Oct. 10, 1933. C. W. WATTLEWORTH 1,930,330

APPARATUS FOR CUTTING WEB MATERIAL

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Fig. 4

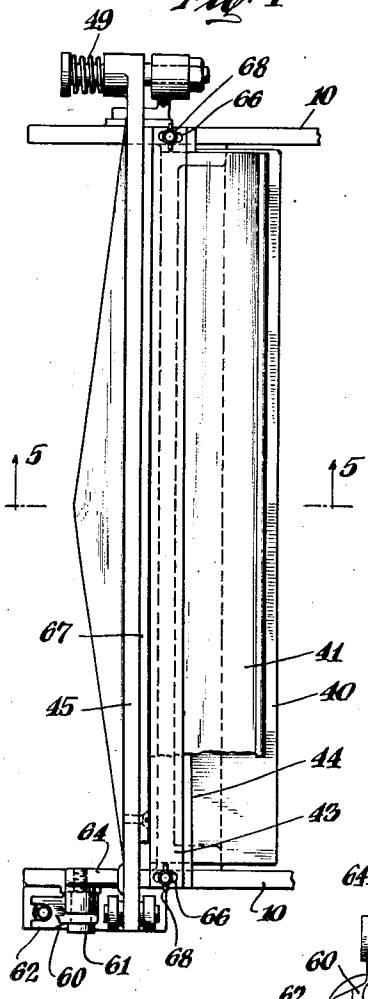
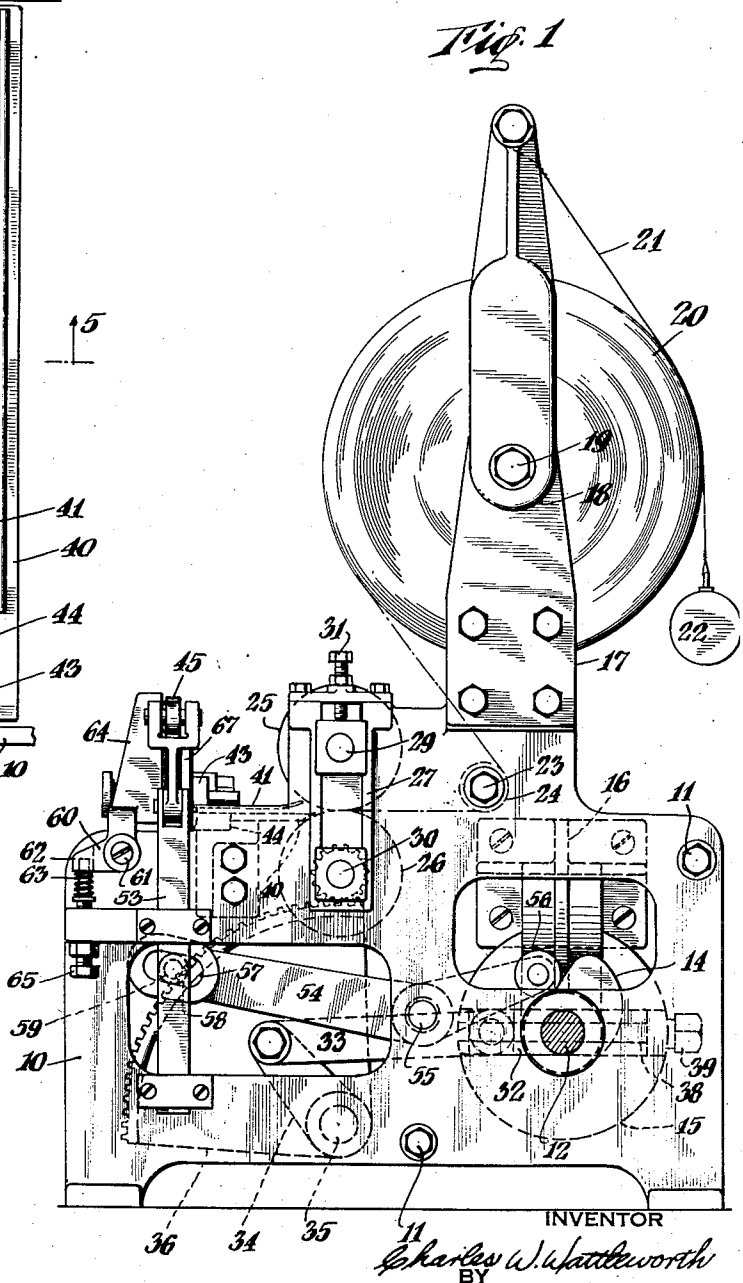


Fig. 1



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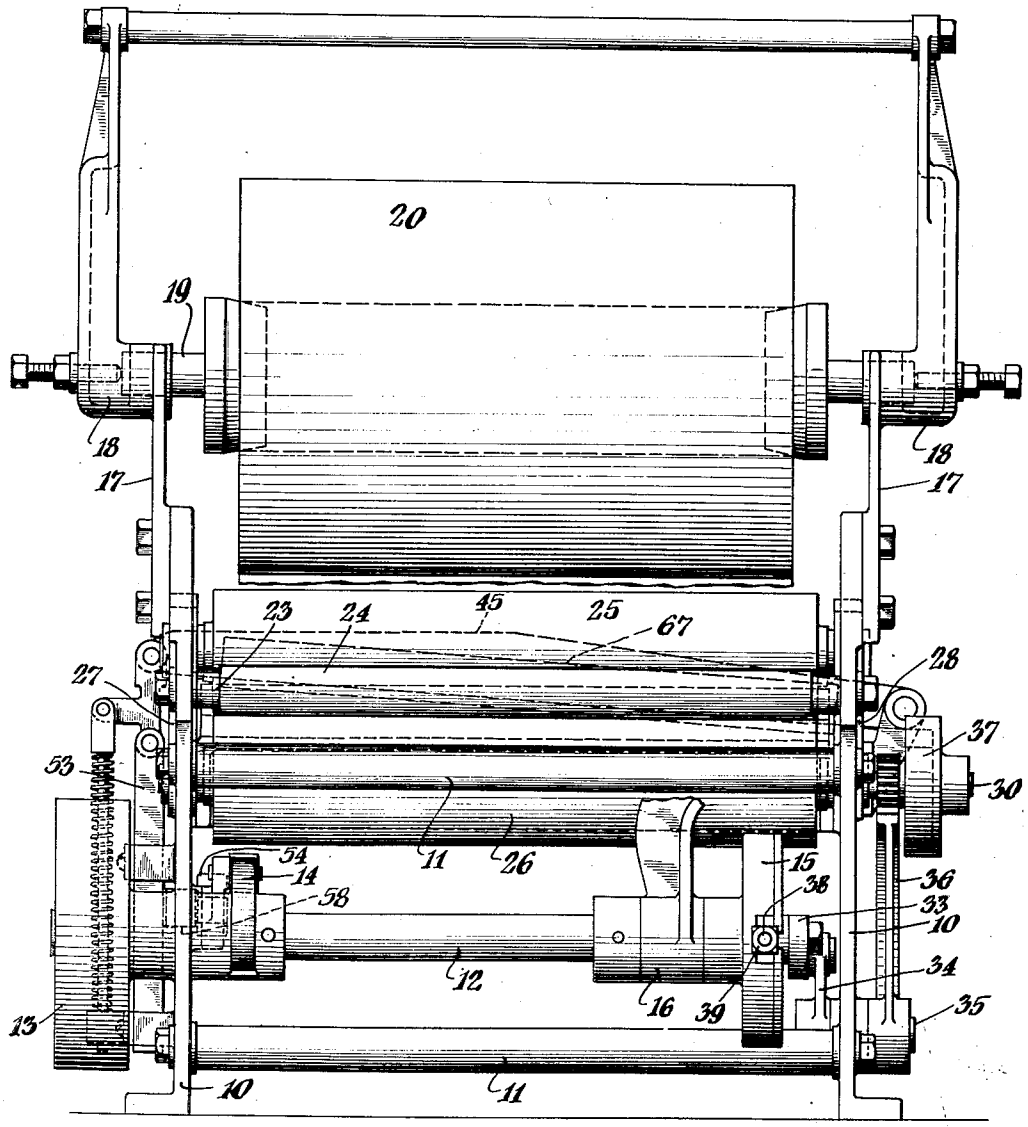
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Fig. 2



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APPARATUS FOR CUTTING WEB MATERIAL

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Fig. 3

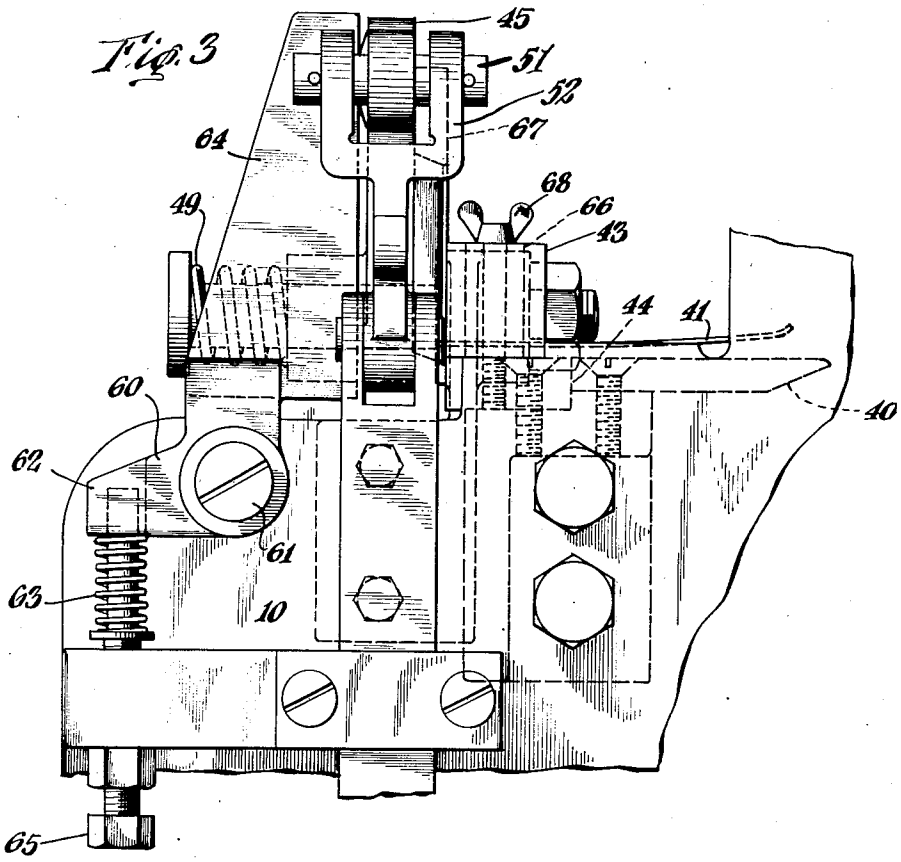
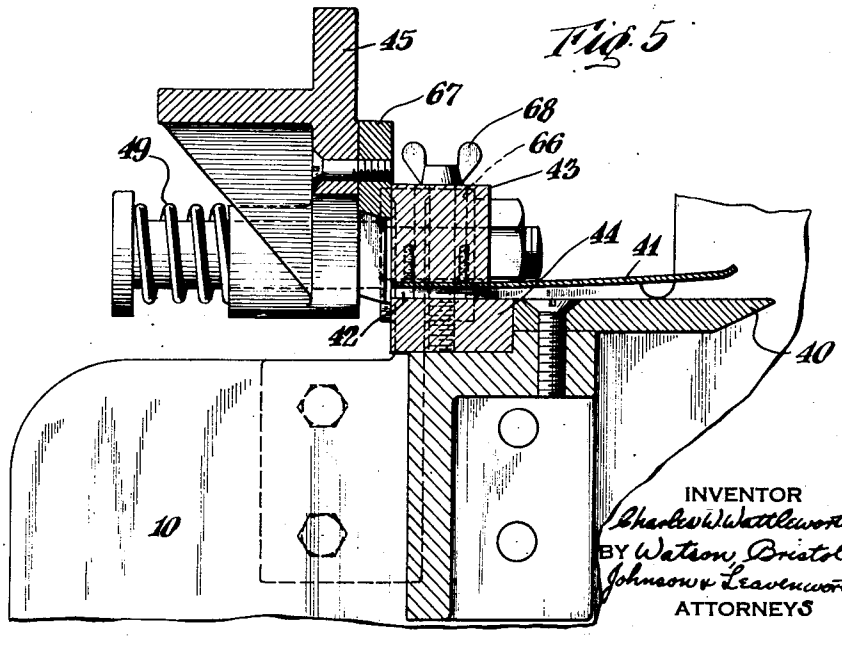


Fig. 5



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1,930,330

UNITED STATES PATENT OFFICE

1,930,330

APPARATUS FOR CUTTING WEB MATERIAL

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Application December 30, 1932
Serial No. 649,535

8 Claims. (Cl. 164—42)

This invention relates to cutting machines of the shear type and has for a general object the provision of a cutting machine having an improved design and enhanced performance in the cutting of a continuous web of material, such as glycerinated regenerated cellulose, paper, gelatine, and the like, into sheets of predetermined size.

Another object of the invention is to provide a novel knife of the shear type adapted to cut non-fibrous homogeneous material such as glycerinated regenerated cellulose without distorting the same and without producing cracks and serrations perpendicular to the cut edge.

A specific object of the invention resides in the combination with a knife of the shear type of a novel tensioning means adapted continuously to maintain the cutting edge of the knife in contact with a guiding block during the stroke of the knife.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises an apparatus having the features and elements and the relation of the elements one to another all as exemplified in the accompanying drawings and the scope of which will be pointed out in the appended claims.

For a more detailed description of the invention reference should be had to the accompanying drawings, in which:

Figure 1 is a side elevation of the improved cutting machine.

Figure 2 is an elevation of the same machine viewed from the right side of Figure 1.

Figure 3 is a detailed view, on an enlarged scale, of a side elevation of the cutting mechanism of the machine of Figures 1 and 2.

Figure 4 is a detailed plan view, of the cutting mechanism shown in Figure 3, on a scale corresponding to that of Figure 1.

Figure 5 is a detailed vertical sectional view, on an enlarged scale substantially corresponding to line 5—5 of Figure 4.

Numerous difficulties arise whenever an attempt is made to cut a sheet of a non-fibrous, homogeneous material such, for example, as glycerinated regenerated cellulose on a known machine designed to cut a fibrous material such as paper. In such known machines, a glycerinated regenerated cellulose web, by reason of its elasticity frequently becomes clogged in the cutting mechanism as for example between the block and the blade. Where such material is severed after the elastic limit is reached the cut edge is weakened by reason of numerous serrations perpendicular to the edge which are commonly produced during the cutting operation. The machine of this invention among other improvements overcomes disadvantages such as those mentioned, chiefly by virtue of a novel aligning and tensioning means associated with the cutting mechanism of the machine.

In the drawings, the frame by which the parts are supported comprises vertical side members 10 fixed in spaced relation by suitable bars 11 bolted thereto. Mounted in bearings on the side members 10 is a horizontal drive shaft 12 driven by a pulley 13 adapted to be operated by manual or other power. Upon shaft 12 are mounted a cam 14 and a drive wheel 15 which latter is supported within the side members 10 by a bracket 16. At the top of the machine standards 17 are provided with U-shaped bearings 18 which are adapted rotatably to support a shaft 19 carrying a roll 20 of web or sheet material to be cut. The roll preferably is mounted to rotate in a counter-clockwise direction, and the web is led therefrom in a manner to assure that any tendency to curl which it may have as it passes over the knife (hereinafter described) will be in a downward direction, as this has been found to facilitate the shearing operation. A brake consisting of a rope 21 and a weight 22, or other suitable means, is provided to prevent roll 20 from continuing its rotation when the feed rolls, hereinafter described, are not operating.

A shaft 23, mounted horizontally in suitable bearings in the side members 10, carries a freely revolving guide roll 24 about which the web is passed so as to be directed horizontally toward a pair of feed rolls 25 and 26. The feed rolls are mounted at each end between vertical guides 27 and 28 which together provide a slot in which shafts 29 and 30 rest. Shaft 29 is vertically adjustable, the pressure of roll 25 upon roll 26 being maintained by set screws 31 located above and at opposite ends of the shaft.

The feed roller 26 is driven from the drive wheel 15 through a crank pin 32 to which is attached a pitman 33. A crank arm 34 is attached to the opposite end of the pitman 33 and is fixed to a shaft 35 which is rotatably mounted in and passes through one of the side elements 10, as illustrated. On the opposite end of this shaft is secured a geared segment 36 which is operatively connected with a free-wheeling clutch 37 on shaft 30 suitably designed to rotate the feed roller 26 in a counter-clockwise direction only.

The crank pin 32 is radially adjustable on the drive wheel 15 through a threaded rod 38 operated by a knurled knob 39 attached thereto.

A horizontal bed plate 40 is positioned substantially tangential to the point of contact of the feed rolls in order to receive the material fed therethrough. A guide plate 41 positioned with predetermined clearance above the bed plate acts to direct the web material through a slot 42 provided between the top of the bed plate and a guiding block 43 positioned at the edge of the bed plate adjacent the knife. This edge of the bed plate serves as a stator or fixed shear blade which cooperates with the knife blade to sever the material. If desired, this shear blade end of the bed plate may be made in the form of a separate block 44 as illustrated, such block in effect being a continuation of the bed plate 40. The slot 42 between block 43 and the cutting end of the bed plate may be obtained by suitably coping the underside of block 43, or by shimming such block at its ends. This slot, while sufficiently large to accommodate the thickness of web material fed therethrough, is rather narrow, and the lower edge of block 43 is spaced rather closely above the shearing corner of the fixed shear blade.

The illustrated cutting mechanism includes an oscillatable shearing knife comprising a supporting bar 45 and a blade 67 mounted on the inside thereof. Bar 45 is attached at one end to a side member 10 by pierced bracket 47 and bolt 48 about which bar 45 pivots freely. The other end of bar 45 is provided with a pin 51 which engages the yoke 52 of a connecting rod 53. Between the head of bolt 48 and the supporting bar 45 is inserted a compression spring 49 which acts normally to urge such bar and its associated knife toward and into contact with the guiding block 43. The tension of spring 49 can be suitably adjusted by taking up the nut 50 at the end of bolt 48.

The free end of the knife is vertically reciprocated by means of a bell crank 54 mounted to rotate on a shaft 55, which is mounted on and projects from that side member 10 which is adjacent cam 14. One end of the crank 54 carries a roller 56 which rides upon cam 14. The opposite end of the crank 54 is provided with an elongated slot 57 in which a roller 58 is slidably fitted. The roller 58 rotates on a pin 59 attached in turn to the connecting rod 53 which operates the knife.

As is most clearly shown in Figures 3 and 4, means are provided for maintaining the free end of the knife under tension. That is, this end of the knife is normally urged toward guide block 43. This means includes a lever 60 pivoted to the side member 10 by a pin 61. One arm 62 of this lever rests upon a coil compression spring 63 which is seated against side member 10. This spring normally urges the long arm 64 of the lever into pressing engagement against the free end of the knife bar 45, which latter thus is constantly in sliding contact with the vertical face. The tension of spring 63 may be adjusted by means of a set screw 65. The fixed end of the knife is also normally urged toward guide block 43 by coil spring 49, as explained above.

The pressing action of the coil springs 49 and 63 hold the knife blade 67 under constant tension against the guiding block 43. The tension of both springs may be varied to vary the pressing tension of the knife blade against the face of block 43, and it is preferable to have this tension sufficiently great to assure maintenance of constant contact between the edge of the blade and the face of the block, as the blade wipes across this block during a cutting operation. Means are provided for adjusting the position of guide block 43 with respect to the fixed shear blade or stator. In the illustrated embodiment this means comprises elongate slots 66 provided at opposite ends thereof, through which thumb screws 68 are fitted for adjustably clamping the block in position over the bed plate shear blade 44. By this means the angle between the longitudinal lower edge of the guide block and the longitudinal cutting edge of the stator can be effectively controlled, and these parts consequently may be placed and kept in proper alignment. If desired, that side of the block 43 which contacts the movable knife blade may be slightly concaved, the lower corner of this block being positioned in proper alignment with respect to the cutting corner of the stator to assure guidance of the movable knife thereagainst in the proper manner to effect a satisfactory shear cut. It will be seen that the constant tension imposed by springs 49 and 63 on the knife blade compel the latter constantly to engage and be guided by the guide block 43, and the adjustable means for positioning the latter affords a precise and constantly functioning control of the relationship of the movable knife blade with respect to the fixed blade. Also, as the guiding block is desirably positioned with its lower edge in substantial coincidence with the cutting edge of the stator, the movable blade is under tension as it wipes across the stator, and this nicety of control of the position of the knife, together with its constant tensioning toward the stator, has been found to effect a markedly superior shearing cut of web materials. This superiority is especially marked in the case of non-fibrous materials, such as regenerated cellulose and the like.

In operation of the machine, the drive shaft 12 is turned so as to revolve the drive wheel 15. This effects rocking of the shaft 35 through the pitman 33 and the crank arm 34. The shaft 35 oscillates the geared segment 36, and when the latter is moving in a clockwise direction, it drives the lower feed roll 26 in a counter-clockwise direction through operation of the clutch 37. Revolution of the feed roll 26 in conjunction with the pressure feed roll 25 draws the web from the roll 20 around the guide roller 24, pushing it forwardly between the bed plate 40 and the guide plate 41, under the block 43 and out through slot 42 in position to be cut off by the knife mechanism. During return or counter-clockwise movement of the geared segment 36, the rollers 25 and 26 cease to be driven by the free wheeling clutch 37 and remain in a fixed position by reason of their inertia, or, if desired, by means of any suitable braking mechanism (not shown).

Cam 14 for driving the knife mechanism is so located on drive shaft 12 with reference to the feed roll drive crank 34 as to raise roller 56 just as or shortly after the forward feeding movement of the web has stopped. Continued rotation of cam 14 elevates roller 56, causing lever 54 to rock so as to force roller 58 downwardly. The latter carries the connecting rod 53 downwardly, this in turn lowering the free end of the oscillatable knife blade. As it is lowered, the block 43 guides this blade against the fixed shear blade and severs the web in the improved manner heretofore described. As soon as the knife cuts the length of paper and clears the bed plate 40 on its subsequent upward stroke, the geared segment

36 again positively motivates the feed roll 26 in a counter-clockwise direction, and the feeding and cutting cycle is repeated.

The length of the sheet cut may be varied by turning the knurled knob 39 adjusting the crank pin 32 radially on the drive wheel 15. As the position of the pin 32 is changed, the throw of the geared segment 36 is changed, thus changing the amount of movement imparted to the feed roller 26 during each cycle. This, in turn, determines the length of the sheet which is fed past the knife 45.

To promote the smooth feeding of the web the feed rolls may be provided with a suitable gripping surface, preferably rubber. Further the guide bed 40 and guide plate 41 may be designed with interspaced ribs on their opposing faces by which the sheet is temporarily corrugated to increase its stiffness prior to its passage through the slot 42.

There may be attached to this machine, if desired, a tray in which the cut sheets may be aligned in piles, or an endless belt may be provided for delivering the sheets one at a time to a wrapping bench. For the purpose of keeping record of the number of sheets cut, a counter may be mounted upon the movable end of the knife frame and the operating lever of the counter connected by suitable means to the frame of the machine.

While the machine of this invention is especially adapted to cutting continuous webs of non-fibrous homogeneous materials it is equally applicable to cutting fibrous materials such as paper and the expressions "web" and "web material" as used in the specification and appended claims are intended to cover both non-fibrous and fibrous sheet material.

It will thus be seen that by means of the present invention there has been provided a novel apparatus adapted to the improved cutting of web material into sheets, and since certain modifications in the apparatus which embodies the invention may be made without departing from its scope, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. In combination, in a machine for cutting a continuous web into sheets, a frame, a feed device for periodically feeding forward said web, a fixed shear blade or stator, a knife cooperating with said stator to sever the web into sheets, means for controlling the tension and angle of the knife with respect to the stator, means contacting said knife for adjusting the tension of the knife against said controlling means.

2. In combination, in a machine for cutting a continuous web into sheets, a frame, a feed device for periodically feeding forward said web, a fixed shear blade or stator, a knife cooperating with said stator to sever the web into sheets, a block spaced above said stator, and controlling the tension and angle of said knife with respect to the cutting edge of said stator, and means associated with said knife for adjusting the tension of the knife against said block.

3. In combination, in a machine for cutting a continuous web into sheets, a frame, a feed device for perodically feeding forward said web, a fixed shear blade or stator, a knife cooperating with said stator to sever the web into sheets, means for imparting reciprocating motion to one end of said knife, a block spaced above and substantially coinciding with the cutting edge of said stator, means for controlling the angle which the edge of said block makes with respect to the cutting edge of said stator, and means contacting the reciprocating end of said knife for urging it into contact with and for controlling its tension against said block.

4. In combination, in a machine for cutting a continuous web of material into sheets, a frame, a feed roller for periodically feeding forward the web, means for intermittently driving said roller, a fixed shear blade or stator, a knife pivoted at one end to said frame cooperating with said stator to sever the web into sheets, means for imparting reciprocating motion to the other end of said knife, a block spaced above and substantially coinciding with the cutting edge of said stator, means for controlling the angle which the edge of said block makes with respect to the cutting edge of said stator, and means contacting both ends of said knife for urging it into contact with and for controlling its tension against said block.

5. In a machine for cutting a web, cutting mechanism comprising a fixed shear blade, a movable blade cooperating therewith to sever the web, means having a guiding surface adjustably located with respect to said fixed blade, and pressing means urging said movable blade into pressing contact with said surface and said fixed blade during a cutting operation.

6. In a machine for cutting a web, cutting mechanism comprising a fixed shear blade, a movable blade cooperating therewith to sever the web, means having a guide surface adjustably located with respect to said fixed blade, pressing means urging said movable blade into pressing contact with said surface and said fixed blade during a cutting operation, and means for controlling the effective strength of said pressing means.

7. In a machine for cutting a web, cutting mechanism comprising a fixed shear blade, a movable blade cooperating therewith to sever the web, a guiding block spaced above said fixed blade and having a guiding surface with its lower edge terminating in substantial coincidence with the cutting edge of said fixed blade, means for controlling the position of said guiding surface, resilient means urging said movable knife into pressing contact with said surface and said fixed blade during a cutting operation, means for moving said knife, and means for feeding a web between said block and fixed blade in position for cutting.

8. In combination, in a machine for cutting a continuous web into sheets, a frame, a feed device for periodically feeding forward said web, a fixed shear blade or stator, a knife cooperating with said stator to sever the web into sheets, means for imparting reciprocating motion to one end of said knife, a block spaced above and substantially coinciding with the cutting edge of said stator, said block being slightly concave on the side facing said knife, means for controlling the angle which the edge of said block makes with respect to the cutting edge of said stator, and means contacting the reciprocating end of said knife for urging it into contact with and for controlling its tension against said block.

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