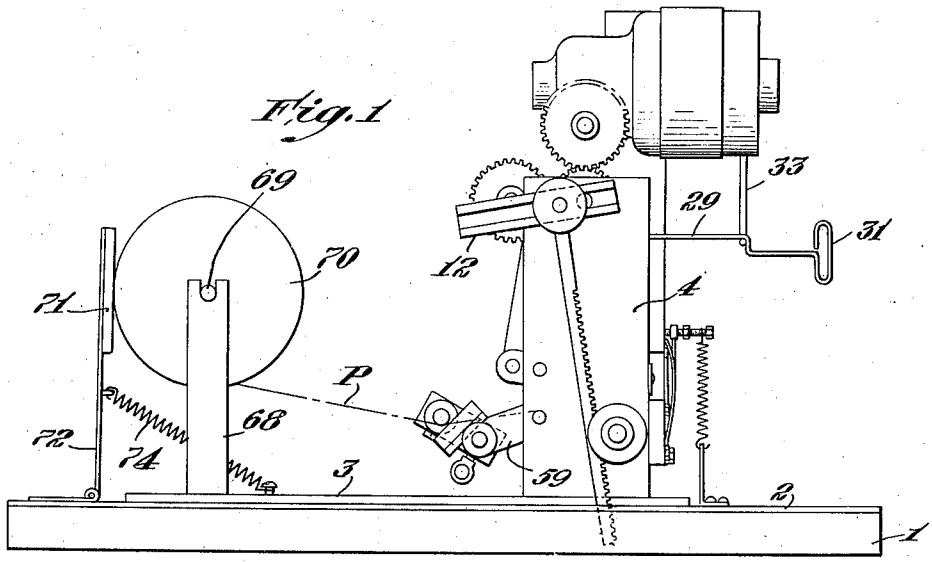
Dec. 19, 1944. E. L. SUTTER 2,365,605

MACHINE FOR CUTTING SHEET MATERIAL

Filed Sept. 1, 1943 4 Sheets-Sheet 1

Fig. 1



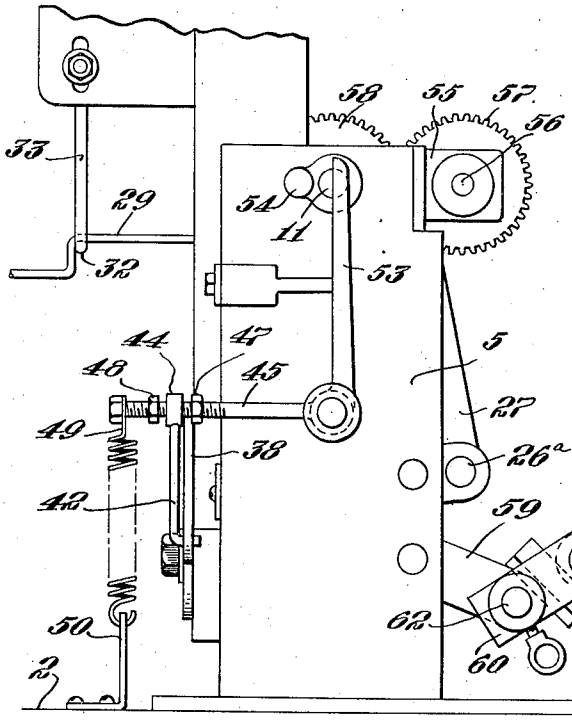


Fig. 2

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MACHINE FOR CUTTING SHEET MATERIAL

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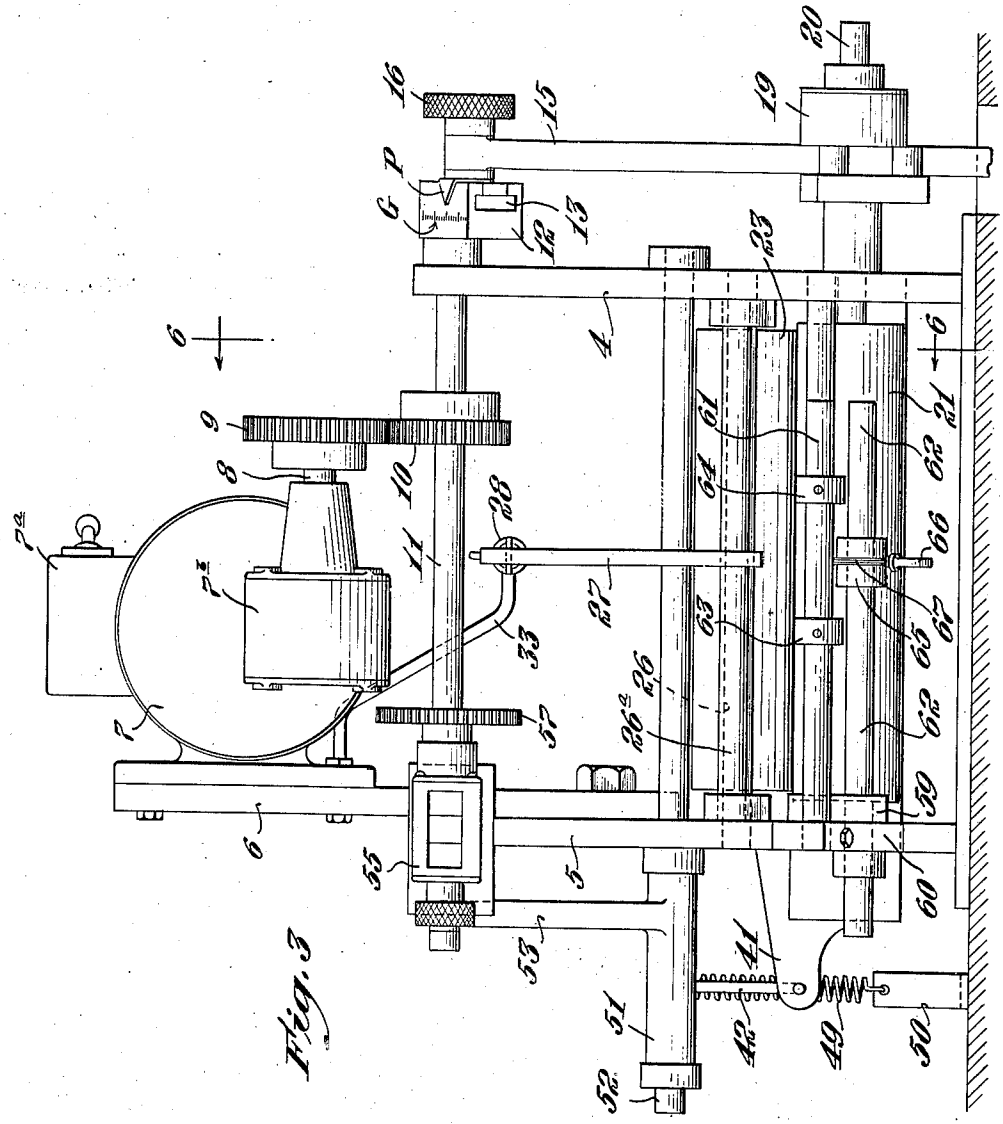


Fig. 3

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MACHINE FOR CUTTING SHEET MATERIAL

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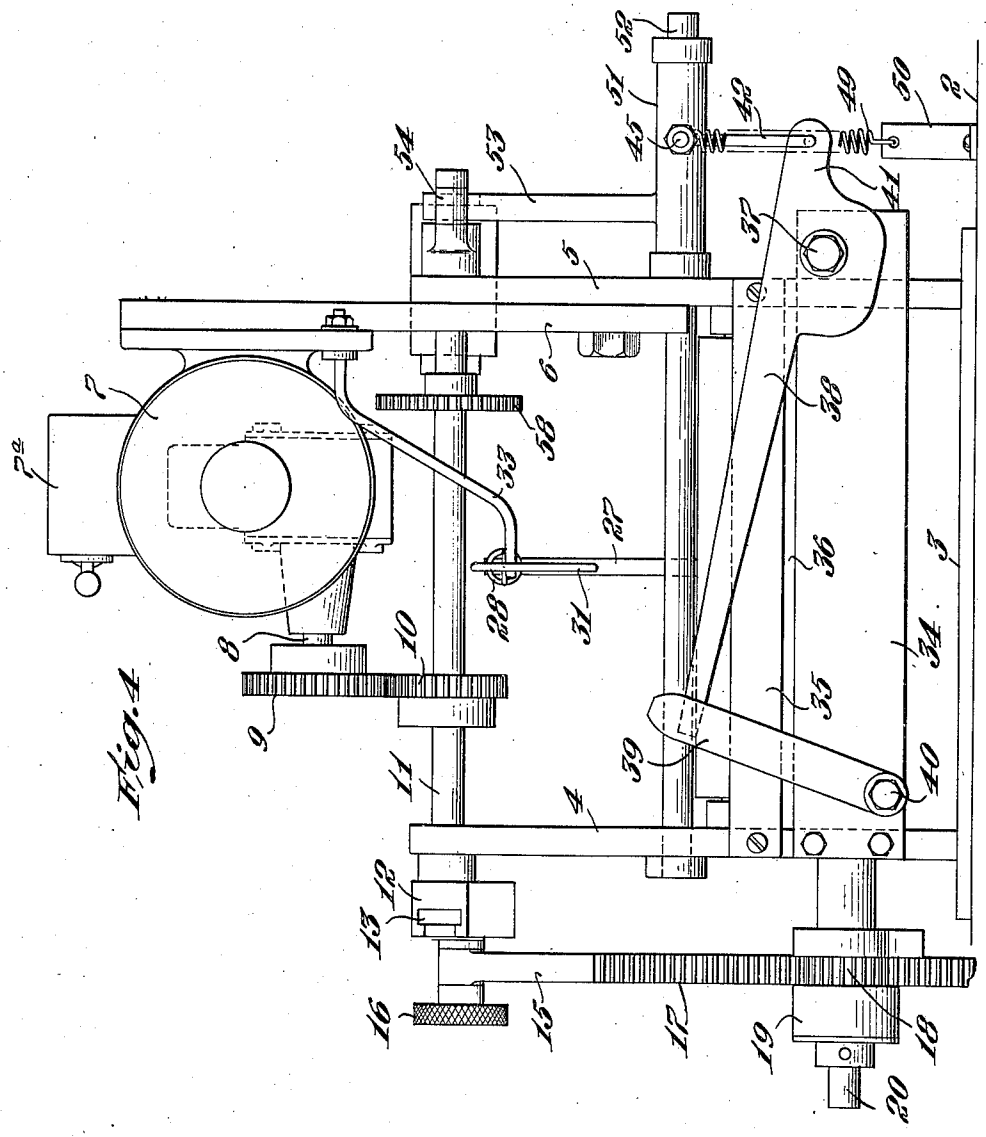


Fig. 4

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MACHINE FOR CUTTING SHEET MATERIAL

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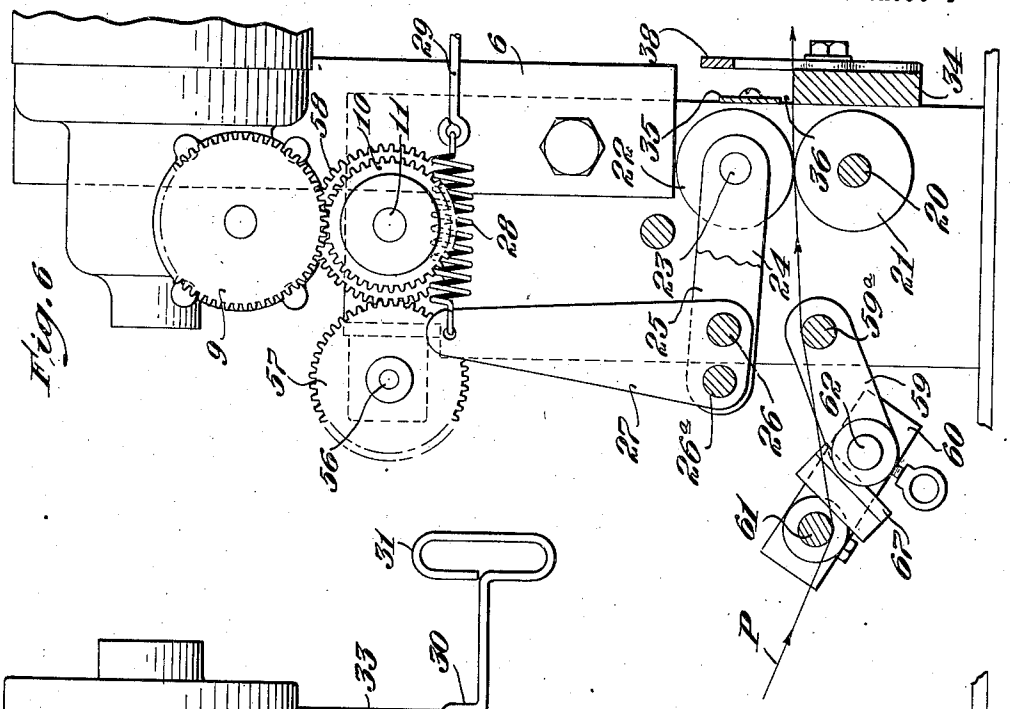


Fig. 6

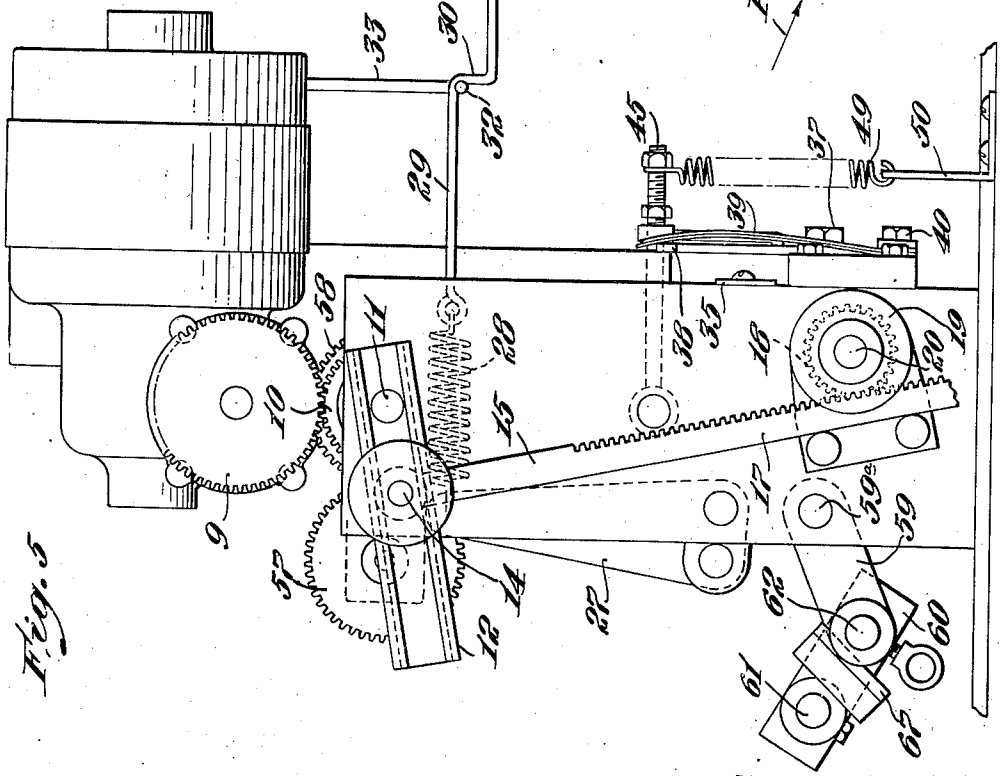


Fig. 5

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UNITED STATES PATENT OFFICE

2,365,605

MACHINE FOR CUTTING SHEET MATERIAL

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Application September 1, 1943, Serial No. 500,774

4 Claims. (Cl. 164—42)

This invention pertains to machines for cutting sheet material, and relates more particularly to a machine for cutting dielectric material, for example paper impregnated with synthetic resin, into uniform lengths and widths for use in the manufacture of electrical apparatus, for instance in electrical condensers. Condensers are made in a wide range of sizes, and thus it is necessary to provide sheets of dielectric material in assorted widths and lengths. However, the only practical way of providing such dielectric material is in the form of a web roll.

The present invention has for its principal object the provision of automatic mechanism operative to draw off the dielectric sheet material from a supply roll and to cut it into pieces of uniform width and length. A further object is to provide a cutting mechanism having provisions for readily adjusting it to cut pieces of different lengths and of any width less than the width of the supply roll. A further object is to provide a simple and durable mechanism capable of operating substantially continuously and with but little supervision and of cutting cleanly and without tearing the tough and hard surfaced sheet material which is used for insulation. Other and further objects and advantages of the invention will be pointed out in the following more detailed description and by reference to the accompanying drawings wherein

Fig. 1 is an elevation of the left-hand side of the apparatus of the present invention;

Fig. 2 is a fragmentary elevation of the opposite side of the apparatus;

Fig. 3 is a rear elevation of the apparatus to larger scale than Fig. 1;

Fig. 4 is a front elevation of the apparatus to the same scale as Fig. 3;

Fig. 5 is an elevation similar to Fig. 1, but to larger scale and omitting certain parts; and

Fig. 6 is a fragmentary section substantially on the line 6—6 of Fig. 3.

Referring to the drawings, the numeral 1 designates a suitable support, for example a bench, upon which the apparatus may be mounted. As here illustrated, the machine comprises a base plate 2 upon which is mounted a second and somewhat heavier plate 3. Welded or otherwise rigidly connected to the plate 3 are the parallel, vertical frame members 4 and 5. An extension 6 is bolted or otherwise secured to the plate 5, the extension 6 extending upwardly beyond the upper end of the plate 5 and constituting a support for a driving motor 7 (Figs. 3 and 4) which may be controlled by a suitable switch mechanism 7a. A reduction gearing 7b is associated with the motor, and a shaft 8 receives motion from this reduction gearing. A gear 9 is secured to the outer end of the shaft 8 and meshes with a gear 10 fixed to the main drive shaft 11 which is journaled at its opposite ends in openings in the upper parts of the frame members 4 and 5.

The shaft 11 projects outwardly beyond the frame member 4, and an elongate crank arm 12 (Fig. 5) is fixed to the outer end of the shaft 11. This crank arm 12 is provided with a longitudinally extending T-slot 13 (Figs. 3 and 4) which receives an adjustable crank pin which passes through an opening in the upper end of a rack bar 15. The crank pin is provided with a manually actuable lock nut 16 at its outer end. By loosening the nut, the crank pin may be moved longitudinally of the slot 13 in the crank arm, thereby to vary the effective length of the crank and the throw of the rack bar 15. If desired, the crank member 12 may be provided with graduations G (Fig. 3), and the crank pin may be provided with a pointer P to cooperate with the graduations, the graduations being indexed to indicate lengths of material to be cut.

The rack bar 15 is provided at its edge with rack teeth 17 which mesh with a pinion 18 (Fig. 5) which constitutes the drive element of a uni-directional clutch mechanism 19. This clutch mechanism may be of any desired type, for example a pawl and ratchet or cam and roller type of usual and well-known construction designed to transform the reciprocating motion of the rack bar 15 into a uni-directional motion of the driven shaft 20 with which the clutch 19 is concentric. This shaft 20 is journaled in bearings in the frame members 4 and 5, and between the members 4 and 6 carries the lower feed roll 21. This driven feed roll 21 cooperates with an upper feed roll 22 (Fig. 6) which is mounted on a shaft 23 journaled at its opposite ends in arms 24 and 25 (Fig. 6). These arms are mounted to rock on a shaft 26 whose opposite ends are mounted in openings in the frame members 4 and 5. A rod 26a, parallel to shaft 26, also connects the arms 24 and 25. An upwardly extending lever arm 27 (Figs. 3 and 6) is fixed at its lower end to the shaft 26 and rod 26a, said arm, together with the rod 26a and the arms 24 and 25 constituting a rigid bell crank frame which rocks about the axis of shaft 26. A spring 28, connected to the upper end of lever arm 27, has its opposite end connected to a rod 29 having an offset portion 30 (Fig. 5) and an actuating han-

dle 31. Normally the offset or hook portion 30 of this link engages a horizontal pin 32 at the lower end of an adjustable bracket 33, here shown (Fig. 4) as mounted on the base of the base of the motor 1. When the part 30 is thus hooked over the part 32, the spring 28 is tensioned, thereby resiliently urging the feed roll 22 downwardly toward the feed roll 21. However, if it be desired to introduce a sheet of paper between the feed rolls, the operator disengages the part 30 from the part 32, thus relieving the tension on the spring 28 and permitting the upper feed roll 22 to be raised from the lower roll in order to introduce the paper between them. After the paper has thus been introduced, the operator pulls the handle 31 forwardly, thereby to tension the spring 28, and then moves the handle down so as to reengage the part 30 with the part 32.

A fixed rigid bar 34 (Figs. 4 and 6) is secured to the front edges of the frame members 4 and 5, the upper edge of this bar being horizontal and being accurately ground to form a fixed or ledger blade. Above the bar 34 and spaced slightly from the latter is a guard member 35 also secured to the front edges of the frame members 4 and 5 and spaced from the upper edge of the bar 34 to leave a narrow slot 36 for the passage of the paper. This guard plate 35 prevents the paper from buckling upwardly during the forward feed motion and thus keeps it in the proper position for cutting.

A stud 37 (Fig. 4) projecting from one end of the bar 34 constitutes a fulcrum for the movable shearing blade 38. This blade is of sufficient length to cut paper of the maximum width for which the machine is designed. In order that this blade may bear firmly against the ledger blade 34 during the cutting action and thus provide a clean sharp cut, a leaf spring 39 is arranged to bear against the front surface of the outer or free end of the blade 38. This leaf spring 39 is secured at its lower end to the bar 34 by means of a bolt 40.

The cutting blade 38 has an arm 41 (Fig. 4) projecting outwardly to the right of the fulcrum pin 37, and to this arm is secured the lower end of a rigid actuating link 42. The upper end of this link (Fig. 2) has a head 44 provided with an opening for the reception of a horizontally disposed lever arm 45. This lever arm is preferably screw threaded for the reception of positioning nuts 47 and 48 disposed at the opposite sides (Fig. 2) of the head 44 of the link 42. A coiled tension spring has its upper end 49 secured to the outer or forward end of the arm 45, and at its lower end is secured to a bracket 50 fixed to the base plate 2. This spring tends to swing the lever arm 45 downwardly, thus raising the cutting balde 38. The arm 45 is fixed to a sleeve 51 (Fig. 4) arranged to turn on a shaft 52 mounted in the frame members 4 and 5, and this sleeve has a vertically extending arm 53 whose upper end is arranged in the path of rotation of a crank pin 54 (Fig. 4) mounted on the left-hand end (Fig. 3) of the drive shaft 11. Thus at each rotation of the drive shaft the sleeve 51 is rocked so as to swing the shearing blade 38 downwardly for cooperation with the edge of the ledger blade 34.

Mounted on the upper part of the frame member 5 is a counter mechanism 55 (Fig. 3) having a drive shaft 56 (Fig. 6) on which is mounted a gear 57 which meshes with a gear 58 on the drive shaft 11. Thus at each actuation of the shear mechanism the counter is actuated so as to count the number of sheets which are cut off.

An arm 59 (Fig. 6) is arranged adjacent to the inner surface of the frame member 5 and projects rearwardly and constitutes a support for an adjustable block 60. This block carries a pair of parallel rods 61 and 62 (Figs. 3 and 6) the block 60 being adjustable about the axis of the rod 62. Collars 63 and 64 (Fig. 3) are adjustably mounted on the rod 61 and constitute guides for the opposite edges of the web of paper as it moves toward the feed rolls. These collars may be adjusted at will to correspond to paper of different widths. The rod 60 carries a support 65 (also adjustable lengthwise of the rod by means of a set screw 66) on which is mounted a razor blade 67, the plane of the blade being accurately vertical.

At the rear of the machine a pair of spaced posts 68 (Fig. 1) removably support a spindle 69 on which is mounted the web roll 70. To prevent too free rotation of this roll, a friction brake 71 is arranged to bear against the peripheral surface of the roll, this brake being carried by a rod 72 which is hinged at 73 to the plate 2. A spring 74 secured to the rod 72 and to a pin projecting rom the plate 3 resiliently urges the brake 71 into frictional contact with the paper roll.

The supply roll 70 is mounted on the spindle 69 and the web P of paper is drawn off from the roll and carried beneath the rod 61, then past the razor blade 67 and over the rod 59a which supports the arm 59. The paper then passes between the feed rolls 21 and 22, the latter being lifted, as above described, while threading up the machine. The paper then passes through the slot 36 and forwardly across the upper edge of the ledger blade 34. When the machine has thus been threaded up the upper roll (preferably a rubber covered roll) is locked down in operative position by hooking part 30 over part 32, the motor is started and at each rotation of the drive shaft 11 the rack bar 15 is actuated by the crank 12 so as to turn the lower feed roll 21 in the feeding direction through a predetermined angle corresponding to the length of paper which is to be cut off. This length may readily be adjusted by changing the position of the crank pin 14 in the slot 13 of the crank member 12. As the lower feed roll 21 is rotated, it feeds a predetermined length of paper forwardly through the slot 36 and across the upper edge of the ledger blade 34. The parts are so timed that at the completion of this forward feed of the paper, and while the rack bar 15 is moving idly in the non-feeding direction, the shearing blade 38 is moved downwardly so as to shear off the length of paper projecting forwardly beyond the upper edge of the ledger blade 34. The machine thus continues to operate, cutting off one length of paper after another so long as the motor is kept in operation, and so long as the paper is not exhausted from the supply roll 70.

The razor blade 67 is adjusted transversely of the machine to such a position as, if necessary, to slit the paper, as the paper passes the blade, to the desired width. Obviously if it is not desired to slit the paper, the blade may be removed or moved so far to one side that it does not engage the paper. On the other hand, if it is desired to cut sheets of less width than the width of the supply web, then the blade is set accordingly, the guide collars 63 and 64 being properly set to engage the opposite edges of the

paper and thus to hold it in accurate position for engagement by the razor blade.

The mechanism as just described is capable of cutting the tough and hard surfaced paper used for insulating purposes so as to provide sheets of accurate width and length and with clean cut edges, and of cutting such sheets at high speed and without substantial attention after the machine has once been set up and started.

While one desirable embodiment of the invention has been disclosed by way of example, it is to be understood that the invention is broadly inclusive of any and all modifications falling within the scope of the appended claims.

I claim:

1. A machine for cutting web material into sheets of predetermined length and width and wherein a movable shear blade cooperates with a fixed ledger blade to shear the material transversely of its length and wherein feed rolls intermittently advance the web material into the field of action of the movable blade, characterized in that one of the feed rolls is mounted on a support so that it may be swung about an axis parallel to the axis of the roll, a rigid lever arm fixed to the support, a spring connected at one end to said arm, a hook device connected to the other end of the spring, and a fixed part with which the hook is normally but releasably engaged whereby the spring tension may be completely relieved at will thereby to permit free separation of the rolls.

2. A machine for cutting web material into sheets of predetermined length and width and wherein a movable shear blade cooperates with a fixed blade to shear the material transversely of its length and wherein feed rolls intermittently advance the web material into the field of action of the movable blade, characterized in having three horizontally spaced rods parallel to the feed rolls, an arm pivoted to swing about the middle rod and means for retaining said arm in adjusted position, a blade support adjustable along the middle rod, a pair of independently adjustable edge guides mounted on the rear rod, the material to be cut passing beneath the rear rod and over the front rod, and a blade mounted on the blade support and projecting transversely across the plane defined by the contact points of the material being cut with the front and rear rods.

3. A machine for cutting web material into sheets of predetermined length and width and wherein a movable shear blade cooperates with a fixed blade to shear the material transversely of its length and wherein feed rolls intermittently advance the web material into the field of action of the movable blade, characterized in that one of the feed rolls is movable bodily toward and from the other, a bell-crank frame comprising parallel arms which support between them the bodily movable roll, the frame including an actuating arm, a tension spring secured at one end to the actuating arm, a rod attached to the other end of the spring, the rod having a handle at its opposite end and having a detent element intermediate its ends, and a fixed member which is normally engaged by said detent thereby to maintain the spring under tension and to hold the bodily movable roll in operative relation to the other roll, the detent element being releasable from said fixed part by actuation of the handle thereby to permit free separation of the roll.

4. A machine for cutting web material into sheets of predetermined length and width and wherein a movable shear blade cooperates with a fixed blade to shear the material transversely of its length and wherein feed rolls intermittently advance the web material into the field of action of the movable blade, characterized in that one of the feed rolls is bodily movable toward and from the other, said bodily movable roll being supported by a pair of parallel arms mounted to rock about the axis of a supporting shaft, a rod parallel to said shaft rigidly uniting the arms, an actuating arm arranged substantially at right angles to the aforesaid parallel arms, said rod and shaft extending through one end of said actuating arm, a tension spring united at one end to the opposite end of the actuating arm, a hook rod secured at one end to the opposite end of the spring, the hook rod having a handle at its opposite end and having an offset hook portion intermediate its ends, and a fixed abutment with which said hook portion may be engaged after tensioning the spring thereby normally to hold the spring under tension with the rolls in operative relation.

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