparatus shown therein comprises essentially the following structure: a conveyor generally designated 11 upon the upper run of which the bales are progressed through my tie removing machine or apparatus generally designated 10; a tie severing mechanism generally designated 12; a tie removing mechanism generally designated 13; a cross conveyor generally designated 14; and a tie removal indicator means generally designated 15.

The tie puller generally designated 10 is supported by any suitable means, in this instance four supporting wheels 18 which may or may not be caster wheels and may have locks to immobilize them, if desired.

A supporting frame comprising a pair of channel side members 20, 21, is joined and separated by a plurality of spacers 22 which also serve as support means for supporting plate 27 which in turn supports the upper run of belt 23 of conveyor 11. Belt 23 as shown best with reference to Figures 2 and 4, comprises a pair of endless belt members 23A and 23B separated by a gap 24 and positioned around pulleys 25 and 26 as shown in Figures 1 and 2. Of these, pulley 26 is an idler pulley supported upon shaft 28 which is journaled for rotation in side members 20 and 21. Pulley 26 may be a single pulley for both of belts 23A and 23B or a tandem pulley as desired, as may pulley 25. Pulley 25 is the drive pulley and is supported upon shaft 29 likewise journaled for rotation in side members 20 and 21 and provided at its extending end with a sprocket 30 secured thereto and driven by chain 31 from sprocket 32 through a reduction gearing 33 by motor 34. Motor 34 is mounted upon a supporting shelf 37 welded or otherwise secured to the bottom flange of frame member 21. As will be appreciated, a guard or other closure may be provided for chain 31 and sprockets 30 and 32 if desired, as well as for the other drives subsequently described.

At the leading end 11A of the conveyor with respect to Figures 1 and 2 and provided on either or both of side members 20 and 21, is a pair of posts 17 joined by a longitudinal bar 17A.

The tie severing mechanism generally designated 12 comprises a cutting member 35 in this instance a metal or abrasive disc which serves to sever the ties T-1 to T-5 of the bale B as it is passed thereover. The disc 35 is secured to shaft 36 for rotation therewith, the ends of shaft 36 being journaled in side members 20 and 21. To one extending end of shaft 26 is affixed a sprocket 38 driven by chain 39 from sprocket 40 secured to the shaft of motor 41. Motor 41, like motor 34, is also secured to a shelf 43 secured to and extending from the bottom flange of member 21.

As is best appreciated by reference to Figures 1, 2 and 4, the disc 35 is positioned in the gap 24 between belts 23A and 23B, and protrudes through a suitable aperture in plate 27.

A starter switch 42 is likewise positioned within the

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gap 24 between the belts 23A and 23B and likewise extends through an aperture in the supporting plate 27. A bifurcated lug 44 attached to the underside of the plate supports an arcuate trigger arm 45 which engages a microswitch 46 supported upon a cross angle brace 48 extending between members 20 and 21. As will be appreciated from Figure 2, the switch 42 is positioned between disc 35 and the leading end 11A of the conveyor, whereas disc 35 is positioned between switch 42 and the trailing end 11B of the conveyor.

The tie removing mechanism generally designated 13 is supported upon a frame comprising a pair of uprights 49 and 50 supported upon members 21 and 20 respectively and joined at the top by a beam 51. Positioned upon beam 51 is a pair of columns or risers 52 and 53 immovably secured thereto and a pair of pillow blocks 54 and 55 each supporting a stub shaft 56 on which the tie removing mechanism 13 pivots. Supported for pivotal movement upon shafts 56 is a box frame 58 upon the top surface of which is supported a motor 60. The center bottom of the box frame 58 is removed at 61 and portions of the sides thereof are reduced throughout their vertical dimension as at 62 to form a pair of angle extensions 63 as shown best in Figures 1 and 3. Angle members 63 are joined at their extending ends by a cross brace 64. The other end of the box frame 58 is closed by an end plate 65. Attached to the bottom or horizontal flanges of angle members 63 and extending longitudinally therealong is a pair of convex surfaces 66 as shown best in Figures 2 and 3.

A tie guide 68 is welded or otherwise secured to cross brace 64 and has a shovel nose or point 69 positioned to engage the ties of an advancing bale B as shown best in Figure 2. Shovel point 69 (as shown in Figure 7) is provided with a portion 70 of lesser incline and a portion 71 of greater incline joined thereto. A groove 72 has an end terminating short of the extreme end 73 of point 69 and extends upwardly throughout the extension of the guide as shown in Figures 2 and 7.

A pair of channel members 74 and 75 are inclined with respect to and welded at one end to box frame 58 as shown in Figures 2, 5 and 6. A cover plate 76 is removably positioned upon their upper inclined flanges 78 of members 74 and 75. A pair of bottom cover plates 79 and 80 are secured to flanges 81 of members 74 and 75 respectively. Each one of the bottom plates 79 and 80 is provided with a roughly U-shaped section 82 secured to the bottom of box frame 58; and the plates are spaced to provide a central slot throughout their extension.

As shown in Figure 4, there is secured to each one of members 74 and 75 a bearing block 83 which supports a shaft 84 to which is fixed a central sprocket 85.

Around sprocket 85 is passed an endless chain 86, the other end of which is passed around a second central sprocket 88, carried by a shaft 89 journaled in bearing blocks 90 secured to angle members 63.

Shaft 84 is driven by an end sprocket 91 in turn driven by endless chain 92 from motor 60 by sprocket 93, secured to the shaft thereof.

The chain 86 as shown best in Figure 5 is provided with a plurality of spaced dogs 94 each having an inclined edge 95 as shown.

A pair of lugs 96 and 98 are secured to members 74 and 75 respectively and are provided with an extending rod 99 fixed thereto; to the ends of which are attached counter springs 100; one of the springs 100 being secured to column 52 and the other of the springs 100 being secured to column 53.

Positioned on the underside of each of the plates 79 and 80 is a tie disengaging wedge 102 cooperating with dogs 94 as shown in Figures 8 and 9 and spaced away from the end of the tie guide 68.

The cross conveyor 14 is supported from members 20 and 21 by a supporting frame comprising two pairs of uprights 103 and 104, each pair joined by a horizontal

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brace 105. A pair of cross members 106 and 107 are supported thereon and are provided with bearing blocks 114 at each end. One pair of bearing blocks 114 supports shaft 108 to which is fixed sprocket 109 driven by chain 110 from sprocket 111 in turn driven by the shaft of motor 112. A second shaft 113 is supported by the other pair of bearing blocks 114. Shafts 108 and 113 are each provided with a pulley 115 for the endless belt 116 of the cross conveyor 14.

Secured to member 106 is a pair of baffles 118 and 119 spaced so as to allow the extension of tie guide 68 therebetween. Tie guide 68 moves arcuately between the spaced edges thereof.

Secured to member 107 and reinforced by braces 120 is an end baffle 121 having an overhanging portion 122.

A pair of side walls 123 are provided extending upwardly from members 21 and 20 respectively and each is provided at its leading edge with an out-turned portion 125 which serves to guide the bound bale B to the position shown in Figures 2 and 4.

The motor 112 is positioned upon a shelf 126 supported by gusset braces 128 from wall 123.

Secured to uprights 104 is a rectangular frame 130 provided with a plurality of feelers 131, each of which is connected as shown in Figure 10, to an electrical connection 132, alternate feelers 131 being connected to positive leads and intermediate feelers 131 being connected to negative leads.

Pivotaly secured at 142 to the exterior of each one of the angle members 63 is a somewhat triangular bracket 141 which is provided with an arcuate slot 143 in which is positioned a cap screw 144. Each bracket 141 carried a height adjustment wheel 140. Bracket 141 (controlling the positioning of wheel 140) may be adjustably pivoted on pivot 142 within the limits of slot 143 and is maintained in adjusted position by cap screw 144 which is threaded into box member 58.

In some instances where metallic ties are being removed from bales, very strong magnets 145 (as for example "Alnico" magnets) are positioned on sections 82 of plates 79 and 80 or other adjacent structure in position to attract and lift the metallic tie from the bale surface before it is engaged by point 73 (shown in Figure 5).

In operation, my tie pulling machine is usually made completely automatic, the automatic operation being initiated by the actuation of switch 42. The bales of material designated B which are provided with the ties T-1 to T-5, usually of metal, will move from right to left through the machine as viewed in Figures 1 and 2. The machine will receive bound bales of various material, transport and hold the bales in position while the ties are cut, remove the ties and eject the freed bales at the discharge end. To accomplish this, the upper run of the conveyor 11 is positioned to traverse the distance from the leading end 11A of the conveyor to the trailing end 11B and thus move the bale leftwardly with reference to Figure 1 or through the machine. As the bales so move, the guide edges 125 will serve to guide the bale between the walls 123 and consequently in engagement with the cutting disc 35.

The bales are placed upon the conveyor 11 in the position shown in Figure 1, usually by a forklift truck which moves the bale into position and drops it onto the conveyor from either side of the conveyor, although the bale may otherwise be deposited as desired. The forks of the truck are advanced into position over the conveyor and supporting the bale, then lowered until they reach engagement with the bar 17A and are positioned between the posts 17. The forks are then withdrawn from underneath the bale B, the bale B will be engaged by the end posts 17 and drop from the forks onto the conveyor 11 to the position shown in Figure 1.

As shown in Figure 2, such positioning of the bale upon the leading end 11A of the conveyor will depress

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the trigger 45 of starting switch 42 from the full to the dotted line position, thus actuating microswitch 46. Switch 46 is connected to a time delay relay which is set so that the forklift truck operator is given sufficient time to completely withdraw his forks before the conveyor 11 goes into operation. In this manner, the time delay relay serves to prevent premature operation of the machine. The time delay relay may be preset to any desired time, usually 5 to 25 seconds and after this preset time through the appropriate electric circuits, motors 34, 41, 60 and 112 are energized.

Energization of motor 34 drives the endless conveyor 11 through chain 31, the upper run of the conveyor will move from right to left with reference to Figures 1 and 2, and the bale will be moved through the machine accordingly.

Energization of motor 41 drives the cutting disc 35 through chain 39. As has been explained previously, in this instance, the cutting disc is an abrasive or metal disc without teeth. However, in certain modifications, teeth may be provided as desired. The function of the disc 35 will be to cut or sever the ties or bands T-1 to T-5, on the bottom side of the bale B, as it passes thereover.

Energization of motor 60 drives the pulling head or tie removing mechanism 13 through chain 92. The function of this mechanism is to engage and remove the tie from the bale partially curling it, and deposit it on the cross conveyor 14.

Energization of motor 112 drives the cross or disposal conveyor 14. A reversible motor or connection is usually provided so that the conveyor may be moved from left to right or from right to left with reference to Figure 4 so that the ties may be ejected from either side of the machine.

As a bale advances, a tie immediately after being severed by disc 35 is engaged by the height guide wheels 140 which ride on the top side of the bale thereby setting the height of the puller head 13 and determining the engagement of shovel nose 69 with the bale. The height guide wheels 140, as previously explained, are adjustable upwardly and downwardly, and may be adjusted laterally to provide various depths of penetration of shovel nose 69 in order to remove the ties from various baled materials. The weight of the tie puller head 13 is otherwise supported by the counterbalancing springs 100 which serve to extend and contract to allow the head to pivot about its pivot 56.

The shovel nose 69 plows slightly beneath the surface of and into the material of the bale as shown in Figure 2 and catches or engages each one of the severed ties as the bale is moved along the conveyor. This is shown for tie T-2 in Figure 5. As the tie is engaged, it is lifted and held by the shovel nose until the tie is hooked by an advancing dog, as dog 94 shown in Figure 9, which dog is travelling in the direction of the arrow shown in that figure. The plurality of dogs as shown in that figure are provided on a continuous chain at approximately 8-inch intervals. The chain travels in the same direction as the travel of the bale but considerably faster. The dog 94 catches the tie after it has been hooked by shovel nose 69 and then pulls the wire along the tie guide 68. The tie cannot become disengaged from the dog 34 since it is held between the upper surface of the tie guide 68 and the bottom plates or surfaces 79 and 80.

To state this another way, as the dog 94 engages the tie, it pulls it upwardly in the direction of the arrow shown in Figure 5. The dog rides in the groove 72, of tie guide 68, throughout the length thereof and the tie progresses successively therealong as shown by the positions of ties T-3 and T-2 in Figure 2. In this figure, the progression of the tie through the machine is shown by the various positions of ties T-5, T-4, T-3, T-2 and T-1. Thus, a tie will approach the cutter 35, as shown

by the position of tie T-5, pass thereover and be severed, as shown for tie T-4, whereupon it will loosen slightly on the bale because of the compression of the material of the bale. The tie will then be engaged by the shovel point 69 and dog 94, as shown for the tie T-2 in Figure 5, will then pass to the position shown for tie T-3 in Figure 2, and thence to the position shown for tie T-2 in Figure 2, and thereafter be stripped from the dog 91 and drop as shown for tie T-1 in Figure 2 onto the cross or disposal conveyor 14.

On the bottom side of each of the angle members 63 are the two convex elements 66. Each tie is pulled around the elements 66 as shown in Figure 8 until free of the bale and by this time the dog carrying the tie has advanced so that the tie will engage the disengaging wedges 102 at the top of the head 13. In this manner, as the tie progresses from the position of tie T-4 to that of T-3 to that of T-2 in Figure 2, it will be drawn around the convex member 66 and into the position shown in Figure 8. After the tie has progressed along the tie guide 68 and dog 94, it will be drawn over the inclined surfaces of wedges 102 as shown in Figure 9. The inclined wedges will then strip the ties from the dog 94 (Figure 9) and it will fall to the position shown for tie T-1 in Figure 2 and thence be received on the cross conveyor. The baffles 118, 119 and 121 insure such reception and prevent the stripped ties from falling back into the loosened material of the bale.

If desired, means may be provided for then automatically stopping the movement of the machine.

The series of fingers 131 disposed around the discharge throat of the machine are so connected to a suitable electric circuit embodying an alarm that if any two fingers come in contact with a metal tie or other metal in the bale, the machine is automatically stopped and an indicator activates. This precaution is provided to eliminate the possibility of some of the tie wires or bands being missed and remaining in the material as it is unbaled.

The feature is of course utilizable with ties composed of conductive metal. However, where the bales being processed include cord or other ties, another type of tie removal indicator may be provided.

In removing ties from bales containing rags and burlap, etc., it is not desirable to allow the shovel nose 69 to plow beneath the surface of the bale as shown in Figures 2 and 5 since it would catch and drag the material with it. This phenomenon is not present with fibrous material. In removing the ties from bales of the former type, the very strong magnets, usually "Alnico" magnets 145, attract the tie or band away from the surface of the bale after the tie has been cut and then end 73 of nose 69 is free to catch the wire without engaging the burlap, rag or other surface of the bale.

In this instance the wheels 140 are adjusted to support the tie removal mechanism 13 on the top of the bale so that shovel nose 69 barely grazes the top of the bale and does not appreciably plow beneath the surface.

Reference may now be had to the circuit shown in Figure 11 for further understanding of the operation of my invention. In Figure 11, there is shown a schematic wiring diagram illustrating one form of circuitry for the operation of the various motors, etc. Thus, as shown, motors 34, 41, 60 and 112 are each connected by delivery lines B to supply lines A of a three phase electrical source. Each of the delivery lines B is normally disconnected to its corresponding supply line A, but may be connected thereto for the delivery of current to the motor by appropriate contacts 150 for motor 34, 151 for motor 41, 152 for motor 60, and 153 for motor 112.

A control circuitry in which lines L1 and L2 are the power lines to any convenient source of current. One of the lines, in this case L1, is provided with a master switch 154 which serves to interrupt the flow

of current to the entire circuit when in its normally open position.

When master switch 154 is closed, a circuit will be conditioned for establishment through line L1, juncture 155 via line 156 to normally closed contacts 158, through line 159 to juncture 160 and via line 161 to normally open contacts 162, and thence via line 163 to normally closed contacts 164 and thence via line 165 through relays 166, 168, 169 and 170 to juncture 171 of line L2.

At the same time, a circuit is conditioned from juncture 160 via line 172 to normally open contacts 173 via line 174 through relay 175 and line 176 to juncture 178 on line L2. A shunt circuit is likewise conditioned via line 179 through relay 180 and thence via line 176 to juncture 178 on line L2.

At the same time, a circuit is conditioned for establishment from juncture 181 through bell 182 via line 183 to normally open contacts 184 and via line 185 to juncture 186 on line L2.

Simultaneously, a circuit is established from juncture 181 through line 188, the primary of a transformer 189 via line 190 to juncture 191 on line L2. The supply of current to the primary of transformer 189 conditions at that time for establishment of a circuit from the secondary of the transformer and thence via line 192 and 193 to alternate fingers 131. Thus, at this time, if communication is established between alternate members of fingers 131 by a metallic object, such as an unremoved bale tie wire, the relay 194 will be energized, closing the normally opened contacts 184 thus ringing the bell 182, and at the same time opening the normally closed contacts 158 and thus breaking any circuit to the relays 166, 168, 169 and 170 to the motors 34, 41, 60 and 112 respectively, if such circuit has been established. Since such circuit has not been so established at this time, the opening of normally closed contacts 158 will have no effect.

To start the machine, the start switch 46 is pushed closing normally open contacts 173 and establishing a circuit through relay 175 which closes the normally open contacts 162 energizing relays 166, 168, 169 and 170 and motors 34, 41, 60 and 112 will commence to operate, and the machine will function as previously explained.

The relay 175 is a time delay relay normally operative after a pre-set time, as previously explained, so that the operator of the forklift truck has sufficient time to withdraw the forks from under the bale after depositing the same upon the conveyor.

At the same time the shunt circuit to relay 180 is completed and relay 180 is energized. This relay is likewise a time delay relay, operating to open the normally closed contacts 164 and thus interrupting any circuit to the relays 166, 168, 169 and 170 and de-energizing motors 34, 41, 60 and 112. However, the relay 180 is a time delay relay having a time lag somewhat longer than that of relay 175, and is pre-set so that the motors will be de-energized only after a bale has progressed through the machine and had its ties stripped therefrom. Thus, relay 180 will halt the action of the machine after one cycle of operation during which a bale has passed therethrough.

While this machine has been explained principally with reference to rectangular parallelepiped bales having ties around the lateral periphery thereof, it is of course to be understood that other shaped bales may be used with ties positioned in other directions. Thus, cylindrical bales having ties around the circumference, rectangular parallelepiped bales having ties around the longitudinal periphery, etc., may be used without departing from the spirit and scope of this invention.

It will of course be appreciated that the apparatus herein described is designed to be used as a unit by itself, i. e., where the forklift truck or some other conveying means places the bale on the conveyor and the bale then proceeds through the apparatus for the removal of the ties, or the apparatus may be used in a conveying system

wherein it is an integral part of the conveying system.

As many widely differing embodiments of this invention may be provided without departing from the spirit and scope thereof, it is to be understood that I do not specifically limit myself to the embodiment disclosed herein.

What I claim is:

1. In a tie cutting and removing machine, a frame, a cutter supported thereon, means for propelling a tie which is to be severed from a package into engagement with said cutter for severing said tie from said package, means for removing the severed tie from the package, said means for propelling said tie comprising an endless conveyor means supported on said frame having a horizontal upper run on which said package is supported, said cutter comprising a rotary member journaled to said frame and in cooperation with said upper run whereby a package thereon will be carried thereby and into communication with said cutter, and for severing the tie as said package is carried thereby, means for removing the severed tie supported on said frame and comprising a first member positioned to engage the severed tie, a second member cooperating with said first member for pulling the tie from the package, means for removing said tie from said second member, and a switch embodied in said conveyor provided for initiating the operation of said conveyor, cutter and means for removing the severed tie as said package is initially positioned on said conveyor.

2. The apparatus of claim 1 further characterized by an indicator means for indicating the presence of an unremoved tie.

3. The sub-combination comprising means for engaging the surface of a translated bale having a severed tie disposed at an angle to the direction of translation, said means for engaging said surface supporting a tie removal mechanism for determining the engagement thereof with said tie, said removal mechanism including point means adapted to engage between the tie and the bale and to initially distend the tie, cooperative means for engaging said tie and removing it from said bale, and said point means including an extending surface inclined with reference to the direction of translation of the bale, and said cooperative means comprising an endless member parallel to said extending surface and having a plurality of spaced catches for engaging said tie and traversing it over said extending surface.

4. The apparatus of claim 3 further characterized by stripping means positioned adjacent the extending end of said endless member for removing said tie therefrom.

5. The apparatus of claim 3 further characterized in that said endless member extends beyond the end of said extending surface, and stripping means positioned adjacent the extending end of said endless member for removing said tie therefrom.

6. The apparatus of claim 3 further characterized in that said inclined extending surface is provided with a groove and said catches are positioned to travel there-through.

7. An apparatus for removing loop ties from bales comprising, a conveyor means, a cutting means to which said bales are moved by said conveyor for severing said ties, a tie removal means positioned for engaging and removing the severed tie including a point means positioned to engage said tie at a point on said loop spaced with reference to the point of severance, adjustable means for determining the engagement of said point means with said ties and means for removal of said ties from said bales after engagement by said point means.

8. A bale tie puller comprising in combination a conveying means for propelling a tie which is to be severed from a bale into engagement with a cutter, said cutter being positioned in cooperation with said conveyor for severing said tie, means for removing said severed tie comprising a tie engaging member adapted to penetrate between said tie and said bale as it is conveyed by said

conveyor for initially distending said tie, an endless conveyor having a plurality of catch means at spaced intervals therearound positioned for cooperation with said engagement means whereby when said engagement means has engaged said tie, one of said catch means on said endless conveyor will pull said tie from said bale.

9. The apparatus of claim 8 further characterized by said engagement means having a surface inclined with respect to the direction of travel of said bale having a groove therein and said catch means are positioned for travel throughout said groove.

10. The apparatus of claim 8 further characterized in that said endless conveyor extends a distance beyond the terminal end of said engagement means and stripping means for removing said ties from said catch means.

11. The apparatus of claim 8 further characterized by a second conveyor positioned to receive ties stripped by said stripping means for disposal thereof.

12. The apparatus of claim 11 further characterized by baffle means guiding said ties to said second conveyor.

13. The apparatus of claim 8 further characterized by adjustable height guide wheels supporting said removing mechanism on said bale as it is moved by said conveyor.

14. The apparatus of claim 8 further characterized by magnetic means positioned to exert a magnetic attraction on said tie before the engagement thereof.

15. The apparatus of claim 8 further characterized by a plurality of spring contact fingers positioned to engage the cross sectional periphery of the bale as it is moved by said conveyor, said fingers being alternately positively and negatively charged and leading to an alarm to indicate the presence of unremoved metallic ties.

16. An apparatus for severing and removing ties from bales comprising in combination, a supporting frame, an endless belt conveyor supported thereby and having an upper run travelling in a given direction, a rotary disc positioned so that as bales are traversed over said upper run of said conveyor the disc will sever the ties thereof at the bottom of the bale, a tie removal means positioned on said frame and over said conveyor, said removal means comprising a tie engaging means and a tie pulling means pivotally supported on said frame and normally suspended by tension members, wheels adapted to engage the upper surface of bales passed thereunder for supporting said tie removal means on the tops of said bales, shovel nose means adapted to engage severed ties and an endless puller member having a plurality of tie engaging members for cooperating with said shovel nose and pulling said ties from said bales, stripper means positioned in cooperation with said puller member for removing the ties therefrom.

17. An apparatus for severing and removing ties from bales comprising in combination, a supporting frame, a first endless belt conveyor supported thereby and having an upper run travelling in a given direction, a rotary disc positioned so that as bales are traversed over said upper run of said conveyor the disc will sever the ties thereof at the bottom of the bale, a tie removal means positioned on said frame and over said conveyor, said removal means comprising a tie engaging means and a tie pulling means pivotally supported on said frame and normally suspended by tension members, wheels adapted to engage the upper surface of bales passed thereunder for supporting said tie removal means on the tops of said bales, shovel nose means adapted to engage severed ties and an endless puller member having a plurality of tie engaging members for cooperating with said shovel nose and pulling said ties from said bales, stripper means positioned in cooperation with said puller member for removing the ties therefrom, and magnetic means positioned adjacent said puller means for elevating said ties from engagement with said bales.

18. An apparatus for severing and removing ties from bales comprising in combination, a supporting frame, a first endless belt conveyor supported thereby and having

an upper run travelling in a given direction, guide means supported by said frame for controlling the position of the bales during their movement along said upper run, a time delay switch associated with the conveyor and positioned to be engaged by bales as they are positioned upon the upper run of said conveyor for controlling the operation of the apparatus, a rotary disc positioned so that as bales are traversed over said upper run of said conveyor the disc will sever the ties thereof at the bottom of the bale, a tie removal means positioned on said frame and over said conveyor, said removal means comprising a tie engaging means and a tie pulling means pivotally supported on said frame and normally suspended by tension members, wheels adapted to engage the upper surface of bales passed thereunder for supporting said tie removal means on the tops of said bales, shovel nose means adapted to engage severed ties and an endless puller member having a plurality of tie engaging members for cooperating with said shovel nose and pulling said ties from said bales, stripper means positioned in cooperation with said puller member for removing the ties therefrom, a disposal conveyor having an upper run travelling at an angle to the direction of travel of said first conveyor, and baffle means for guiding said tie onto said disposal conveyor.

19. An apparatus for severing and removing ties from bales comprising in combination, a supporting frame, a first endless belt conveyor supported thereby and having an upper run travelling in a given direction, guide means for controlling the position of the bales during their movement along said upper run, a time relay switch positioned to be engaged by bales as they are positioned upon the upper run of said conveyor for controlling the operation of the apparatus, a rotary disc positioned so that as bales are traversed over said upper run of said conveyor the disc will sever the ties thereof at the bottom of the bale, a tie removal means positioned on said frame and over said conveyor, said removal means comprising a tie engaging means and a tie pulling means pivotally supported on said frame and normally suspended by tension members, wheels adapted to engage the upper surface of bales passed thereunder for supporting said tie removal means on the tops of said bales, shovel nose means adapted to engage several ties and an endless puller member having a plurality of tie engaging members for cooperating with said shovel nose and pulling said ties from said bales, stripper means positioned in cooperation with said puller member for removing the ties therefrom, a disposal conveyor having an upper run travelling at an angle to the direction of travel of said first conveyor, baffle means for guiding said tie onto said disposal conveyor, a plurality of electrical contact members positioned to engage the periphery of the bale transverse to the direction of movement of the bale, said members being connected to an alarm device for operation thereof whenever a circuit between two of said members is completed, and magnetic means positioned adjacent said puller means for elevating said ties from engagement with said bales.

20. A machine for severing and removing band ties from packages including a frame, an endless belt conveyor supported by said frame having a horizontally extending upper run upon which a package from which a band tie is to be severed may be positioned and transported thereby, a cutter journaled for rotation to said

frame and positioned with respect to said upper run so that the packages supported thereupon will be transported thereby and into communication therewith for severing ties thereon, means for removing the severed tie supported by said frame for engagement with said severed tie at a point substantially opposite the point of severance thereof including point means adapted to engage beneath the tie and the package and to initially distend the tie, said point means being supported by means for engaging the surface of the package for determining the engagement of said point means with said tie and hook means supported by said engagement means and movable from a first position remote in respect to said severed tie to a second position for engaging said severed tie for removing the same.

21. An apparatus for severing and removing ties from bales comprising in combination, a supporting frame, a first endless belt conveyor supported thereby and having an upper run travelling in a given direction, guide means for controlling the position of the bales during their movement along said upper run, a time delay switch supported by said frame positioned to be engaged by bales as they are positioned upon the upper run of the conveyor for controlling the operation of the apparatus, a rotary disc supported by said frame positioned so that as bales are traversed over said upper run of said conveyor the disc will sever the ties thereof at the bottom of the bale, a tie removal means positioned on said frame and over said conveyor, said tie removal means comprising a tie engaging means and a tie pulling means and pivotally supported on said frame and normally suspended by tension members therefrom, wheels thereon adapted to engage the upper surface of bales passed thereunder for supporting said tie removal means on the tops of said bales, shovel nose means as a part of said tie removal means and adapted to engage severed ties, an endless puller member as a part of said tie removal means and having a plurality of tie engaging members for cooperating with said shovel nose and pulling said ties from said bales, stripper means as a part of said tie removal means positioned in cooperation with said puller member for removing the ties therefrom, a disposal conveyor supported by said frame having an upper run travelling at an angle to the direction of travel of said first conveyor, baffle means connected to said frame for guiding said tie onto said disposal conveyor, a plurality of electrical contact members affixed to said frame and positioned to engage the periphery of the bale transverse to the direction of movement of the bale, said members being connected to an alarm device for operation thereof whenever a circuit between two of said members is completed, and magnetic means as a part of said tie removal means positioned adjacent said puller means for elevating said ties from engagement with said bales.

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U. S. DEPARTMENT OF COMMERCE
PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,820,282

January 21, 1958

Edmund C. Schneider, Jr.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 23, for "a flax" read --as flax--; column 2, line 39, after "described" insert a comma; column 11, line 31, for "a time relay" read -- a time delay--; line 44, for "several" read --severed--.

Signed and sealed this 15th day of April 1958.

(SEAL)

Attest:

KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON
Commissioner of Patents