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MATERIAL CUTTING DEVICE

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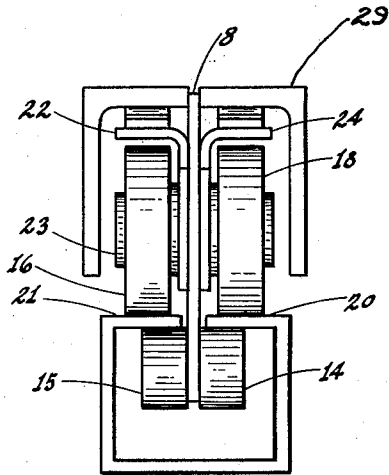


Fig. 3

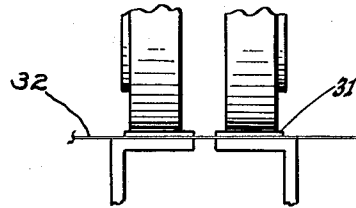


Fig. 4

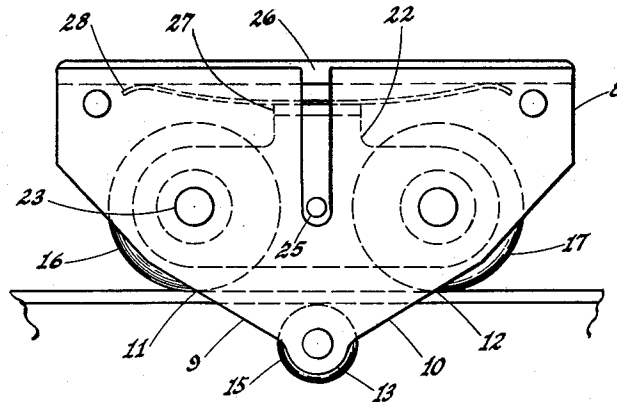


Fig. 2

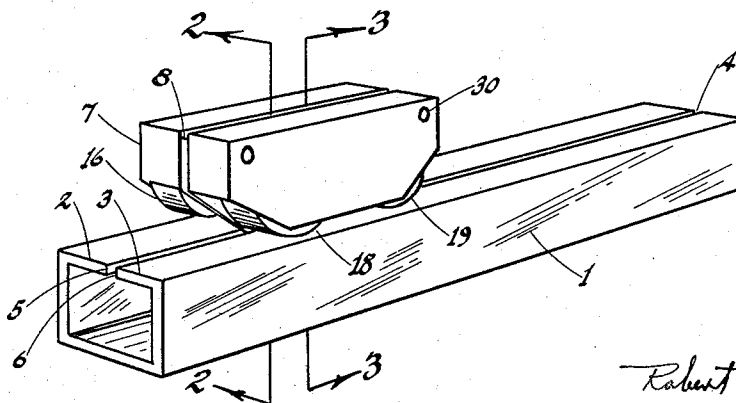


Fig. 1

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MATERIAL CUTTING DEVICE
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This invention relates to a device designed to cut paper and the like and, more particularly, to a cutting head and rail which will accurately and reproducibly cut materials of a wide variety of thickness and finish.

In the past a variety of cutting devices have been developed to cut paper and similar materials, but these devices have not satisfactorily solved the problem of holding the paper in place during the cutting operation to effect accurate and reproducible results. In the present invention the material being cut is held firmly in position to produce accurate and reproducible cuts without the necessity for manually holding or adjusting the material to compensate for the shifting of position of the material caused by the build-up of unbalancing forces during the cutting operation.

It is a most important object of the present invention, therefore, to provide a cutting unit which will cut material accurately and reproducibly without the necessity of holding the material in position with one or both hands during the cutting operation.

A further object is to provide a cutting unit which can be operated by hand or by motor means.

A still further object is to provide a cutter unit which can cut accurately by remote control through utilization of motor means to propel the cutting unit.

A still further object is to provide a cutting unit which will not inadvertently cut diagonally or along a bias regardless of the thickness of the material being cut.

Yet another object of the invention is to provide a bi-directional cutting device which will permit the cutting of the material as the cutting head is moved in either direction along the cutting rail.

With the foregoing and other objects in view, my invention consists in certain novel features of construction and arrangement of parts that will be hereinafter more fully described as well as illustrated in the accompanying drawings in which:

FIGURE 1 is a perspective view of the cutting head and rail constructed in accordance with my invention.

FIGURE 2 is a vertical cross-section taken on line 2-2 of FIGURE 1.

FIGURE 3 is a vertical cross-section taken on line 3-3 of FIGURE 1.

FIGURE 4 is a fragmentary cross-section showing a modified version of the FIGURE 3 cross-section.

Referring by numerals to the accompanying drawings which illustrate a preferred embodiment of my invention, in FIGURE 1 a cutter bar or channel means 1 is comprised of longitudinal rail portions 2 and 3 which define a long narrow slot 4 with faces 5 and 6. Mounted on this cutter bar or rail is a cutting head 7 which contains a vertical plate 8, as shown in FIGURE 2, that extends down into the slot 4 defined by faces 5 and 6 of the cutter bar portions. This vertical plate 8 is of a thickness approaching the width of the slot 4 and extends longitudinally along said slot 4 in order to effectively guide and align the cutting head 7 as it travels the length of the cutting bar 1. The leading edges 9 and 10 of the vertical plate 8 are inclined downwardly and inwardly to form merging cutting edges that intersect with the plane of the upper surface of the cutting bar 1 at points 11 and 12, respectively. These two leading edges 9 and 10 converge at a portion 13 which emerges from the underside of said longitudinal rail portions 2 and 3.

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As shown in FIGURE 3, attached to the two surfaces of the vertical plate 8 at the lower portion 13 are two oppositely extending anti-friction or roller means 14 and 15. These roller means 14 and 15 come into contact with the under side of the longitudinal rail portions 3 and 2, respectively, at areas next adjacent to the slot 4. By virtue of the roller means 14 and 15 the cutting head can not be removed from the rails unless withdrawn from the ends. However, a special removable section may be provided on the rails or the slot 4 can be made appropriately wide to provide the necessary clearance for the rollers 14 and 15 as the cutting head is withdrawn.

In order to hold the material being cut firmly in place, wheels 16, 17, 18, and 19 or other anti-friction means are resiliently connected to each side of the vertical plate 8. It is most important that these wheels or other anti-friction means not be secured rigidly to the plate 8, otherwise invariably at any one time during cutting only those points of contact will be made with the material being cut. This permits the material to shift under the wheel not making contact in accordance to the forces acting upon it at that instant. For example, if the cutting device is used to cut sections of paper from a roll hanging on a wall support, the channel means will best be arranged so that the vertical plate 8 is actually in a horizontal position as the hanging paper crosses the rail faces 2 and 3. With gravity acting upon the paper, as the cutting head advances and the paper is cut, the weight of the portion cut sets up an ever-increasing force vector at the lower rear wheel to cause the paper to pull askew and thereby cut diagonally or along a bias. Thus, if the wheel does not bear down evenly at all times the paper will slip and result in inaccurate cuts. Such a cut is wholly unsatisfactory as it produces an irregular edge on the cut sheet and, consequently, wastes paper. Because of the smoothness of the surface of some papers and other materials it is desirable to roughen the upper surfaces of the rail at portions adjacent to the slot by such means as sandblasting. In cases where the material is of such a thin gauge that slippage is a serious problem it has been found essential to incorporate the improvement in FIGURE 4 which will hereinafter be described in further detail.

Consequently, in order to assure substantially even and equal pressure of all the wheels on the material gripped between the wheels and the track surfaces 20 and 21, these wheels must be individually suspended and not rigidly connected to the plate 8. This can be accomplished by a number of alternative means. In the present invention as shown in FIGURES 2 and 3 it is effected by connecting each pair of wheels on a side of plate 8 to a carriage 22 by means of an axle or rivet 23. Carriage 22 is pivotally connected to the opposing carriage 24 with a rivet 25 which rides freely in recess 26 of plate 8 thereby permitting free relative movement between the two carriages 24 and 25 and the plate 8. It is preferred that the holes in carriages 22 and 24 be oversized in relation to the rivet diameter to permit free relative movement between the carriages 22 and 24 and plate 8.

Each carriage has a horizontal flange 27 at its upper portion to accommodate a leaf spring 28 in contact with the underside of the housing shell 29 which in turn is secured rigidly to the plate 8 by means of a traverse securing screw 30. The leaf spring 28 makes contact with the underside of housing 29. In this manner each individual wheel is caused to bear down on the upper surface of the channel rail (or of the material inserted therebetween) with substantially equal force in spite of slight variations in the rail surface smoothness (or the material thickness). It is by this equal application of pressure at all four points of contact that accurate and reproducible cutting of a variety of materials is effected. However, it

should be noted that this pressure effect can be produced by using a spring 23 on only one side and simply substituting a spacer along the outer edge of 22 on the other side.

However, an additional unique feature in the design of the instant device combines with the individual suspension of the anti-friction means to effect the desired accurate cutting. This feature is the positioning of the contact area between the anti-friction means or wheels and the rail surfaces in advance of the point of contact of the cutting edges with the material being cut at points 11 or 12. Wheels 16 and 17 contact the channel rail 5 at points outside or astride the points 11 and 12 where the blade edge contacts and thereby cuts the material. In this manner the material is first firmly and equally gripped by the forward advancing wheels; then the material is fed into contact with the cutting edge to effectively mitigate the tendency of the material to bunch or be forced forward as the head advances resulting in an untrue cut. Consequently, this problem of material bunching in advance of the cutting edge which was occasioned in the prior art devices, has now been eliminated. An example of such a prior art device is found in U.S. Patent No. 1,515,289 to J. T. Tullis, issued on November 11, 1924, wherein at FIG. 14 a cutting head is shown having the point of contact of wheel 44 on rail 39 coincidental with the point of contact of the blade and the material to be cut.

In the event extremely thin or smooth-surfaced material is being cut or the cutting conditions are such that unusual forces are built up during cutting causing the material to slip from the grip of the wheels or the surface of the rails, it has been found essential to incorporate a hold-down band 31 as shown in FIGURE 4. This band of metal which snaps on the ends of the rail portions of channel means 1 is placed parallel to and just adjacent to the slot 4. If the material 32 is inserted between the band 31 and the rail surface 20 or 21 no difficulty will be experienced in cutting along a bias. This is because the wheels, which as pointed out above must hold the material in position prior to the contact of the cutting edges with the material, can now actually extend their gripping influence far in advance of their point of contact and thereby effectively hold the material in place in spite of the smoothness or thinness of said material.

It is understood that various modifications are contemplated and may obviously be resorted to by those skilled in the art without departing from the spirit and scope of the invention, as hereinafter defined by the appended claims, as only a preferred embodiment (or embodiments) thereof have been disclosed.

I claim:

1. In a material cutting device comprised of:

(a) channel means comprised of a pair of longitudinal portions arranged in spaced relationship to provide a narrow longitudinal slot therebetween;

(b) a vertical plate of a thickness substantially equal to the width of said slot and a height substantially greater than the depth of said slot having two inclined downwardly inwardly converging cutting edges extending downwardly into the slot and converging at a portion that emerges from the underside of said channel means whereby said plate slides alignably in said slot, extends longitudinally for a predetermined distance along said slot and has upper and lower portions extending both above and below the said channel means;

(c) oppositely extending lower surface anti-friction means normally attached to the two surfaces of said vertical plate at a portion emerging from the underside of the channel means whereby said anti-friction means come into contact with the surface area adjacent to the slot and the underside of said channel means;

(d) at least two upper surface anti-friction means lo-

cated on each side of said vertical plate and making contact with the upper surface of said channel means astride the two points defined by the intersection of the cutting edges of such vertical plate and the plane of the upper surface of said channel means;

(e) resilient means interposed between each of the anti-friction means on at least one side of the channel means and said vertical plate to cause all anti-friction means to grip their respective sides of the channel means;

whereby material laid across the slot of a channel means to be cut is gripped between the channel means and individually suspended upper anti-friction means before the leading cutting edge of the advancing vertical plate contacts and thereby cuts the material.

2. In a material cutting device as in claim 1 the combination therewith at least one thin, flat hold-down band running parallel to and in adjacent proximity to the slot whereby the material being cut is placed between the upper surface of said channel means and the hold-down band thereby causing the upper anti-friction means to run along and bear down upon the upper surface of said hold-down band thereby holding the material firmly in place substantially in advance of the point of contact of the upper anti-friction means with the hold-down band.

3. In a material cutting device as comprised of:

(a) channel means comprised of a pair of longitudinal portions arranged in spaced relationship to provide a narrow longitudinal slot therebetween;

(b) a vertical plate of a thickness substantially equal to the width of such slot and a height substantially greater than the depth of said slot having two inclined downwardly inwardly converging cutting edges extending downwardly into the slot and converging at a portion that emerges from the underside of said channel means whereby said plate is alignably slidable in said slot and extends for a predetermined distance this slot and has upper and lower portions extending both above and below said channel means;

(c) oppositely extending lower surface anti-friction means normally attached to the two surfaces of said vertical plate at a portion emerging from the underside of said channel means whereby said anti-friction means come into contact with the surface area adjacent to the slot at the underside of said channel means;

(d) at least two upper-surface roller means located on each side of said vertical plate and making contact with the upper surface of said channel means astride the two points defined by the intersection of the cutting edges of said vertical plate and the plane of the upper surface of said channel means;

(e) resilient means interposed between each of said upper rolling means and the upper portion of said vertical plate to cause the anti-friction means and rolling means to grip their respective sides of the channel means; whereby material laid across the slot of the channel means to be cut is gripped between the channel means and the individually suspended rolling means before the leading cutting edge of the advancing vertical plate contacts and thereby cuts the material.

4. In a material cutting device as in claim 3 the combination therewith at least one thin, flat hold-down band running parallel to and in adjacent proximity to said slot whereby the material being cut is placed between the upper surface of said channel means and the hold-down band thereby causing the rolling means to run along and bear down upon the upper surface of said hold-down band thereby holding the material firmly in place substantially in advance of the point of contact of the upper rolling means with the hold-down band.

5. In a material cutting device comprised of:

(a) channel means comprised of a pair of longitudinal

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portions arranged in spaced relationship to provide a narrow longitudinal slot therebetween;

- (b) a vertical plate of thickness substantially equal to the width of said slot and a height substantially greater than the depth of said slot having two inclined downwardly inwardly converging cutting edges extending downwardly into the slot and converging at a portion that emerges from the underside of said channel means whereby the said plate is alignably slidable in said slot, extends longitudinally for a predetermined distance along said slot and has upper and lower portions extending both above and below said channel means;
- (c) oppositely extending lower surface rolling means normally attached to the two surfaces of said vertical plate and a portion emerging from the underside of the channel means whereby said rolling means come into contact with the surface area adjacent to the slot the underside of said channel means;
- (d) at least two upper surface rolling means located on each side of said vertical plate and making contact with the upper surface of said channel means astride the two points defined by the intersection of the cutting edges of the vertical plate and the plane of the upper surface of said channel means;
- (e) resilient means interposed between each of said upper rolling means and the upper portion of said

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vertical plate to cause all rolling means to grip their respective sides of the channel means;

whereby material laid across the slot of the channel means to be cut is gripped between the channel means and the individually suspended rolling means before the leading edge of the advancing vertical plate contacts and thereby cuts the material.

6. In a material cutting device as in claim 5 the combination therewith at least one thin, flat hold-down band running parallel to and in adjacent proximity to said slot whereby the material being cut is placed between the upper surface of said channel means and the hold-down band thereby causing the upper rolling means to run along and bear down upon the upper surface of said hold-down band thereby holding the material firmly in place substantially in advance of the point of contact of the upper rolling means with the hold-down band.

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