United States Patent [19]

Lazickas

[11] **3,791,246**

[45] **Feb. 12, 1974**

[54] **MACHINE FOR CUTTING-SHEET-LIKE MATERIAL SUCH AS FABRIC**

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[22] Filed: **Feb. 26, 1973**

[21] Appl. No.: **335,579**

[52] **U.S. Cl.** ..... **83/375,** 83/455, 83/477.2, 83/489, 83/491, 83/495, 83/925 CC

[51] **Int. Cl.** **B26d 1/22**

[58] **Field of Search** .. 83/375, 455, 477.2, 489, 491, 83/495, 925 CC

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Primary Examiner—Frank T. Yost

[57] **ABSTRACT**

A carriage is mounted for manual movement along a slotted track and supports the peripheral cutting edge of a rotary knife within the slot. A roller is mounted on the carriage for rotation about an axis parallel to that of the rotary knife to hold a portion of material to be cut against the track and has a peripheral groove arranged to receive a portion of the rotating cutting edge of the knife. A nip is defined at the point where the cutting edge enters the roller groove to abradingly cut material arranged in its path movement. A cantilevered throat plate is preferably mounted on the carriage and has split trails at its free end to receive the cutting edge therebetween and to smooth such held material proximate the nip. The configuration of the split trails tends to insure the rotative independence of the roller and the knife.

12 Claims, 13 Drawing Figures

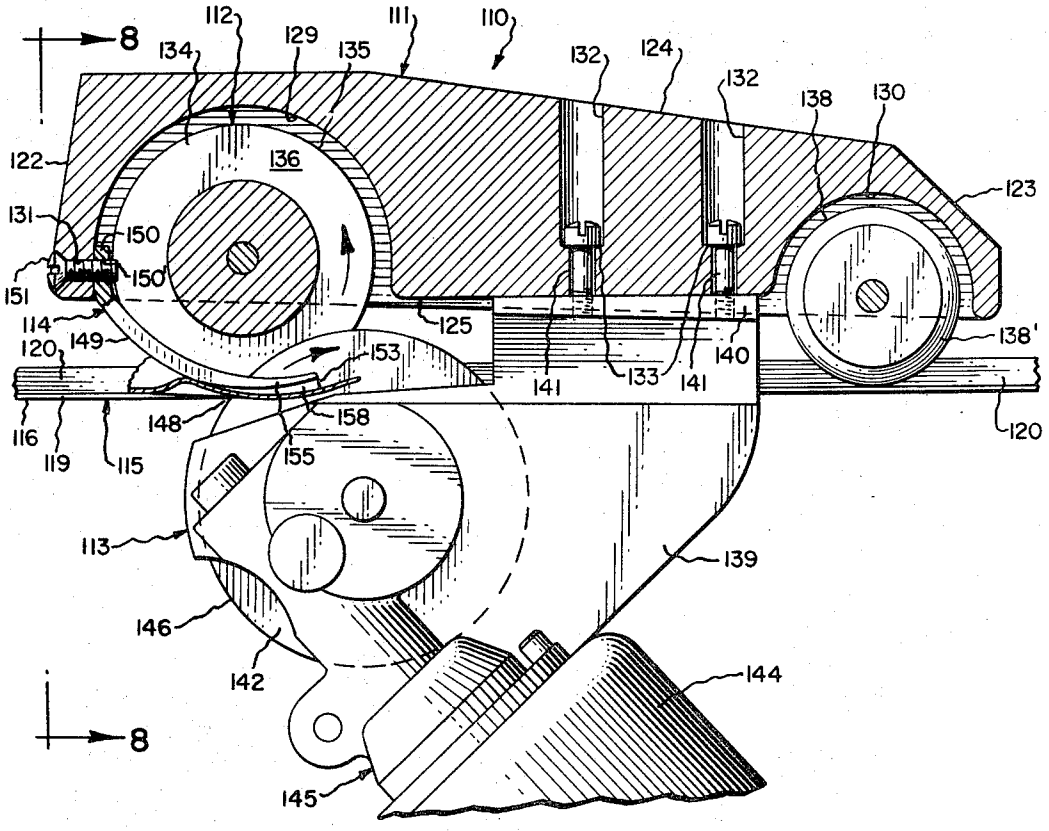


Fig. 1.

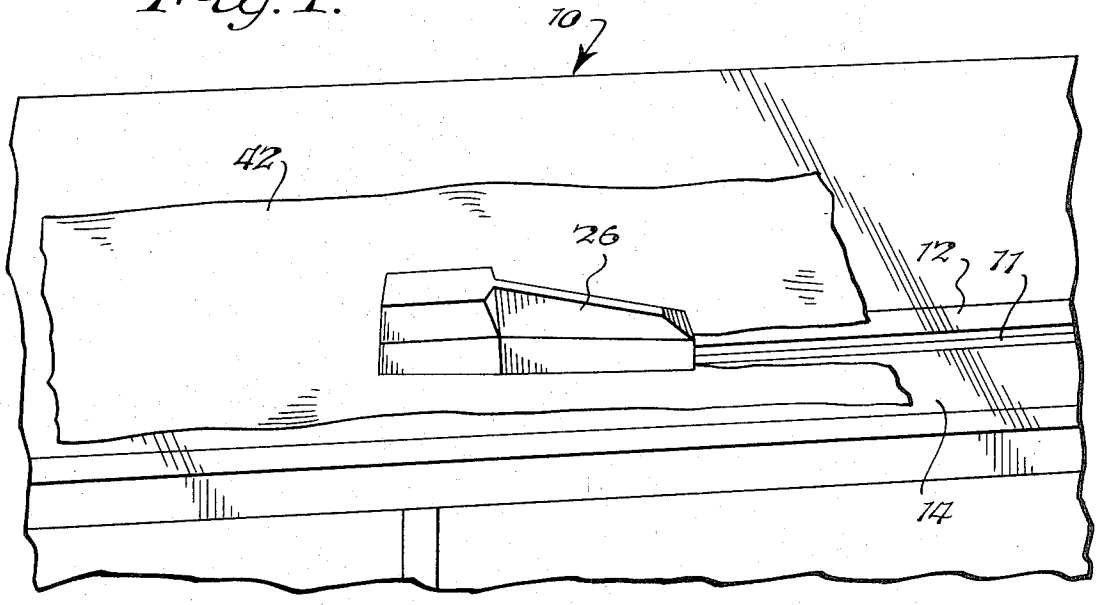
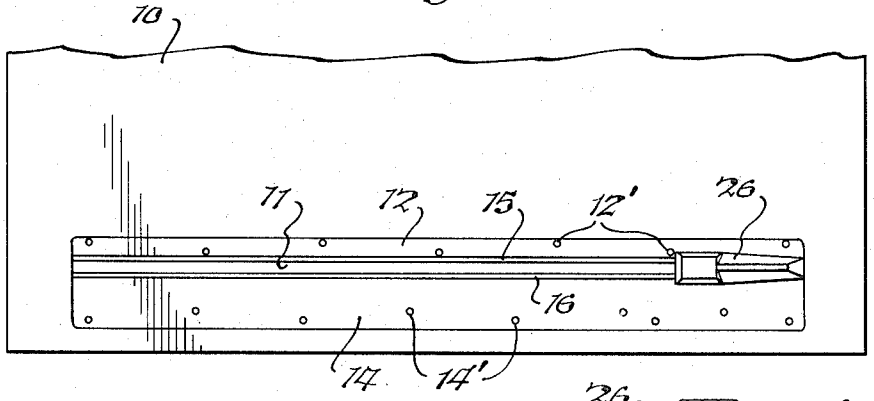


Fig. 2.



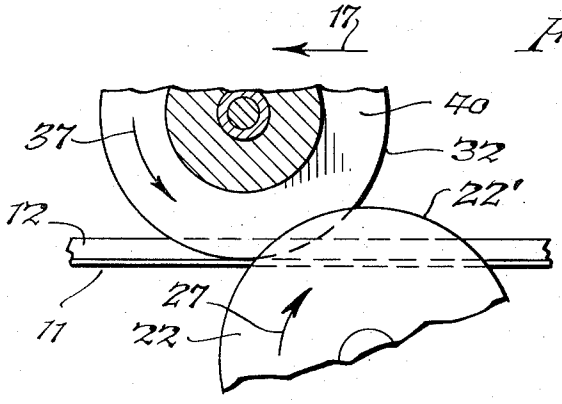
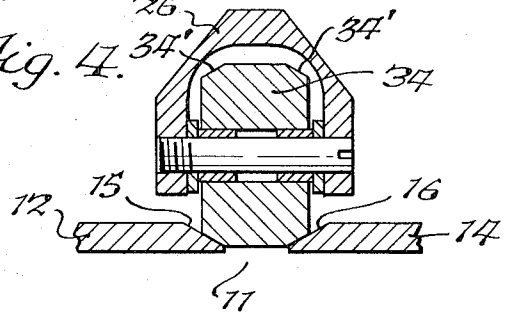


Fig. 3.

Fig. 4.



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Fig. 5.

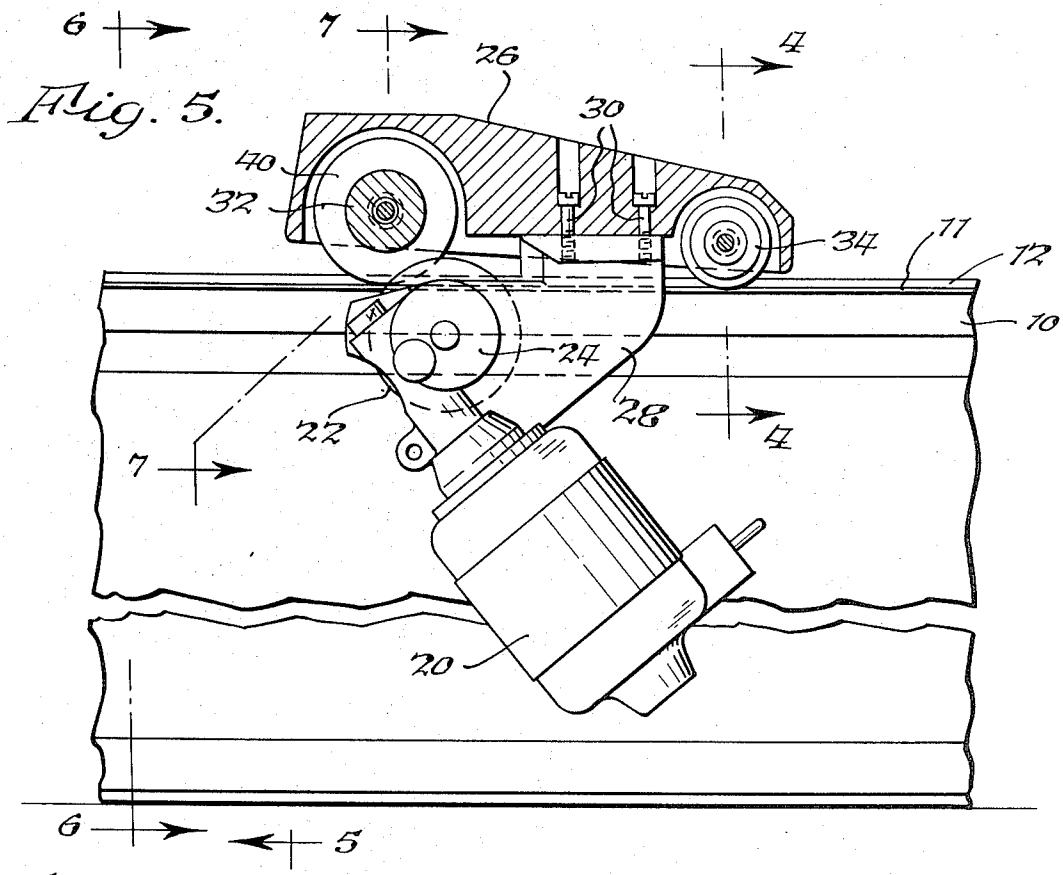
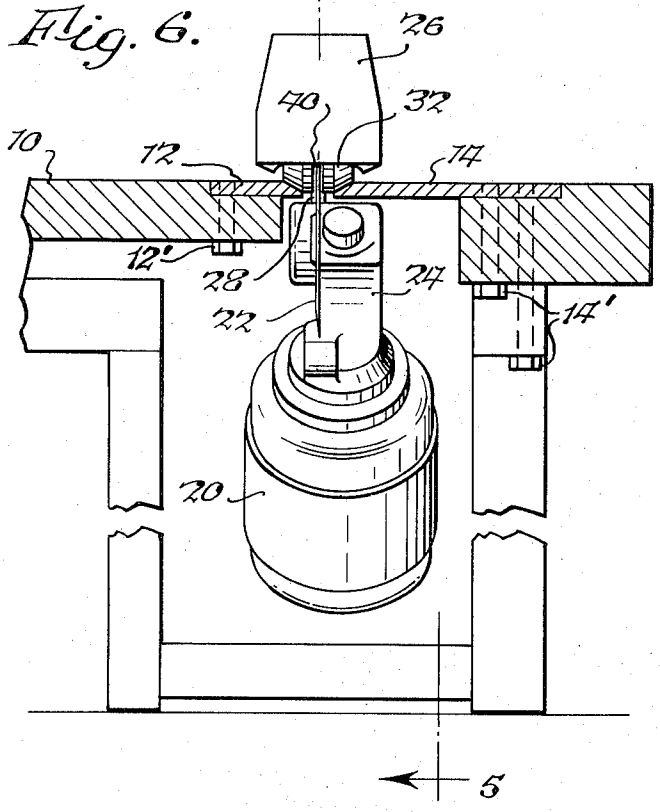


Fig. 6.



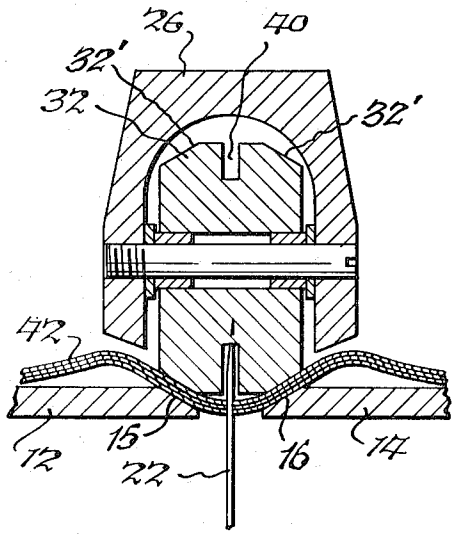


Fig. 7.

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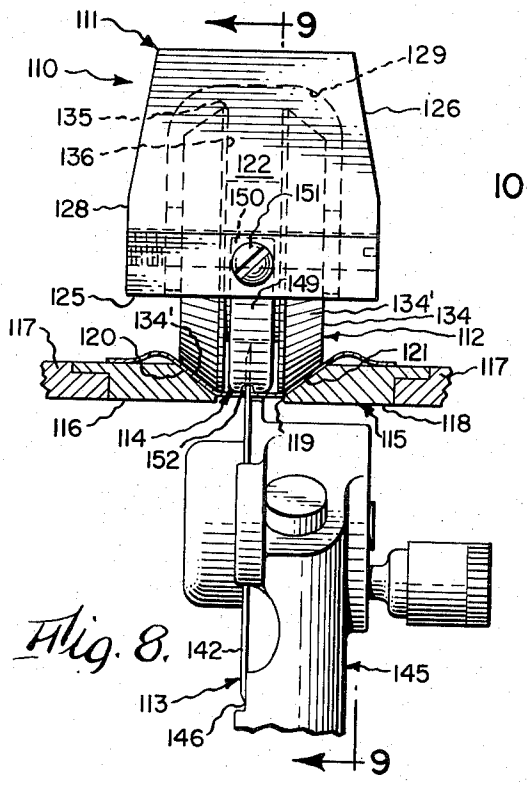


Fig. 8.

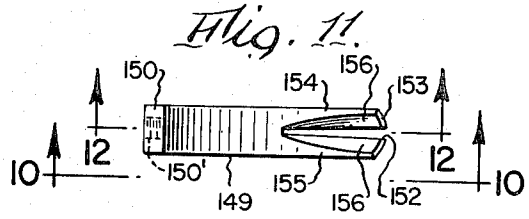


Fig. 11.

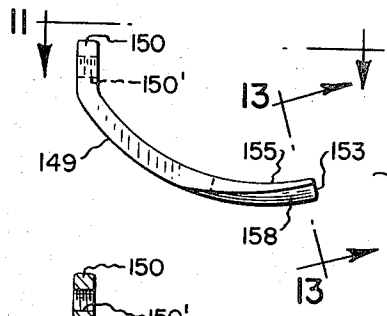


Fig. 10.

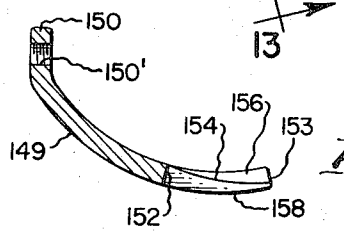


Fig. 12.

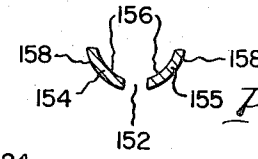


Fig. 13.

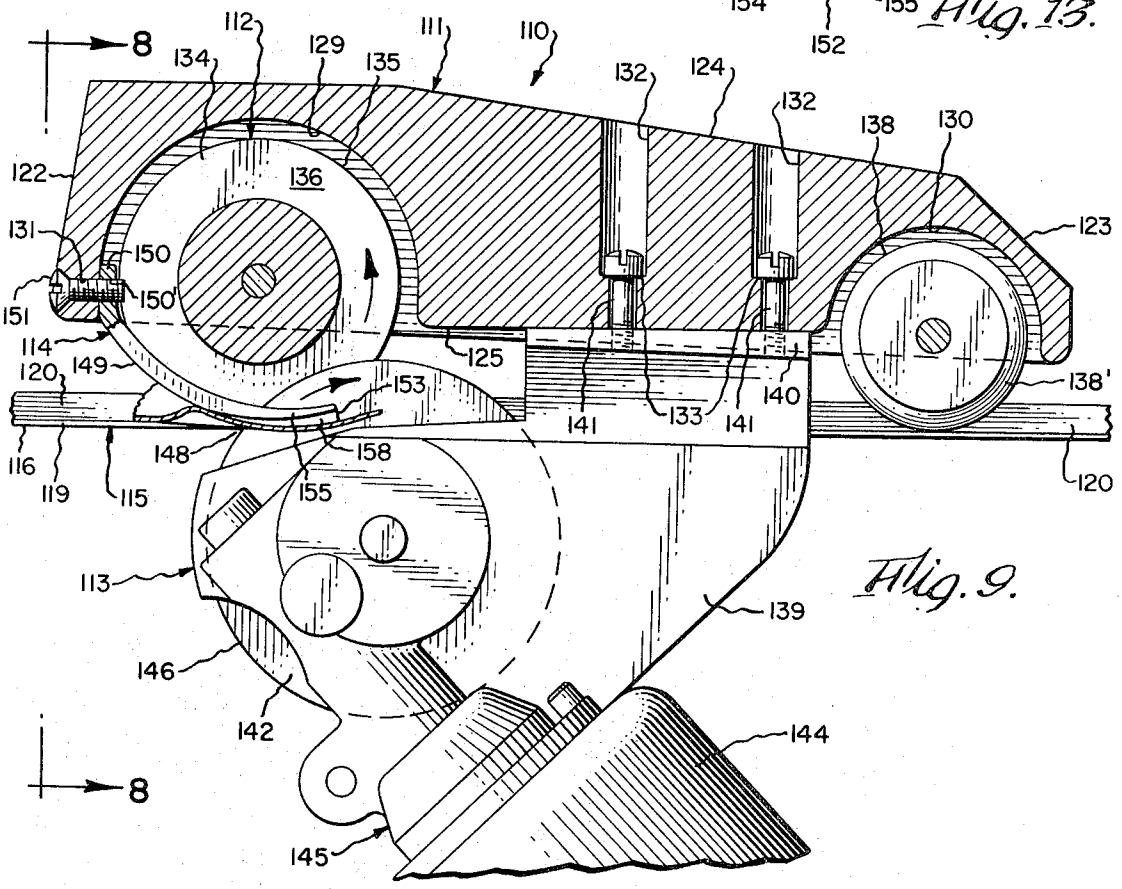


Fig. 9.

MACHINE FOR CUTTING-SHEET-LIKE MATERIAL SUCH AS FABRIC

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of application Ser. No. 100,026 filed Dec. 21, 1970, now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to apparatus for cutting sheet-like material, such as fabric.

2. Description of the Prior Art

Heretofore, machines for cutting sheet-like material, such as fabric, have contemplated relative movement between the material to be cut and a knife. Some have mounted the knife on a shuttle carriage to be moved relative to the stationary material, as typified by the device disclosed in Pugh U.S. Pat. No. 2,503,353. Other devices like the one shown in Evans U.S. Pat. No. 1,406,947 have delivered the fabric to the cutting edge of a rotary knife but in a way involving a drive connection between the cloth feed means and the knife resulting in a variable feed rate.

Another type of prior art cloth cutter was of the type employing a rotating round knife having a cutting edge which entered a slot in a stationary throat plate. When the material to be cut was fed to the nip formed by the portion of said cutting edge entering said slot such material had to be slid over the throat plate so that there was relative movement between the material and throat plate in the direction in which said slot extended. This relative movement between material and throat plate caused friction which frequently resulted in the material bunching or hanging up in advance of the knife, producing inferior cutting of the material and delay.

Folds or creases in the material to be cut have resulted in jagged or interrupted cuts. In most applications, it is desirable that the cut be smooth and continuous. Regardless of the manner employed to effect relative movement between the knife and the material to be cut, no known machine of the prior art has been provided to clamp the material proximate the place of cutting or additionally if desired to smooth the material preparatory to cutting to prevent these folds or creases from causing such jagged cuts and to prevent the build up of lint which can produce an undesirable effect.

SUMMARY OF THE INVENTION

The present invention relates to an improved machine which eliminates the aforementioned disadvantages of prior art cloth cutters.

An important object of the present invention is to improve that type of cloth cutter which includes a power driven rotatable round knife having a cutting edge, by providing a rolling throat plate over which the material to be cut passes without movement relative thereto, and by eliminating any drive connection between the knife and rolling throat plate thereby providing frictionless contact between such material and rolling throat plate so as to enhance the effectiveness and speed of cutting by such rotating knife.

Another important object of the present invention is to prevent the build up of lint at the cutting edge of the rotary knife which can act to gear the roller to the much more rapidly rotating knife and thereby undesirably power feed the material into the nip with consequent jamming of the material or leaving some strands of the fabric still uncut.

A further object of the present invention is to smooth the material in its presentation to the cutting edge of the knife.

In accordance with the present invention a machine is provided for cutting sheet-like material, such as fabric, along a slotted track, including a carriage mounted for movement along the track. Knife means, such as a power driven round disc knife, are mounted on the carriage to have a rotary cutting edge disposed within the track slot to abradingly cut material arranged in its path of movement. A roller having a circumferential groove is rotatably mounted on the carriage to hold or clamp a portion of the material to be cut to the track. Smoothing means may be mounted on the carriage for smoothing the held portion of such material adjacent the cutting edge of the knife and be utilized to prevent the build up of lint.

Other objects and advantages of the present invention will be apparent after a reading of the ensuing detailed description considered in conjunction with the accompanying drawings.

While the present invention has particularly advantageous application to the cutting off of sheet-like material such as fabric after having been unwound from a roll, fed along a table top and measured, it is to be understood that the invention is not limited to such application but is intended to have the breadth permitted by the scope of the appended claims.

Two preferred embodiments of the present invention in keeping with the aforementioned application are illustrated in the accompanying drawings, one in FIGS. 1–7, and the second in FIGS. 8–13.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a portion of a cutting machine constructed in accordance with one preferred embodiment of the present invention and showing a lay of sheet-like material such as fabric on a table top being cut.

FIG. 2 is a fragmentary top plan view of the aforementioned table top and showing a slotted track along which a movable part of the cutting machine is guided, the fabric being omitted from this view.

FIG. 3 is an enlarged fragmentary vertical view partly in section and partly in elevation and showing the relative position of a rolling throat member and the cutting edge of a rotating knife without the interposition of fabric therebetween, these elements providing components of the inventive cutting machine.

FIG. 4 is a fragmentary vertical sectional view of the cutting machine taken on line 4—4 of FIG. 5 and transversely of the aforementioned track.

FIG. 5 is a fragmentary vertical view partly in section and partly in elevation of the cutting machine taken longitudinally of said track and generally along line 5—5 of FIG. 6, the fabric again being omitted.

FIG. 6 is a fragmentary vertical view partly in section and partly in elevation of the cutting machine taken transversely of said track and generally along line 6-6 of FIG. 5, the fabric also being omitted.

FIG. 7 is an enlarged fragmentary vertical sectional view of the cutting machine taken transversely of said track and generally along line 7—7 of FIG. 5 and showing how a lay of sheet-like material comprising several

plies of fabric is clamped between the track and rolling throat member while being cut.

FIG. 8 is a front elevational view of another preferred embodiment of the present invention and particularly shows the cooperative configuration of the slotted track and roller, the smoothing means, and the rotary disc knife, a lay of fabric being illustrated in this view.

FIG. 9 is a vertical sectional view thereof taken on line 9—9 of FIG. 8 and illustrates the smoothing means arranged to smooth material interposed at the nip between the roller and the cutting edge, the fabric being cut being also illustrated in this view.

FIG. 10 is an isolated detail side elevational view of the smoothing means depicted in FIG. 9.

FIG. 11 is a top plan view of the smoothing means depicted in FIG. 10 and more clearly shows the unique configuration of the split trails of such means.

FIG. 12 is a vertical sectional view thereof taken on line 12—12 of FIG. 11 and illustrates the particular configuration of one of the trails shown in FIG. 11.

FIG. 13 is a transverse sectional view thereof taken on line 13—13 of FIG. 10 illustrating the cross-sectional shape of the trails.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1–7

The cutting machine is shown as including a table top 10 on which a sheet-like material such as fabric which is being measured passes from the measuring means (not shown). This table top is provided with an elongated slot 11 of uniform width over which the fabric to be cut is positioned. The slot 11 may extend straight across the table top as shown in the drawings, or it may be curved if desired.

The slot 11 is formed by two track plates 12 and 14 which extend across the table in spaced relation to each other, fitting in accommodating recesses provided in the upper surface of the table top and secured thereto in any suitable manner as by fasteners 12' for plate 12, and 14' for plate 14. These two plates 12 and 14 whose adjacent edges form the slot have beveled marginal upper faces 15 and 16, respectively, which incline downwardly toward the slot, collectively to provide a dished track. This taper may be of any suitable type, that shown being arranged approximately at a 30 degree angle to the upper faces of the plates.

So as not to interfere with the measuring of the fabric on the table top, the cutting machine is shown as comprising knife driving means of suitable construction arranged below table top 10. This driving mechanism includes an electric motor 20 which rotatively drives a round disc knife 22 having a circular cutting edge 22' through a gear mechanism of conventional construction housed in a standard or housing 24. Knife 22 is arranged for rotation about a horizontal axis extending transversely of the track and has an upper portion which extends vertically through table top slot 11 and is arranged substantially centrally thereof. The motor 20 and the standard 24 are carried by a carriage 26 arranged above the table top 10, the motor being connected with the carriage 26 by means of a plate-like projection 28 of the housing 24 of reduced thickness which extends through the slot 11 and is rigidly attached at its upper end to the carriage 26 in any suitable manner, for example by means of screws 30. The carriage 26 is mounted to travel on the track plates 15 and 16 which form the sides of the slot 11. For this purpose the carriage is provided with a front wheel or roller 32 and a rear wheel or roller 34, the respective axes of which are substantially parallel to each other and to the axis of knife 22. The peripheries of these wheels 32 and 34 have beveled marginal portions, indicated at 32' and 34' respectively, so as to be contoured in complementary fashion to the opposing track portions 15 and 16. In this manner the carriage 26 is guided in its movement along the track. The body of carriage 26 is shaped so as to be conveniently grasped by the hand of an operator who pushes the carriage along the track to cut the lay of sheet-like material interposed between the track and carriage. The lower part of the machine is of course moved with the carriage 26 through the rigid connection 28.

The two wheels or rollers 32 and 34 are employed to obtain stability for straight line or slightly curved tracks. If the tracks have more decided curves a single wheel con-struction os carriage employing the wheel 32 may be employed. If a single wheel support is employed, the parts of the cutting machine suspended from the carriage are counterbalanced so that the center of gravity of the movable assembly of the cutting machine passes through the wheel axis to obtain a reasonable degree of stability.

The front wheel or roller 32 has a curved peripheral surface provided with a circumferential groove 40 which receives and through which passes a portion of the cutting edge 22' of rotatable knife 22, as shown in FIGS. 3 and 5–7.

The shape of the body of the carriage 26 is such that it functions as a handle by means of which the movable components of the cutting machine including the knife 22 can be moved for cutting the lay of sheet-like material 42 such as several plies of fabric as depicted in FIG. 7. The carriage is so shaped as to provide an easy grip for an operator to grasp the same and push it along the guide track without danger of coming into contact with the knife.

The front wheel or roller 32 of the carriage performs different functions while maintaining a simple configuration. The front wheel as shown in FIG. 7 guides the machine in the guide track because of its peripheral contour, complementing that of the track. It acts as a rolling throat member for holding the material 42 while the cutting assembly is moving along the track. The material 42 is held against not only sliding action longitudinally but also transversely of the track. The rolling action of wheel 32 on material 42 prevents relative sliding movement therebetween in a direction extending substantially parallel to the portion of groove 40 penetrated by knife 22. The combined effect of these holding and rolling actions is to provide faster and more effective cutting of material 42.

In FIG. 3, roller 32 turns about its axis in the direction of arrow 37 when the carriage supporting this roller is moved along the track in the direction of arrow 17 and knife 22 rotates about its axis in the direction of arrow 27. From an examination of FIGS. 3 and 5, it can be visualized that the peripheral surface of roller 32 engages the material 42 to be cut immediately prior to the cutting edge 22' of round knife 22 entering groove 40. This engagement holds the material taut while being cut by the knife.

Such peripheral surface of roller 32 and that portion of cutting edge 22' which is entering groove 40 defines

a nip toward which material 42 to be cut is effectively fed while this material contacts this surface adjacent such nip without movement relative to this surface in a direction extending substantially parallel to that portion of groove 40 penetrated by knife 22.

It will also be seen that the track portions 15 and 16 constitute a means on opposite sides of knife 22 for pressing material 42 against the peripheral surface of grooved roller 32 adjacent the aforementioned nip so as to achieve the lack of relative movement discussed above. Eliminating such relative movement between material 42 and roller 32 prevents wrinkling of the material in advance of the cut, resulting in a cleaner, neater, faster and easier cutting of the material.

The knife 22 is driven to rotate typically at about 1,500 rpm so that it rotates much faster than roller 32 which is caused to rotate by hand movement of carriage 26. Roller 32 has only a rolling contact with the material being cut such as fabric. As a result, the cutting edge 22' of knife 22 attacks the fabric tearing away at the strands or fibers thereof so as to cut them by an abrading action, as opposed to a shearing or scissoring action as would be the case if knife 22 only rolled with respect to the fabric.

In the operation of cutting the material 42 the operator moves the material, which may be of one or more plies, over the table top 10 and over the guide track positioning it for the cut. Power to motor 20 is turned on in a conventional manner and the operator then grips the carriage 26 which is at an end of the slotted track 11, specifically at the right end as shown in FIG. 2, and advances the carriage along the slot over the material. As the front wheel or roller 32 rolls over the material the part thereof to be cut is pressed or clamped against track portions 15 and 16 and held transversely and longitudinally taut while being cut by knife 22. The clearances between the groove 40 and the knife 22 is kept at a minimum so that even the thinest materials receive adequate support as the knife cuts through them. The operator continues to push the carriage 26 along the guide track until the cut is completed whereupon the carriage is returned to its starting point on the track for repetition of the cycle. It will be noted that the weight of the motor and parts arranged below the table top help to hold the carriage 26 down on the table so that very little work is required by the operator to make the cut.

It will be understood that various changes in the details, materials, and arrangements of parts which have been herein described and illustrated in order to explain the nature of the invention may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims. For example, while the track portions 15 and 16 are shown as stationary they could be the peripheries of back-up rollers in certain applications of the invention to provide a rolling track. Also, the contour of the peripheral surfaces 32' of the rolling throat member 32 can be generally concave instead of generally convex as shown. Such contouring of either type might even be eliminated in certain applications of the invention. As well, any sort of suitable structure for supporting the material to be cut may be provided instead of a table top having a substantially horizontal upper surface as shown.

FIGS. 8–13

This embodiment bears many similarities to that disclosed in FIGS. 1–7 but there are sufficient differences as to warrant a completely independent detailed description which ensues.

Referring to FIG. 8, the cutting machine is generally indicated at 110 and is shown as including a carriage 111, roller means 112, knife means 113 and smoothing means 114.

As best illustrated in FIGS. 8 and 9, machine 110 is shown supported by a slotted track 115 having a parallel pair of horizontally spaced track plates 116, 118 defining an elongated slot 119 therebetween. The marginal upper faces 120, 121 of each of these track plates 116, 118 immediately adjacent slot 119 are shown beveled down into the slot to provide a dished track. This taper may be of any suitable type, that shown being arranged approximately at a 30° angle to the upper faces of the plates. The slotted track may be suitably mounted on supporting structure 117, such as a table top.

The carriage 111 is illustrated as generally having vertically rising front and rear surfaces 112, 123, a downwardly and rearwardly tapering top surface 124, a generally horizontal planar bottom surface 125, and vertically rising left and right side surfaces 126, 128. Front and rear roller recesses 129, 130 extend upward into the carriage from the bottom surface 125 thereof. The carriage is also shown provided with a horizontal through hole 131 extending from a lower part of front surface 122 into the forward recess 129, and a pair of vertical through holes 132 provided between the front and rear roller recesses 129,130. As shown, the vertical holes 132 are provided with intermediate shoulders 133.

The roller means 112 includes a front roller 134 suitably journaled within front recess 129 to rotate about a horizontal axis. The front wheel or roller 134 has a curved peripheral surface 135 provided wtih a circumferential groove 136. This groove 136 is relatively wider than the groove 40 in the first embodiment, for a purpose hereinafter explained. Similarly, a rear wheel or roller 138 is suitably journaled within the rear roller recess 130 to rotate about a horizontal axis. The peripheries of these wheels or rollers 134, 138 have spaced means such as beveled marginal portions, indicated at 134' and 138', respectively, so as to be contoured in complementary fashion to the opposing beveled track portions 120, 121. In this manner, the carriage 111 is guided in its movement along the slotted track with the front and rear rollers having rolling contact with the track plates. The two wheels or rollers 134, 138 are employed to obtain stability for straight line or slightly curved tracks. If the tracks have a more decided curve, a single wheel construction of the carriage 111 employing only front wheel 134 may be utilized. The front roller 134 also functions to hold or press a portion of material to the beveled portions of the track plate, as seen in FIG. 8.

A thin vertical bracket member 139 has its upper end 140 secured to the carriage bottom surface 125 by a pair of headed fasteners 141 acting upon shoulder portions 133, and has an intermediate portion passed through slot 119 to support knife means 113 therebelow.

The knife means **113** includes a round disc knife **142** rotatable about a horizontal axis and driven by motor means, such as electrical motor **144**, operatively connected to the knife **142** by intermediate power transmission gearing **145**. As best shown in FIG. **9**, the circumferential cutting edge **146** of knife **142** extends into groove **136** of front roller **134**. The point at which rotary cutting surface **146** enters groove **136** of the front roller defines a nip **148** therebetween.

Thus, carriage **111** is mounted for manual movement along the slotted track. The electric motor **144** causes the disc knife **142** to rotate at a high speed to abradingly cut cloth arranged or interposed at nip **148**. It should also be noted that movement of carriage **111** is completely independent of the operation of the knife means. Preferably, the knife **142** is rotated on the order of **1500** rpm to maintain an abrading cutting action at the nip irrespective of the speed of movement of carriage **111** along the slotted track.

The smoothing means **114** includes a throat plate member **149** affixed to the carriage for movement therewith. As best illustrated in FIGS. **9–13**, the throat plate **149** is a cantilevered member having its fixed end **150** secured to the front surface of recess **129** by a fastener **151** passed through horizontal hole **131** and threadingly engaging a hole **150'** provided through the fixed end. The throat plate **149** extends arcuately downwardly and rearwardly to enter groove **136** in roller **134**. The lower surface of throat plate **149** intersects at or near a lateral extension line of the nip **148**. A longitudinal slot **152** extends inward from the free end or extremity **153** of the throat plate **149** to define left and right trails **154, 155**, respectively. Thus, the lower surface of throat plate **149** is substantially coterminous with the periphery of roller **134** at the edges of groove **136** therein proximate where cutting edge **146** intersects slot **152**.

As best illustrated in FIGS. **10–13**, the rectangular cross section of the throat plate is varied to have transversely concave upper and transversely convex lower surfaces **156, 158** at the free ends of the trails. As shown in FIG. **8** and **9**, a portion of the disc knife **142** passes within slot **152** between trails **154, 155**. Thus, the left and right trails are positioned on opposite sides of knife **142** proximate the nip **148**. In use, the trails function to smooth cloth ahead of and proximate the cutting nip **148**. A portion of the lower surface of the trails may extend below the nip to draw taut the held material before cutting.

The rounded convex lower surface **158** of the trails rides along such held material without cutting or unduly straining the material. The concave upper surface **156** of the trails is so shaped to purge itself of lint accumulated on the throat member. In this manner, the unique configuration of the throat member tends to insure the rotative independence of front roller **134** from knife **142**. Should this rotative independence be lost, roller **134** would be propelled across the cloth, causing loss of manual control over the movement of carriage **111**. The independence of front roller **134** from the rotation of knife **142** insures rolling contact of the front roller along the track at all times. Material to be cut is thus held or pressed between the track and front roller **134**. The throat plate smoothes material ahead of and laterally proximate the rotating disc knife to insure a clean, continuous, and unjagged cut of the material so held.

The shape of the carriage **111** is such that it functions as a handle which may be grasped to manually move the apparatus along the slotted track.

In connection with this second preferred embodiment of the invention shown and described, it will be understood that various changes and modifications may be made therein without departing from the spirit of the invention which is defined by the following claims.

What is claimed is:

1. In a machine for cutting sheet-like material, such as fabric, including a round knife rotatable about an axis and having a cutting edge and means for rotating said knife about such knife axis, the improvement which comprises a roller rotatable independently of said knife in use about another axis substantially parallel to said knife axis and free of any even indirect drive connection with said knife in use and having a curved peripheral surface provided with a circumferential groove penetrated by said cutting edge, said surface and that portion of said cutting edge which is entering said groove defining a nip, whereby such material to be cut may be fed toward said nip while contacting said surface adjacent said nip without movement relative to said surface in a direction extending circumferentially of said roller.

2. A cutting machine according to claim **1** and further comprising means for pressing said material against said surface adjacent said nip.

3. A cutting machine according to claim **2** wherein said pressing means includes spaced means on opposite sides of said knife.

4. A cutting machine according to claim **2** wherein said pressing means includes a supporting structure having an elongated slot therein and track portions extending along opposite sides of said slot, said roller being adapted to be moved longitudinally of said slot to roll on and effect cutting of any of said material which may be interposed between said roller and track portions.

5. A cutting machine according to claim **4** wherein said track portions and the opposing portions of said peripheral surface are contoured in complementary fashion so as to guide said roller in its travel along said slot.

6. A cutting machine according to claim **5** wherein said supporting structure is a table top, said track portions are arranged on said table top to face upwardly, further comprising a manually movable carriage on which said roller is rotatably mounted and arranged above track portions, and said means for rotating said knife includes an electric motor arranged below said table top and connected to said carriage so as to move therewith.

7. A machine for cutting sheet-like material, such as fabric, along a slotted track, comprising a carriage arranged for movement along said track, knife means mounted on said carriage and having a cutting edge disposed within said track slot to cut material arranged in its path of movement, roller means mounted on said carriage to hold a portion of said material to said track, and smoothing means mounted on said carriage for smoothing such held portion of said material adjacent said cutting edge.

8. A machine according to claim **7** wherein said smoothing means includes a cantilevered throat plate member having its fixed end mounted on said carriage

and having its free end portion arranged to smooth said material adjacent said cutting edge.

9. A machine according to claim **8** wherein said throat plate member is arcuate.

10. A machine according to claim **9** wherein said throat plate member is provided with a longitudinal slot extending inwardly from the extremity of said free end portion to define two trails arranged on opposite sides of said knife means which penetrates said slot.

11. A machine according to claim **10** wherein each of said trails has a transversely concave upper surface and a transversely convex lower surface.

12. A machine according to claim **10** wherein said roller means has a circumferential groove, and the slotted free end portion of said throat plate member is arranged in said groove and has a curved lower surface substantially coterminous with the periphery of said roller means at the edges of said groove proximate where said cutting edge intersects said slot.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,791,246 Dated February 12, 1974

Inventor(s) Casimir M. Lazickas

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Title page, the title should be --MACHINE FOR CUTTING SHEET-LIKE MATERIAL SUCH AS FABRIC--;

Col. 4, line 20: "con-struction os" should be --construction of--;

Col. 6, line 33: "forward recess" should be --forward roller recess--;

Col. 6, line 39: "front recess" should be --front roller recess--.

Signed and sealed this 9th day of July 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents