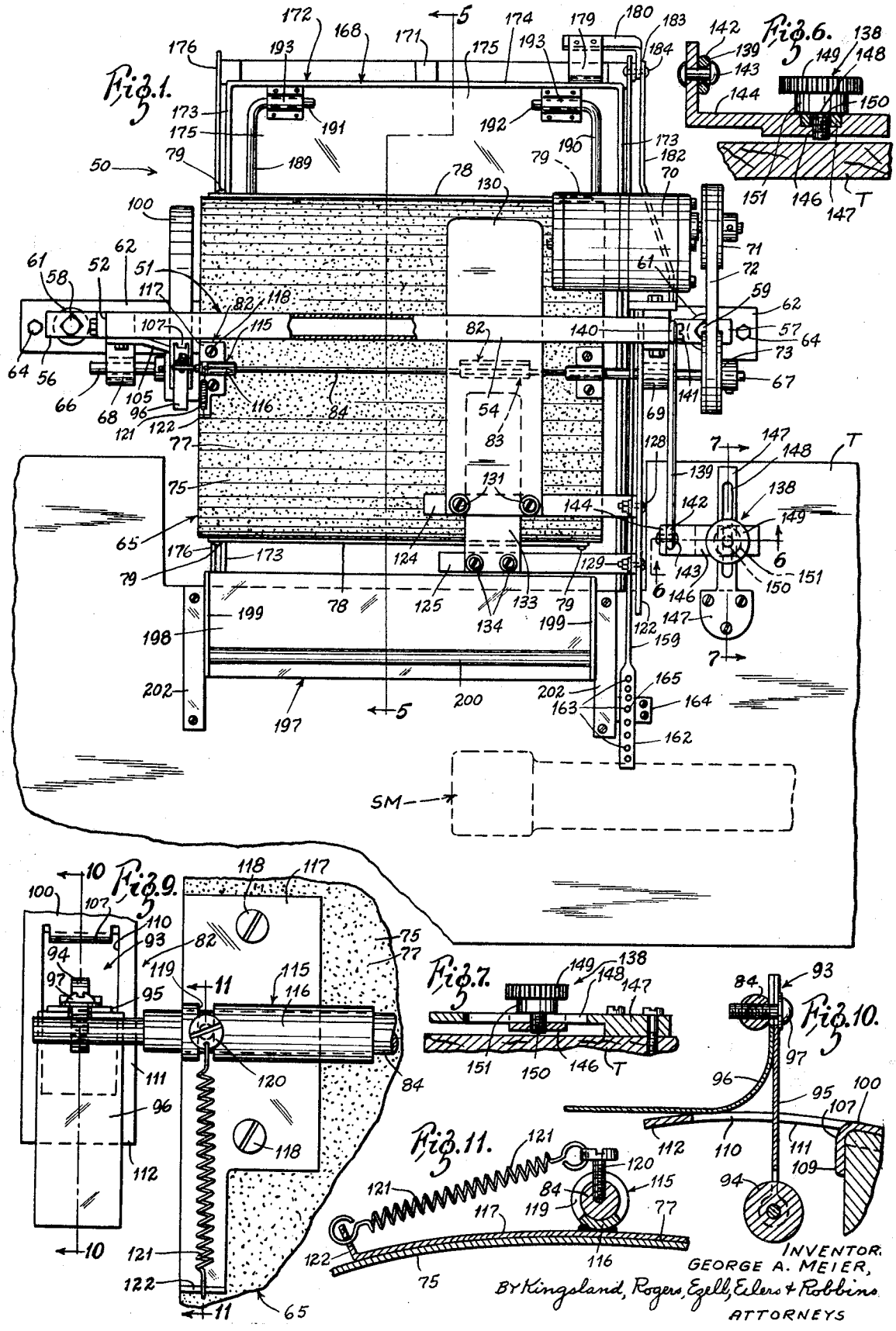
May 5, 1970 G. A. MEIER 3,509,839

STACKING DEVICE

Filed Oct. 9, 1968 4 Sheets-Sheet 1



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STACKING DEVICE

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Fig. 2.

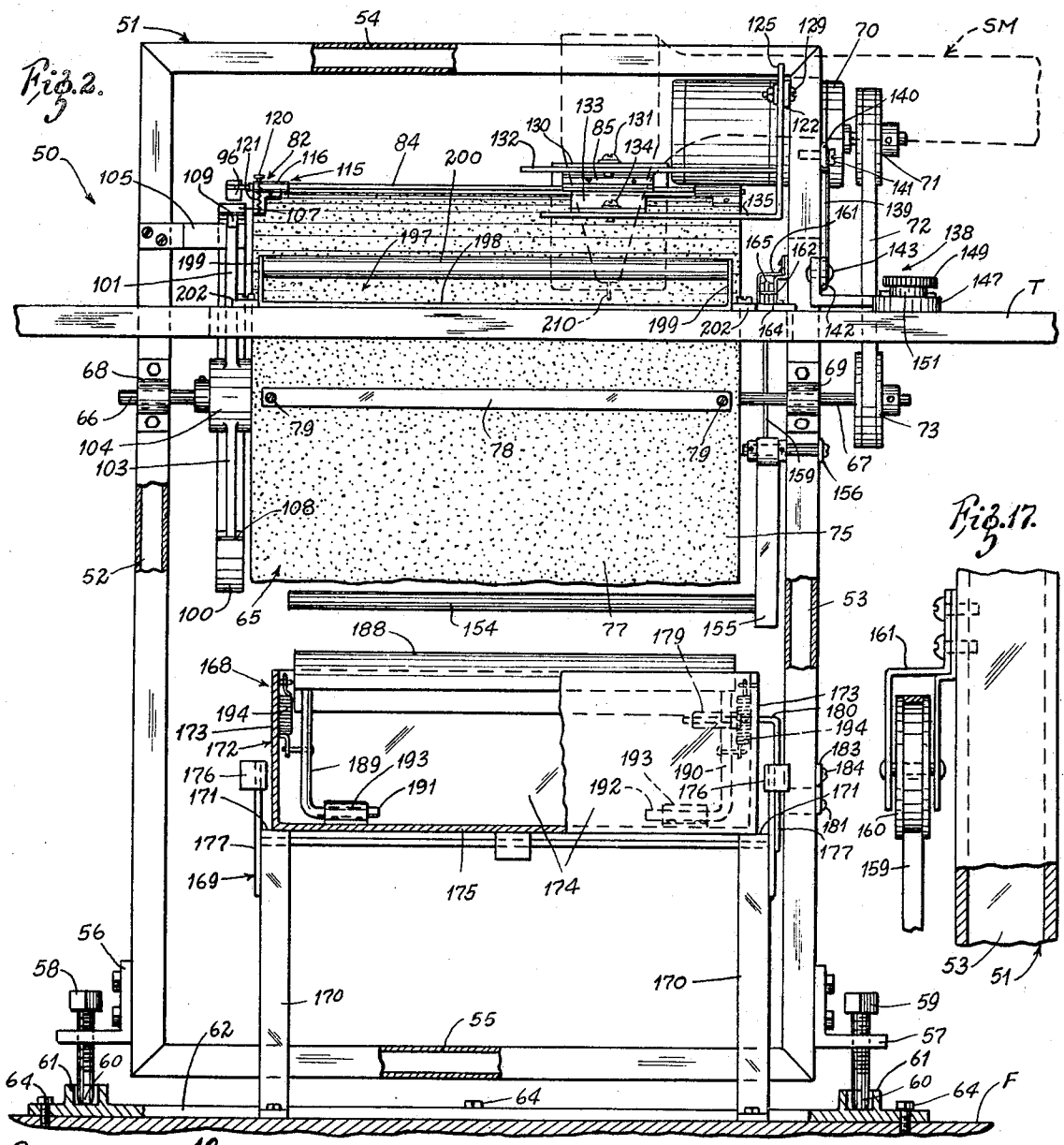


Fig. 17.

Fig. 18.

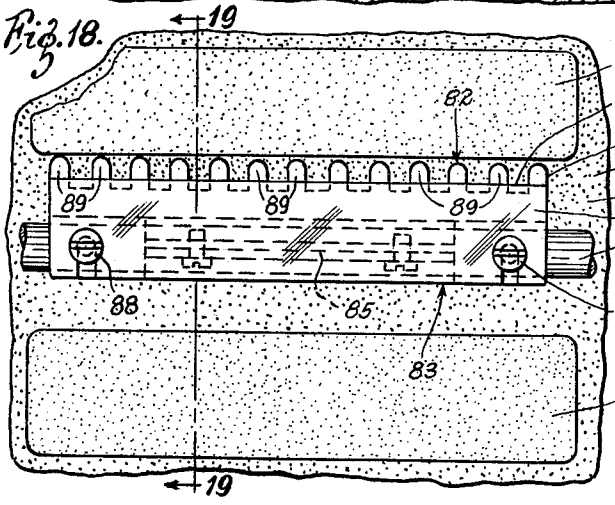
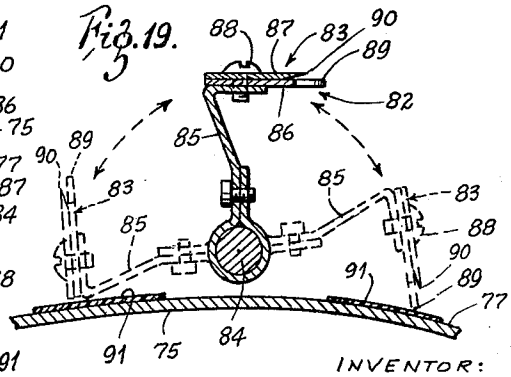


Fig. 19.

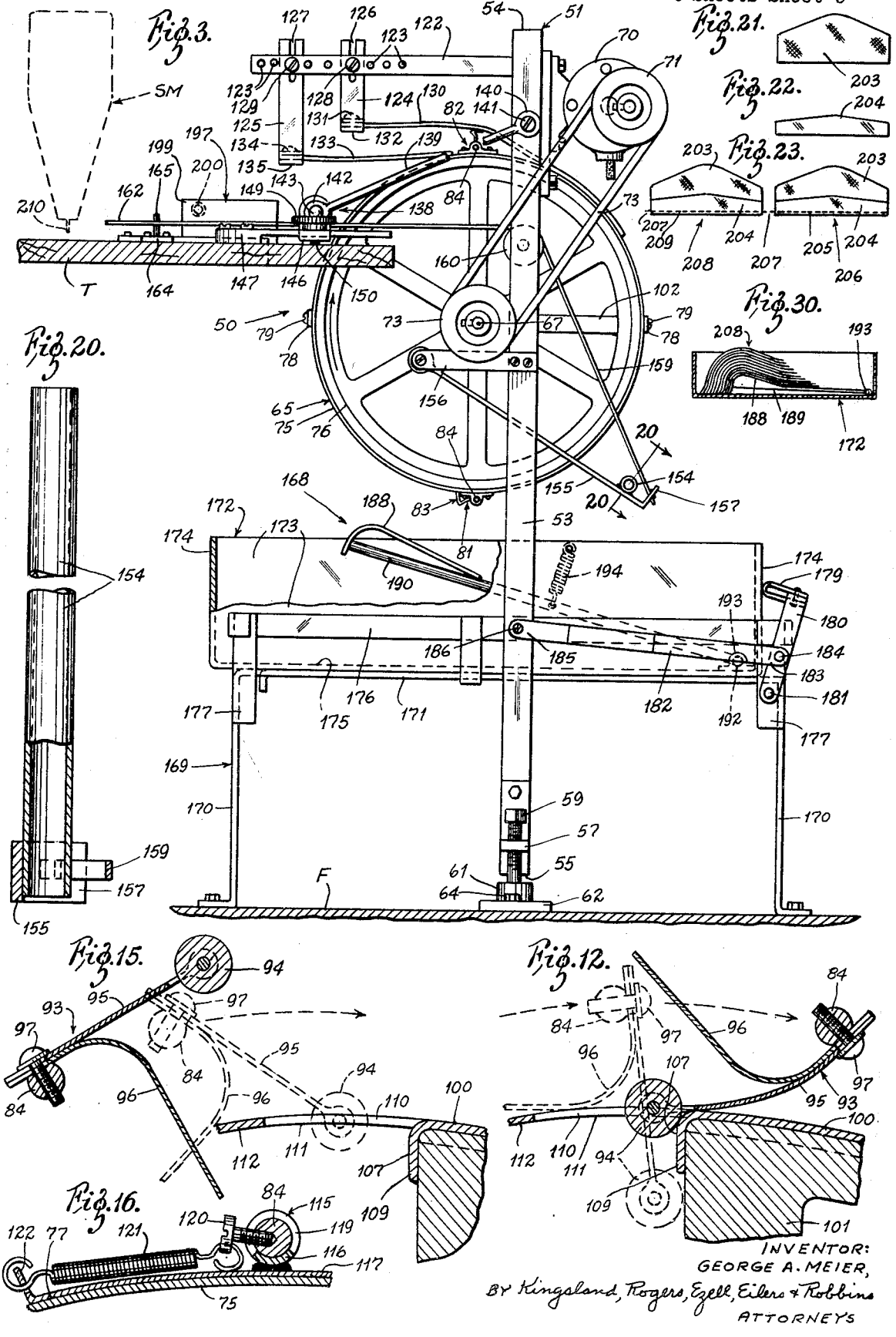


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STACKING DEVICE

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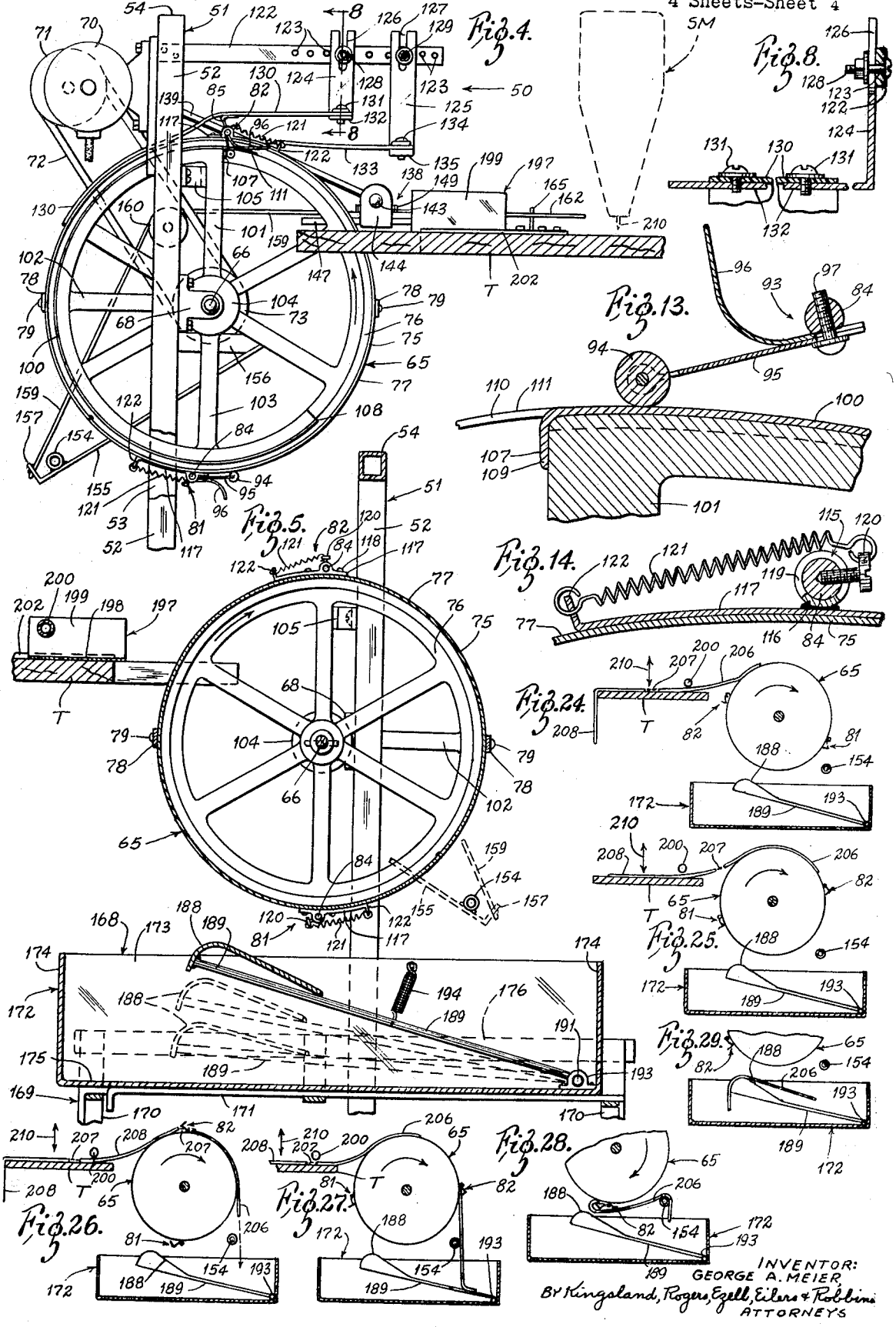


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STACKING DEVICE

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3,509,839

STACKING DEVICE

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Int. Cl. D05b 23/00
U.S. Cl. 112—121.29 12 Claims

ABSTRACT OF THE DISCLOSURE

A device for automatically cutting the connecting threads and stacking sewn articles as they are produced by a sewing machine, without regard to synchronization of the operation of the stacking device with the sewing operation. The device is adjustable for different sizes of sewn articles, with automatic coupling to adjust the position of a collection basket. Articles are stacked in the same orientation as produced by the sewing operation.

Brief description of the invention

A drum is rotatable adjacent the edge of a sewing machine table. Articles which are sewn are joined by connecting threads, and the sewn articles are directed to the surface of the rotating drum. The surface of the drum is roughened so that articles can rotate with the drum. The drum rotates at a rate that moves its surface at a speed greater than the speed of movement of the articles being moved toward the drum.

A cut and clamp mechanism comprises a set of gripper teeth, and a cutting blade. The teeth and blade are carried by the drum and are operated by a control mechanism to swing through a cutting and clamping arc to first cut the connecting threads and immediately thereafter clamp the separated material units to the drum. There may be a plurality of such cut and clamp mechanisms carried by the drum. The cut and clamp mechanism holds the unit against the drum and draws it past a rod which inverts the unit. Thereafter, the control mechanism causes the cut and clamp mechanism to release the unit for deposit into a collection basket.

Brief description of the drawings

FIG. 1 is a top plan view of the stacking device shown installed to operate with a table top or board used with a sewing machine.

FIG. 2 is a front elevation view of the stacking device.

FIG. 3 is a side elevation view of the stacking device as viewed from the right side of FIG. 2.

FIG. 4 is a fragmentary side elevation view of the stacking device a viewed from the left side of FIG. 2.

FIG. 5 is a view in section taken along the line **5—5** of FIG. 1.

FIG. 6 is an enlarged fragmentary view in section taken along the line **6—6** of FIG. 1.

FIG. 7 is an enlarged fragmentary view in section taken along the line **7—7** of FIG. 1.

FIG. 8 is an enlarged fragmentary view in section taken along the line **8—8** of FIG. 4.

FIG. 9 is an enlarged fragmentary view of the left central portion of FIG. 1.

FIG. 10 is a fragmentary view in section taken along the line **10—10** of FIG. 9.

FIG. 11 is a fragmentary view in section taken along the line **11—11** of FIG. 9.

FIG. 12 is a side elevation view similar to that of FIG. 10, but showing the mechanism control in a farther advanced condition.

FIG. 13 is a side elevation view similar to that of FIG. 12, but showing the mechanism control in a farther advanced condition.

FIG. 14 is a fragmentary view in section similar to that of FIG. 11, but showing the components in farther advanced positions corresponding to the positions of the mechanism control as shown in FIG. 13.

FIG. 15 is a view in section similar to that of FIG. 10, but showing the mechanism control in position prior to the position reached as shown in FIG. 10, with dotted lines showing a farther advanced position.

FIG. 16 is a view in section similar to that of FIG. 11, but showing the positions of the components corresponding to the position of the mechanism control as shown in FIG. 15.

FIG. 17 is an enlarged fragmentary front elevation view of the pulley mounting over which the control rod adjusting band is trained.

FIG. 18 is an enlarged fragmentary top plan view of the cut and clamp mechanism and mounting thereof.

FIG. 19 is a fragmentary view in section taken along the line **19—19** of FIG. 18, with different positions shown in broken lines.

FIG. 20 is an enlarged fragmentary view in section taken along the line **20—20** of FIG. 3.

FIG. 21 is a plan view of a lower piece of material to which another piece is to be sewed.

FIG. 22 is a plan view of the upper piece of material to be sewed to the piece of material shown in FIG. 21.

FIG. 23 is a plan view of two stitched material units as they proceed from the sewing machine to the drum.

FIG. 24 is a diagrammatic illustration showing the right-hand unit of FIG. 23 advancing to the drum.

FIG. 25 is a diagrammatic view similar to that of FIG. 24, but showing a farther advanced position of the right-hand unit of FIG. 23 during stitching of the left-hand unit.

FIG. 26 is a diagrammatic view similar to that of FIGS. 24 and 25, and showing the cut and clamp mechanism in cutting position.

FIG. 27 is a diagrammatic view showing the cut and clamp mechanism in clamping position.

FIG. 28 is a fragmentary diagrammatic view showing the material unit being drawn over the control rod.

FIG. 29 is a fragmentary diagrammatic view showing release of the material unit.

FIG. 30 is a diagrammatic view of the collection basket showing a large number of stitched units stacked in place.

Detailed description of the invention

The stacking device **50** includes various parts that are mounted on a frame **51**. The frame **51** may be in any suitable form, such as the channel stock illustrated, formed to a rectangle having sides **52** and **53**, and top and bottom **54** and **55**.

A pair of angle members **56** and **57** are bolted to the lower ends of the side frame members **52** and **53**. Adjusting bolts **58** and **59** are threaded through the angle members **56** and **57**, respectively, with the nose ends **60** of the bolts **58** and **59** resting in pivot wells **61** which are formed in a bar **62** that is bolted as at **64** to the floor F. This mounting permits the frame **51** to swing in an arc normal to the line of the bolts **58** and **59**. The frame **51** can be leveled by adjusting the bolts **58** and **59**.

A drum **65** is mounted between the sides **52** and **53** of the frame **51**. The drum is mounted on shafts **66** and **67** that are journaled in bearings **68** and **69** bolted to the sides of the frame members **52** and **53** (see FIG. 4). The drum is rotated by a motor **70**, having a pulley **71** connected to its output shaft with a belt **72** wound about

the pulley **71**, and about another pulley **73**. The pulley **73** is connected to the shaft **67** on which the drum **65** is mounted. The drum **65** rotates in close proximity to a sewing machine table T on which a sewing machine SM operates. The drum **65** rotates in a clockwise direction as viewed in FIG. 3, with its upper surface moving away from the sewing machine table T.

The drum **65** comprises a cylinder **75** supported on spoked wheels **76** that are attached to the shafts **66** and **67**. The outer surface **77** of the cylinder **75** is roughened or coarse so that it will frictionally engage fabrics. There are spaced bars **78** fastened by screws **79** to the cylinder **75**.

Two cut and clamp mechanisms **81** and **82** are carried at diametrically opposite positions by the drum **65**. Since the mechanisms are identical, only one need be described in detail. The cut and clamp mechanism **82** includes a cut and clamp assembly **83** mounted on a rod **84**. (See FIGS. 18 and 19.) A bracket member **85** is strapped to the rod **84**, and bent to the angle shown in FIG. 19. A clamp **86** and a knife blade **87** are fastened by bolts **88** to the bracket **85**. The clamp **86** has an aligned row of rounded gripper teeth **89** spaced from one another. The knife blade **87** has a cutting edge **90** that extends across and is exposed by the spaces between the teeth **89**. However, the gripper teeth **89** project beyond the cutting edge **90** of the knife blade as clearly shown in FIGS. 18 and 19 which also show a pair of spaced thin plastic pads **91** affixed to the surface **77** of the drum to protect the cut and clamp mechanism against damage.

The cut and clamp assembly **83** is operated by a control mechanism **93** (see FIGS. 10–16). The control mechanism **93** includes a roller **94** which is rotatably mounted on a plate **95**. The plate **95** and a curved guide plate **96** are connected to the rod **84** by a bolt **97**. The control mechanism **93** also includes a track **100** that is mounted by spokes **101**, **102** and **103** to a hub **104**. The hub **104** is loosely mounted on the shaft **66** so that the shaft can rotate within the hub **104**. The track **100** is prevented from rotating by a bracket **105** that is bolted or welded between the spoke **101** and the frame **51**, as shown in FIGS. 2 and 4.

As shown in FIG. 4, the track **100** extends through an arc of approximately 225 degrees between a leading edge **107**, and a trailing edge **108**. As shown in FIGS. 9 and 10, the leading edge **107** of the track is formed by turning a flap **109** down from within a rectangular opening **110** that is in a short extension **111** of the track **100**. The end **112** of the extension **111** constitutes a bridge and initiator for the control mechanism, as will be described hereinafter.

As shown in FIGS. 9 and 11, the rod **84** extends through a spring guide **115** that comprises a tube **116** welded to a plate **117** that is fastened by bolts **118** to the drum cylinder **75**. There is a slot **119** in the tube **116**, and a bolt **120** that is threaded into the rod **84** is guided within the slot **119**. A tension spring **121** is connected at one end to the bolt **120**, and at the other end to a tab **132** turned upwardly from the plate **117**. The spring **121** biases the rod **84** in a counterclockwise direction as viewed in FIG. 16, which biases the cut and clamp mechanism **83** in a counterclockwise direction toward the left dotted position illustrated in FIG. 19.

A horizontal bar **122** extends over the drum **65** from the upper end of the side frame member **53**. The bar **122** is welded or bolted to the frame member **53**, and it has a plurality of holes **123** spaced along its length. A pair of angle members **124** and **125** have vertical slots **126** and **127** so that the angle members **124** and **125** can be adjustably mounted to selected ones of the holes **123** by bolts **128** and **129**. A flexible plastic flap **130** is fastened by bolts **131** to the horizontal section **132** of the angle member **124**. The flap **130** overlies the drum **65**. Another flexible flap **133** is fastened by a pair of bolts **134** to the horizontal section **135** of the angle member **125**. The flap **133** lies under the flap **130** and overlies the drum **65**. These flaps assure proper feeding of fabrics being handled by the mechanism.

The frame **51** is pivotal about the bolt supports **58** and **59** to an adjusted position. The adjusted position is determined by a locator mechanism **138** that comprises a tie rod **139**, having an end **140** pivotally mounted by a bolt **141** to the side member **53** of the frame **51**. The other end **142** of the tie rod **139** is pivotally mounted by a rivet **143** to a bracket **144**. (See FIG. 6.) The bracket **144** has a horizontal section **146** that is slidably positioned beneath a locking strip **147** that is mounted to the sewing machine table T. The locking strip **147** has a slot **148** in it. A locking knob **149** has an end **150** threaded into the horizontal section **146** of the bracket **144**, with a larger diametered shoulder **151** overlying the plate **147** beyond the edges of the slot **148**.

A rod **154** is welded to an arm **155** that is pivotally mounted on a bracket **156** (see FIG. 3). The bracket **156** is bolted to the side member **53** of the frame **51**. The rod **154** extends parallel to the axis and spaced from the surface of the rotating drum **65**. The arm **155** has an upturned flange **157** to which the end of a strap **159** is welded or otherwise connected. The strap **159** is of flexible metal. It is guided about a pulley **160** which is mounted to the side member **53** of the frame **51** by a bracket **161** (see FIG. 17) and has a widened section **162** extending over the table T. As shown in FIG. 1, there are a plurality of holes **163** in the section **162** of the band **159**. A bracket **164** is mounted to the table T. The bracket has an upstanding pin **165** by which the strap section **162** is selectively located. By changing which one of the holes **163** the pin **165** projects through, the rotative position of the arm **155** can be varied. This varies the position of the rod **154**.

There is a basket assembly **168** for collecting materials deposited from the drum **65**. The basket assembly **168** comprises a stand **169** having legs **170** that are preferably bolted to the floor F and having horizontal plates **171**, or other supporting strips for supporting a collection basket **172**. The collection basket **172** has sides **173** and ends **174**, and its bottom **175** is slidable on the plates **171**. There are side rails **176** fastened by suitable brackets **177** to the frame **169** to act as lateral guides for the basket **172**.

A stop **179** bears against an end **174** of the basket **172** to position the basket **172**. The stop **179** is mounted on an arm **180** that in turn is pivotally mounted on a bolt or rivet **181** affixed to the frame **169**. An arm **182** has an end **183** pivotally mounted by a bolt **184** to a central portion of the arm **180**. The other end **185** of the arm **182** is pivotally mounted by a bolt **186** to the side member **53** of the frame **51**. Thus, as the frame **51** pivots, the arm **182** moves, thereby moving the arm **180** and adjusting the position of the stop **179**.

A curved collector plate **188** is mounted on a pair of of rods **189** and **190**. The rods **189** and **190** have bent ends **191** and **192** that are journaled in brackets **193** mounted on the bottom **175** of the basket **172**. A pair of springs **194** bias the rods **189** and **190**, and therefore the collector plate **188** toward an upward position as illustrated in FIG. 3. This movement of the collector plate **188** keeps the top of the stack of finished units at approximately uniform distances from the drum surface. Also, in its lowermost position, the collector plate **188** may actuate an alarm (not shown) to indicate the basket **172** is full.

Finally, a channel **197** may be provided for resting upon the sewing machine table T. The channel **197** has a bottom wall **198** and side walls **199**. A bar **200** extends between the side walls **199** and is spaced above the bottom wall **198**. The channel is disposed between a pair of guide plates **202**, and can be moved by the sewing machine operator, its purpose being to guide the sewn materials between its side walls **199** and below the bar **200**.

Operation

An operator operates the sewing machine SM in the conventional manner to sew pieces of material together. The kinds and shapes of materials that are to be sewn and stacked by the stacking device **50** can be greatly varied and are not themselves part of this invention. However, FIGS. 21 through 23 illustrate an example of materials that are sewn and stacked. In this example, two pieces of material **203** and **204** are sewn together along stitched line **205** to form a sewn unit **206**. Upon completion of sewing the seams **205**, there are thread connections **207** to another sewn unit **208** that also comprise the two sheets of material **203** and **204** sewn together along a sewing line **209**. To stack the sewing units **206** and **208**, and numbers of similar units, the connecting threads **207** between adjacent units must be cut and the units must thereafter be stacked. Hence, the sewing machine operator sews the units **206** and **208** and succeeding ones in series and feeds them across the channel **197** between its sides **199** and beneath the rod **200**.

As the drum **65** is rotated by operation of the motor **70**, its upper surface is always moved in a direction away from the table T. The drum **65** rotates at a greater surface speed than the speed of feeding the sewn units **206** and **208**. Therefore, there are many revolutions of the drum **65** during which no sewn unit **206** or **208** is in position for a cutting and clamping operation. In these cases, the cut and clamp mechanism simply moves past the flexible flaps **133** and **130**, raising them, and also past any portion of sewn units **206** and **208**.

As the cut and clamp mechanism, such as the mechanism **82**, is carried by the drum **65**, the mechanism **83** is sequentially moved from the left dotted position of FIG. 19 through the solid position to the right dotted position. However, if there is no thread **207** exposed to the spaces between the grippers **89**, the knife edge **90** is ineffective to do any cutting because the grippers **89** push the cloth pieces up and out of the way. Such a condition is shown in a sequence illustrated in FIGS. 24 and 25 where sewing by the sewing machine needle **210** is taking place on threads **207** between the material units **206** and **208**, and the unit **206**, which has just been sewn, is only initially fed to the drum **65**. In this condition, the cut and clamp assembly **82** will pass beneath the material unit **206**, and as the assembly rotates, the grippers **89** will simply push the unit **206** up and out of the way so that, as the material is fed farther onto the drum **65** and is carried around with the drum as permitted by the rate of sewing of the next unit **208**, the unit **206** is not held by the cut and clamp assembly **82**.

As the sewing continues, permitting the material unit **206** to be drawn farther around the drum **65** to the position illustrated in FIG. 26, the thread connection **207** between the units of **206** and **208** reaches the point at which it is in the path of swinging movement of the cut and clamp mechanism **82**. Therefore, as the cut and clamp mechanism **82** rotates under the influence of the control mechanism **93**, the thread connection **207** is deflected by the gripper teeth **89** into one of the spaces between adjacent gripper teeth and is cut by the knife edge **90** of the cutting blade **87**. Since the surface of the cylinder **75** is roughened, and since this cutting action takes place while most of the material unit **206** is positioned on an upper portion of the surface of the drum **65**, the material unit **206** does not fall from the drum **65**. Furthermore, since the cut and clamp mechanism **83** continues to rotate to the right dotted position of FIG. 19, the material unit **206** is immediately clamped by the gripper teeth **89** engaging the trailing edge of the material unit **206**.

With the gripper teeth **89** now engaging and holding the material unit **206**, the drum **65** continues to rotate, and the material unit **206** begins to fall by gravity past the control rod **154**, and into the basket **172**, as illustrated in FIGS. 26 and 27. However, at this point, the gripper teeth do not release the material unit **206**, and the material unit is drawn over the control rod **154** as illustrated in FIG. 28. This orients the material unit **206** in the same manner as its orientation when sewed by the sewing machine SM. Finally, the gripper teeth of the cut and clamp mechanism release the material unit **206**, and it is deposited on the collector plate **188**, as illustrated in FIG. 29. The drum **65** continues to rotate until another material unit **208** reaches the position for being cut from the following material unit, and for being handled by the stacking device as before described.

Cutting of the thread connection between adjacent material units and thereafter clamping the separated material unit is done by rotation of the cut and clamp assembly **83** through the positions illustrated in FIG. 19 from left to right. This rotation occurs when the shaft **84** rotates, the shaft **84** being common to the control mechanism **93** of FIGS. 10 through 16.

The cut and clamp mechanism is biased to the left dotted position of FIG. 19 by the spring **121** which tends to rotate the shaft **84** to the position illustrated in FIG. 16. This rotation under the biasing of the spring **121** is possible so long as the roller **94** and initiator plate **96** have not reached the extension **111** of the cylinder **100**, as illustrated in the full line position of FIG. 15. However, as one of the cut and clamp mechanisms **81** or **82** reaches a position near the uppermost arc of travel corresponding to the position of the cut and clamp mechanism **82** illustrated in FIG. 5, the guide plate **96** reaches the initiator plate **111** and starts pivoting of the control mechanism **93**, as indicated by the dotted line position of FIG. 15. As this initial rotation starts to take place, the shaft **84** begins rotation as the opening **110** permits the roller **94** to swing downwardly into a position opposite the leading edge **107** of the track **100**. (See the dotted line position illustrated in FIG. 12.) Further rotation of the drum **65** draws the roller **94** upwardly to further rotate the control mechanism **93** to the solid position illustrated in FIG. 12 against the force of the biasing spring **121** until the roller **94** finally rides on the surface **100** of the track as illustrated in FIG. 13. This rotates the shaft **84** to the opposite condition as illustrated in FIG. 14, rotating the cut and clamp mechanism **83** to the right dotted position illustrated in FIG. 19.

FIG. 30 illustrates how a stack of a large number of material units are positioned on the collector plate **188**, and how as this stack builds up, the springs **194** stretch and permit the collector plate **188** to descend. Each of the material units forming the stack of FIG. 30 has been oriented by the control rod **154** corresponding to the orientation of the material unit as it is sewn.

This stacking device **50** can be adjusted for different sizes of material units being sewed and stacked. For these adjustments, the drum **65** can be moved by swinging the frame **51** about its bolt supports **60**. Moving the frame is done by loosening the locking knob **149** so that the bracket **144** can slide relative to the lock strip **147**. When the desired position of the drum **65** has been reached, the knob **149** is again tightened. At the same time, or separately, the frame **51** can be aligned by adjusting one or both of the bolts **58** and **59** on which the frame **59** is mounted. Also, whenever the drum **65** is adjusted in position, or sometimes for independent reasons, the rod **154** may be adjusted. This is done by changing the selection of a hole **163** in the strap **162** into which the pin **165** projects. Each time the strap **162** is adjusted, the rod **155** is pivoted, and this changes the position of the control rod **154**.

Each time the frame is pivoted, thereby pivoting the position of the drum **65**, it is desirable that the basket **172** be moved so that its position will be proper with respect to the drum **65**. This is done automatically by the connections to the stop **179**. As the frame **151** pivots, the arm **182** is moved and rotates the arm **180**. This adjusts the position of the stop **172** against which the basket **172** is positioned.

Also, the flexible flaps **130** and **133** which hold the material units against the drum **65** can be adjusted and positioned. They can be adjusted in elevation by sliding as permitted by the slots **126** and **127**. They can be adjusted horizontally by changing which ones of the holes **123** they are connected to.

Various changes and modifications may be made within this invention as will be readily apparent to those skilled in the art. Such changes and modifications are within the scope and teaching of this invention as defined by the claims appended hereto.

What is claimed is:

1. A stacking device comprising a drum, a frame for rotatably supporting the drum on a horizontal axis, means to rotate the drum, a cut and clamp mechanism carried by the drum, means on the cut and clamp mechanism for cutting threads connected between sewn material units, means on the cut and clamp mechanism for clamping a material unit against the surface of the drum subsequent to cutting the the thread connecting that unit to an adjacent unit, means to operate the cut and clamp mechanism as aforesaid controlled by the rotated position of the drum, and means controlled by the rotated position of the drum to cause the cut and clamp mechanism to release the material unit.

2. The stacking device of claim **1** including means to invert the material unit prior to its release by the cut and clamp mechanism.

3. The stacking device of claim **2** wherein the last named means comprises a rod supported in spaced position relative to the drum, and extending in a direction parallel to the axis of rotation of the drum.

4. The stacking device of claim **1** including means to adjust the pivotal position of the frame to adjust the position of the drum relative to a sewing machine table.

5. The stacking device of claim **4** including a basket for receiving the released material unit, a frame for supporting the basket, and means to adjust the position of the basket automatically with the adjustment of the position of the drum.

6. The stacking device of claim **5**, including a stop for the basket, the adjusting means comprising an articulated connection between the frame and the stop for the basket.

7. The stacking device of claim **1** wherein the means to operate the cut and clamp mechanism comprises a stationary track adjacent the drum, a roller assembly, a shaft, the cut and clamp mechanism, and roller assembly being mounted on the shaft, the roller being in the path of the track, the track having leading and trailing ends to control the rotational position of the shaft by controlling the position of the roller.

8. The stacking device of claim **1** wherein the cut and clamp mechanism comprises a plurality of spaced, aligned gripper teeth, a knife blade extending into the spaces between the gripper teeth but short of the ends of the gripper teeth, and means connecting the gripper teeth and knife blade to the operating means.

9. The stacking device of claim **1** wherein the surface of the drum is roughened.

10. The stacking device of claim **1** wherein the rotational speed of the drum is unsynchronized with the rate of feeding material units to the drum.

11. The stacking device of claim **1** including flexible flap means overlying the drum for smoothing wrinkles in the material units fed to the drum and for controlling the position of cloth during the cut and clamp operation.

12. The stacking device of claim **11** including means to adjust the positions of the flexible flap means relative to the drum.

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