

Sept. 9, 1952

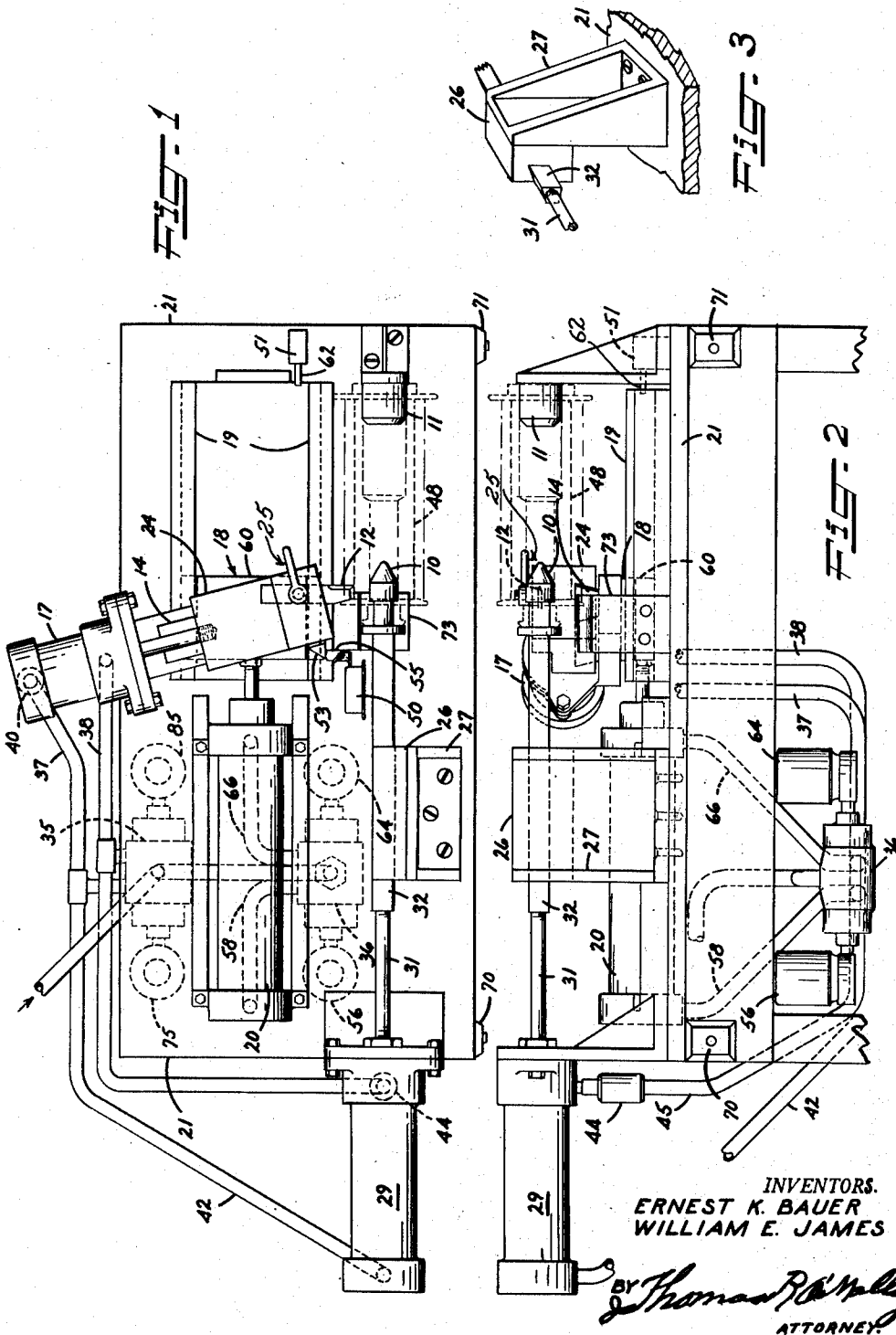
E. K. BAUER ET AL

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BOBBIN CUTTER

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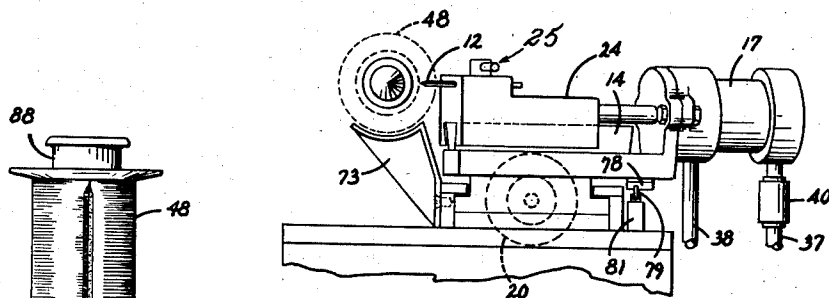


FIG. 4

FIG. 6

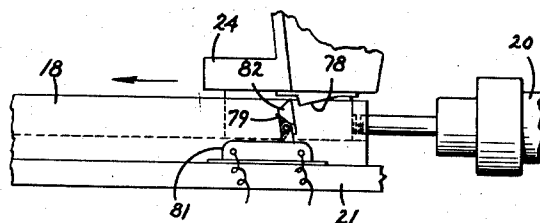


FIG. 5

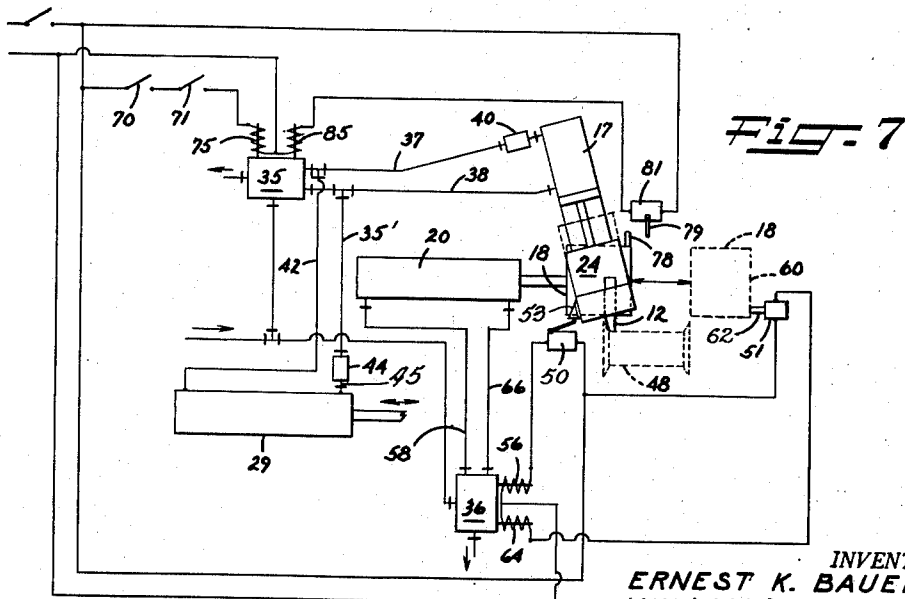


FIG. 7

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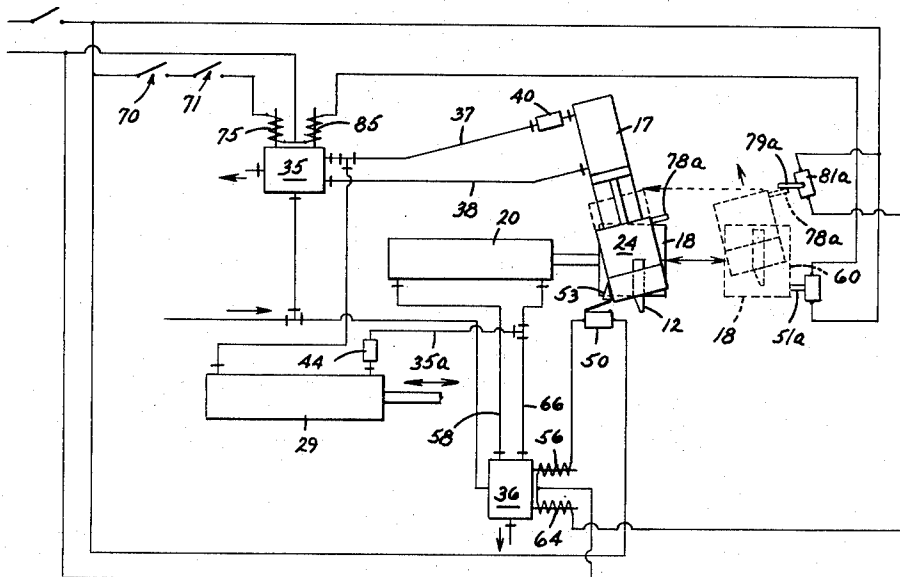


Fig. 8

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BOBBIN CUTTER

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11 Claims. (Cl. 164—73)

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This invention relates to apparatus for removing strand material from strand package cores, bobbins and the like and particularly to an apparatus for cutting the strand material to facilitate the removal thereof.

In the manufacturing of strands, especially those of textile materials, the collection of yarns, threads and the like into packages is effected by winding the strand onto a spool, bobbin or core which controls the shape of the package and provides a surface which may be gripped to support the package in subsequent treatments or rewinding operations. It sometimes happens in the manufacturing of textile strands that a wound package is unacceptable for further processes and that the defective material must be removed in order that the core may again be used or, as frequently happens, the residual strand of a package remaining after a winding operation must be removed to reclaim the core or the strand.

It is an object of the invention to provide an automatic apparatus for removing the strand material from a core member or spool upon which the material is wound. It is another object to provide a strand removing apparatus which may be operated safely and rapidly. It is still another object to provide an apparatus which is simpler in construction and easier to maintain than the prior art devices. Still another object is to provide a strand stripping apparatus which is unusually quiet in operation and economical in floor space. Other objects, features and advantages will be apparent from the following description of the invention and the drawing relating thereto in which

Fig. 1 is a plan view of a preferred embodiment of the invention;

Fig. 2 is a side elevation of the apparatus illustrated in Fig. 1;

Fig. 3 is a pictorial view of a slide bar and guide assembly included in the apparatus of Figs. 1 and 2;

Fig. 4 is an elevation of the knife-supporting assembly as viewed from the end of the apparatus;

Fig. 5 is a portion of the apparatus illustrating the relationship of a control switch and switch actuating members;

Fig. 6 illustrates a wound package with the strand material thereof incised;

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Fig. 7 is a diagram of the electrical system and fluid conducting system used for controlling the apparatus; and

Fig. 8 is a diagram illustrating another arrangement of an electrical system and fluid conducting system for controlling the apparatus.

In brief, an apparatus according to the invention comprises a cutting member and package holding members whose movements are produced by fluid pressure which is automatically controlled to produce a desired sequence in the movements of the members to grip the wound package, to strip or sever the strand, and to release the package.

The apparatus of Figs. 1 to 7 is illustrated in plan view in Fig. 1 and comprises chucks 10 and 11 for gripping and centering a strand package shown in dotted outline at 48. A knife 12 and a carriage 24 to which the knife is secured are reciprocable with respect to a guide 14 in a direction toward and away from an axis extending through the members 10 and 11. The guide 14 and a fluid cylinder 17 are secured to and supported by a carriage 13 which is slidable along the guide members 19 in a direction parallel to the axis of chucks 10 and 11. The carriage 18 is reciprocated by a fluid cylinder 20 which is fixed to the main frame 21 of the apparatus. The carriage 24 is reciprocated with respect to the carriage 18 and the guide 14 by the fluid cylinder 17. The knife 12 is secured with respect to the carriage 24 by a screw clamp assembly 25 mounted on the carriage 24. The chuck 10 is reciprocable along its axis in a direction toward and away from the other chuck 11 while supported by a guide block 26 secured to the bracket 27. Reciprocation of the member 10 is effected by operation of the fluid cylinder 29 with the reciprocable force being transmitted from the cylinder to the member 10 through the piston rod 31 and a slide bar 32 of trapezoidal cross section.

Movement of the fluid used for operating the cylinders 17, 20 and 29 is obtained according to a desired time sequence by operation of solenoid-controlled master control valves 35 and 36. Since the cylinder 17 moves relative to the frame 21 in consequence of being supported by the carriage 18, it is connected by flexible tubes 37 and 38 with the valve 35. The cylinder 29 is also connected with the ports of the valve 35 which are connected with the cylinder 17, but on account

of a sequence valve 40 in the line 37, (see Fig. 7) the cylinder 29 is actuated to move the package-holding chuck 10 to the right (into the position shown) before cylinder 17 is actuated to produce movement of the knife 12 toward the axis of the package-holding members. The sequence valve 40 is of the type allowing free flow in the reverse direction. An air sequence valve manufactured by the Logansport Machine Company, Inc. identified as Model 6411 and described on page 10 of Bulletin 371 published by that company is an example of the type that may be used for the sequence valves 40 and 44. The valve 40 is sufficiently resistant to the passage of air to prevent air from entering the cylinder 17 through line 37 until movement of the chuck 10 to the right is completed and a pressure rise occurs in cylinder 29.

In a later portion of the operating cycle of the machine, another sequence valve 44 is used to restrain the flow of air through the line 45 from the valve 35 into the cylinder 29 so as to delay the package-releasing return stroke of the chuck 10 to the left until the knife 12 is withdrawn to a position in the clear of the package. Before air can enter the right end of cylinder 29, the cylinder 17 receives sufficient air through line 33 to cause the knife 12 to completely withdraw from the bobbin 48 (shown in ghost outline in Figs. 1 and 2) in the direction determined by the guide 14. Once the cylinder 17 has completed its knife-retracting stroke, the air pressure rises in the line 35 and overcomes the resistance of valve 44 to the passage of the air. The right end of cylinder 29 may then receive air and thus effect a package-releasing stroke.

The operation of cylinder 20 produces movement of the knife 12 in a direction which is longitudinal with respect to the package supported between the members 10 and 11. With the knife adjusted at the desired distance laterally from the core of the package to engage the strand material of the package, the forward stroke produced by cylinder 20 results in the severing of windings at a desired depth. Forward and return movements of cylinder 20 and the knife are determined by the closing of microswitches 50 and 51. The microswitch 50 is actuated by a cam 53 mounted on the side of the carriage 24. Movement of the carriage 24 and the knife toward the package until the knife has penetrated the package to the desired depth of the longitudinal cut to be made brings the cam 53 into engagement with the trigger-finger 55 of the switch 50. This switch is electrically connected with the solenoid 56 which controls the passage of air into the cylinder 20 through a line 58. The cylinder 20 subsequently moves the knife 12 and the supporting assembly therefor in a direction toward the right as viewed in Figs. 1 and 2 until a leading surface 60 of the carriage 18 engages the plunger 62 of the switch 51. A solenoid 64 for operating the valve 36 is electrically connected with the switch 51. The action of cylinder 20 is thereupon reversed by operation of the solenoid 64 to change the setting of the valve 36 and air passes through a line 66 into the right end of the cylinder 20.

Button switches 70 and 71 are located on an outer surface of the frame 21 near the top thereof and placed in series arrangement in the main circuit for energizing the apparatus. Both buttons must be engaged by the operator to operate the machine. Since the switches are spaced at substantial distance, obviously, an operator must use both hands to push the buttons; consequent-

ly, his hands are necessarily restricted from entering any of the regions traversed by moving portions of the machine.

A preferable operating cycle for the machine is set forth hereinbelow with particular reference to Fig. 7 and according to the following sequence. A bobbin is placed on a stand or rest 73 and over chuck 11, and the buttons of the two switches 70, 71 are pressed. A solenoid 75 is energized and sets the valve 35 so that it passes air into and through the line 42 into the cylinder 29. The knob 10 moves into the position shown in Figs. 1, 2 in which it grips the package 48. When the knob or chuck 10 completes its movement to the right, the air pressure increases within the cylinder 29 and the line 37 to cylinder 17 until it overcomes the resistance of the sequence valve 40 to passage of the air. When the valve 40 opens, cylinder 17 moves the knife 12 into the position shown in the Figs. 1 and 2. However, as the knife moves into cutting position, the cam 53 actuates the switch 50 and closes a circuit to the solenoid 56. Air then feeds through the line 58 into the cylinder 20 and the knife is carried toward the right as viewed in Figs. 1 and 2 along a path parallel to the package axis. The stroke is completed when surface 60 engages the plunger 62 of the switch 51. The solenoid 64 and the valve 36 are actuated as hereinbefore described to reverse the flow of air into the cylinder 20. The piston of cylinder 20 is then acted upon by air admitted into the right end-portion of the cylinder through line 66 until the carriage 18 and the knife-holding apparatus supported thereupon complete their movement to the left. Near the end of the stroke of this assembly to the left, a cam 78, best shown in Figs. 4 and 5, engages the trigger 79 of a microswitch 81 secured to a portion of the frame 21. The trigger 79 is so designed that a pivotable element 82 thereof will tilt to permit the cam 78 supported on an undersurface of the carriage 24 to pass over in the direction of the arrow in Fig. 5 without moving the arm of the trigger extending from the body of the switch 81. However, when the cam passes over in the opposite direction, the element 82 does not tilt and the trigger is swung toward the right as viewed in Fig. 5 to close the switch. At this juncture, it should be noted that although the cam 78 is secured to the carriage 24, engagement of the cam with the switch is produced by movement of the carriage 18 which supports the carriage 24. Operation of the switch 81 closes an electrical circuit which includes a solenoid 85 for controlling the valve 35. The solenoid in becoming energized adjusts the valve to the setting wherein it directs air through line 38 into the cylinder 17 which then pulls the carriage 24 and the knife 12 toward the cylinder to a position wherein the knife is clear of the package 48. When the cylinder 17 has completed its stroke, the pressure rises in the line 35 to overcome the resistance of the sequence valve 44 to the passage of air into the cylinder 29. Air then enters the cylinder 29 to retract the chuck 10. Fig. 6 illustrates a package which has passed through a complete operating cycle of the machine just described to produce a longitudinal incision 87. The severed strand material may be brushed, shaken or otherwise urged from the core 88.

The apparatus hereinbefore described constitutes one embodiment of the invention. Another embodiment may be constructed in accordance with the diagram of Fig. 8 wherein the position of the switch 81 as shown in Fig. 7 is

changed to that designated as 81a in Fig. 8. The functions of switches 81a and 51a (the latter switch having the same position as 51 of Fig. 7) are reversed in the embodiment illustrated in Fig. 8 with respect to the fluid cylinders which they control when compared with the switches 81 and 51 of Fig. 7; otherwise, the structure of the two embodiments may be identical. In the arrangement illustrated in Fig. 8, the knife traverses a square or parallelogram path while executing a complete cycle whereas by the earlier described embodiment, the knife advances and returns along an L-shaped path. In producing the quadrilateral ambit of the knife which would result from operation of the apparatus illustrated in Fig. 8, the apparatus executes the following steps. A strand package is gripped between the chucks 10 and 11 as the cylinder 29 moves chuck 10 toward chuck 11. The knife 12 is advanced by cylinder 17 from the lateral position inwardly toward the axis of the package. The cylinder 20 then advances the knife longitudinally through the package until the carriage 18 touches the plunger of the switch 51a. The switch 51a is connected with the solenoid 85 for actuating the valve 35 to the setting wherein it directs air into the cylinder 17 through the line 38 to produce withdrawal of the knife from the package. The carriage 24 is provided with a cam or detent 78a which engages the trigger 79a of the switch 81a as the carriage 24 moves to the position of greatest departure from the package 48. Switch 81a is electrically connected to the solenoid 64 which resets the valve 36 to the position which passes air through the line 66 into the cylinder 20. The cylinder 20 then executes a return stroke to return the knife 12 to its position at the beginning of the cycle. As the air pressure builds up within the cylinder 20 and in the line 35a, pressure overcomes the sequence valve 44 and passes into the cylinder 29 to effect retraction of the chuck 10 and to release the package.

If desired, apparatus may be constructed according to Fig. 8 in which the sequence valve 44 is omitted from the line 35a. Such an arrangement will result in simultaneous actuation of cylinders 20 and 29 to effect return of the carriage 18 to its starting position, and retraction of the chuck 10, to thus release the package 48 as soon as the knife has been fully retracted in a lateral direction after completing its cutting stroke.

It is to be understood that changes and variations may be made from the spirit and scope of the present invention as defined in the appended claims.

We claim:

1. Apparatus for removing a material from a package in which the material is wound about a core thereof, said apparatus comprising means for holding the package, a knife for cutting the material, means for supporting the knife so that it projects toward the core of the package when gripped by the holding means, means for moving the knife toward said core into the material, means for advancing the knife through the material along the core, and means actuated by the knife moving means upon the attainment of a predetermined position of the knife with respect to the core for initiating actuation of the knife advancing means.

2. Apparatus for removing a material from a package in which the material is wound about a core thereof, said apparatus comprising means for holding the package, a knife for cutting the

material, means for supporting the knife so that it projects toward the core of the package when gripped by the holding means, means for moving the knife toward said core into the material, means for advancing the knife through the material along the core, means actuated by the knife moving means upon the attainment of a predetermined position of the knife with respect to the core for initiating actuation of the knife advancing means, means for removing the knife away from the core, and means actuated by the knife advancing means upon the completion of its cutting stroke for initiating actuation of the removing means.

3. Apparatus for removing a material from a package in which the material is wound about a core thereof, said apparatus comprising means for holding the package, a knife for cutting the material, means for supporting the knife so that it projects toward the core of the package when gripped by the holding means, means for moving the knife toward said core into the material, means for advancing the knife through the material along the core, means actuated by the knife moving means upon the attainment of a predetermined position of the knife with respect to the core for initiating actuation of the knife advancing means, means for removing the knife away from the core, means actuated by the knife advancing means upon the completion of its cutting stroke for initiating actuation of the removing means, means for returning the knife along the core, and means actuated by the knife removing means for initiating actuation of the returning means.

4. Apparatus for removing a material from a package in which the material is wound about a core thereof, said apparatus comprising means for holding the package, a knife for cutting the material, means for supporting the knife so that it projects toward the core of the package when gripped by the holding means, means for reciprocating the knife toward and away from said core into and out of the material, means for reciprocating the knife through the material along the core, means actuated by the first-mentioned reciprocating means upon the attainment of the knife's predetermined closest position with respect to the core for initiating actuation of the second reciprocating means through a single cycle, and means actuated by the second reciprocating means upon the completion of said cycle for initiating actuation of the first-mentioned reciprocating means through its return stroke for moving the knife away from the core.

5. Apparatus for removing a strand material from a package comprising a rigid core and windings of the material supported thereupon, said apparatus comprising a pair of gripping members aligned along a common axis of which one is stationary and the other is movable, a knife for cutting the strand material, means for supporting the knife so that it extends therefrom toward the axis, means for moving the movable member toward the other to effect engagement of the members on opposite ends of the core, reciprocating means responsive to the core-engaging position of the first means for moving the knife-supporting means toward the axis to carry the knife into the strand material, means responsive to the position of the supporting means at maximum penetration of the package by the knife for moving the supporting means in a path laterally spaced with respect to the axis to move the knife through and thus sever the strand material,

control means positioned for engagement as the third-mentioned means completes its forward stroke for energizing said means to effect a return stroke, control means for energizing the reciprocating means to effect lateral withdrawal of the knife and positioned for engagement at the completion of the return stroke of the third-mentioned means, and control means responsive to the position of the reciprocating means wherein the lateral withdrawal of the knife has been completed for effecting disengagement of the movable member with the core.

6. Apparatus for removing a strand material from a package comprising a rigid core and windings of the material supported thereupon, said apparatus comprising a pair of gripping members aligned along a common axis of which one is stationary and the other is movable, a knife for cutting the strand material, means for supporting the knife so that it extends therefrom toward the axis, means for moving the movable member toward the other to effect engagement of the members with opposite ends of the core, reciprocating means responsive to the core-engaging position of the first means for moving the knife-supporting means toward the axis to carry the knife into the strand material, means responsive to the position of the supporting means at maximum penetration of the package by the knife for moving the supporting means in a path laterally spaced with respect to the axis to move the knife through and thus sever the strand material, control means positioned for engagement as the third mentioned means completes its forward stroke for energizing said means to effect a return stroke, control means positioned for engagement at the completion of the return stroke of the third mentioned means for energizing the reciprocating means to effect lateral withdrawal of the knife, control means responsive to the position of the reciprocating means wherein the knife has completed lateral movement for energizing the means for moving the core-gripping member to move said member away from the core, and a stand for supporting the package in a desired alignment for engagement therewith by the gripping members.

7. Apparatus as in claim 6 wherein the various control means are electrically operated and connected to a common supply circuit and said apparatus also comprises switch means in the supply circuit.

8. Apparatus as in claim 6 wherein the various control means are electrically operated and connected to a common supply circuit and said apparatus also comprises two switches in series connection in said circuit and spaced to require operation by both hands of an operator.

9. Apparatus for removing a strand from a wound package formed on a rigid core member, said apparatus comprising a stationary member and a movable member for gripping the packages by engaging opposite ends of the core member, a fluid cylinder for moving the movable member toward and away from the stationary member along an axis extending therebetween, a carriage, guide means for limiting movement of the carriage along a path which is spaced laterally with respect to said axis, a second fluid cylinder for reciprocating the carriage, means for supporting the knife so that the knife extends from said support means in a direction toward the axis, guide means for limiting the movement of the support means along a path extending laterally of the carriage path to carry the knife to-

ward and away from said axis, a third fluid cylinder for reciprocating the support means, a first control means for directing fluid into one end of the first cylinder to effect gripping of the package, a second control means in timed relationship with the first control means for directing the fluid into one end of the third cylinder to effect movement of the knife into the strand material of a package after the package is gripped, a third control means in timed relationship with the second control means for directing the fluid into one end of the second cylinder to effect movement of the knife through the strand material longitudinally of the package, a fourth control means for directing the fluid into the opposite end of the second cylinder to effect a return stroke of the knife, a fifth control means responsive to a return position of the knife for directing the fluid into the opposite end of the third cylinder to effect lateral withdrawal of the knife, and a sixth control means responsive to the position defining complete lateral withdrawal of the knife for directing a fluid into the opposite end of the first cylinder to effect disengagement of the gripping means.

10. Apparatus for removing a strand material from a package comprising a rigid core and windings of the material supported thereupon, said apparatus comprising a pair of gripping members aligned along a common axis of which one is stationary and the other is movable, a knife for cutting the strand material, means for supporting the knife so that it extends therefrom toward the axis, means for moving the movable member toward the other to effect engagement of the members on opposite ends of the core, reciprocating means responsive to the core-engaging position of the first means for moving the knife-supporting means toward the axis to carry the knife into the strand material, means responsive to the position of the knife-supporting means at maximum penetration of the package by the knife for moving the supporting means in the path laterally spaced with respect to the axis to move the knife through and thus sever the strand material, control means positioned for engagement as the third mentioned means completes the strand-cutting stroke for energizing said reciprocating means to effect a return stroke, control means positioned for engagement at the completion of the return stroke of the reciprocating means for simultaneously energizing the means for moving the knife in the path laterally spaced to the axis in a return stroke and the movable gripping member to effect a return stroke to free the package.

11. Apparatus for removing a strand material from a package comprising a rigid core and windings of the material supported thereupon, said apparatus comprising a pair of gripping members aligned along a common axis of which one is stationary and the other is movable, a knife for cutting the strand material, means for supporting the knife so that it extends therefrom toward the axis, means for moving the movable member toward the other to effect engagement of the members on opposite ends of the core, reciprocating means for moving the knife-supporting means toward the axis to carry the knife into the strand material and responsive to the core-engaging position of the first means, means for moving the supporting means in a path laterally spaced with respect to the axis to move the knife through and thus sever the strand material and responsive to the position of the knife-supporting means at

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maximum penetration of the package by the knife, control means positioned for engagement as the third-mentioned means completes the strand-cutting stroke for energizing said reciprocating means to effect a return stroke, control means for energizing the means for moving the knife in a path laterally spaced to the axis to effect a return stroke and positioned to be engaged at the completion of the return stroke of the reciprocating means, control means for energizing the movable gripping member to effect a return stroke so as to release the package and responsive to the position of the means for moving

the knife along the path as said means completes the return stroke.

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