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L. E. LA BOMBARD

2,341,503

SHEET CUTTING MECHANISM

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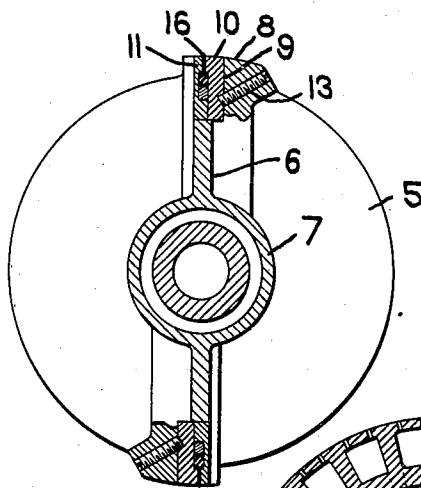


Fig. 1.

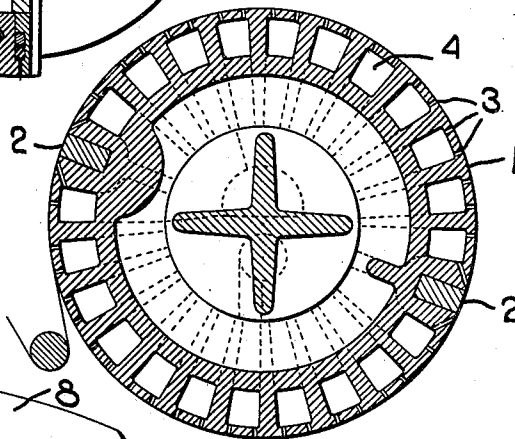


Fig. 2.

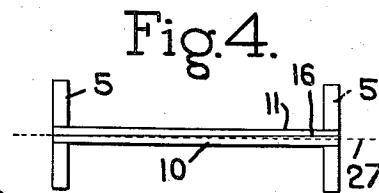
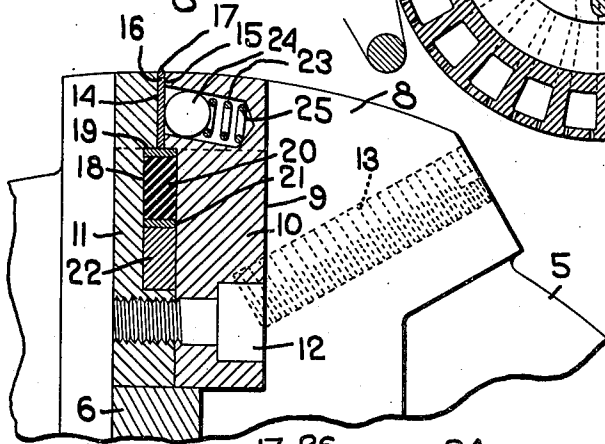


Fig. 4.

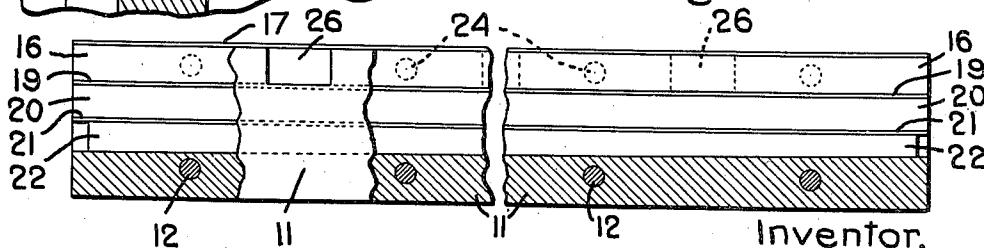


Fig. 3.

Inventor.
Leon E. LaBombard
by *Heard Smith & Tennant.*
Attys.

UNITED STATES PATENT OFFICE

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SHEET CUTTING MECHANISM

Leon E. La Bombard, Nashua, N. H., assignor to
The International Paper Box Machine Com-
pany, Nashua, N. H., a corporation of New
Hampshire

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17 Claims. (Cl. 164—66)

This invention relates to improvements in mechanism for cutting sheets or webs of material by a pinch-cutting action between two relatively movable members one of which, hereinafter defined as a "platen," is provided with a suitable surface to support the sheet at the line to be cut, and the other member with a knife the cutting edge of which is forced against the platen with sufficient pressure to cut through the material disposed between it and the platen.

It will be readily understood that where a very thin material is to be cut, such as Cellophane which often is less than .001" or even one-half of .001" in thickness, it is difficult to maintain such uniform adjustment of the cutting blade as will insure uniform and complete severance of the material throughout the length of the cutting blade. Furthermore it is found that where proper initial adjustment of the knife relatively to the platen has been made changes in temperature or other atmospheric conditions will distort the knife, platen or other parts of the machine sufficient to necessitate readjustment of the knife even when the knife and platen are accurately ground which in itself is very difficult and expensive.

The principal object of the invention is to provide a pinch-cutting construction of the character described having a platen and a cooperating cutting blade in which relative yielding movement between the cutting blade and the platen is so permitted as to cause uniform engagement of the cutting blade and platen throughout the length of the blade thereby to insure complete and clean severance of the material throughout the length of the cutting blade.

Another object of the invention is to provide a suitable cutting blade which is transversely flexible in the direction of applied cutting force so mounted in a cutter holder that the blade will deflect in the direction of cutting and so pre-loading the same that the cutting edge thereof will conform to the surface of the platen throughout the length of cut.

A further object of the invention is to provide pre-loading means in which pressure is applied continuously to the back of the blade in a stepless manner throughout the length of the blade.

A further object of the invention is to provide means for frictionally retaining the blade in its cutting member which will prevent detachment of the blade therefrom but which will not interfere with the yielding movement of the blade in response to the pressure between it and the platen.

Another object of the invention is to provide means which will enable the cutting blade to be

readily removed from the cutter holder for repair or replacement.

These and other objects and features of the invention will more fully appear from the following description and the accompanying drawing and will be particularly pointed out in the claims.

A preferred embodiment of the invention is illustrated herein as applied to the cutting mechanism disclosed in my prior Patent No. 2,202,496 granted May 28, 1940, which, as illustrated in Fig. 14 thereof, is employed for severing sections from a thin web of Cellophane or like material. It will, however, be understood that the present invention may be employed to sever sections from or to produce cuts in predetermined portions of sheets of any suitable thickness, the length of the cut being dependent only upon the length of the cutting blade.

In the drawing,

Fig. 1 illustrates a preferred form of a rotatable cutting member embodying the invention in cooperative relation to a companion rotatable member having platens in the periphery thereof adapted to cooperate with the blades of the cutter during synchronized rotation of said members;

Fig. 2 is a greatly enlarged detail sectional view of a preferred form of mechanism for supporting the cutting blade in the rotatable member and the means for adjustably pre-loading the same;

Fig. 3 is a view, partially in section and partially in elevation, illustrating the cutter holder, the cutting blade, the mechanism for pre-loading the cutting blade, and partly broken away to illustrate means permitting access to the blade to enable its removal and replacement; and,

Fig. 4 is a detail diagrammatic view illustrating the longitudinal inclination of the cutting blade relatively to the axis of the cutter holder.

A preferred embodiment of the invention is illustrated herein as applied to cooperating synchronized rotatable members of the character disclosed in Fig. 14 of my patent above identified. One of the rotatable members comprises a cylinder 1 having inset in the periphery thereof suitable platens 2 presenting a cylindrical surface conforming to the periphery of the cylinder. In this construction the periphery of the cylinder is provided with suitable apertures 3 which lead to chambers 4 which extend longitudinally of the cylinder and through which suction is applied to cause adherence of the sheet of material to the periphery of the cylinder in the manner described in my previous patent.

The cooperating rotatable cutter-carrying

member, like that disclosed in my previous patent, comprises suitable cylindrical heads 5 connected by webs 6 to a hub 7 which is rotatably mounted upon a suitable shaft. The webs are provided with enlarged end portions 8 having longitudinally extending rectangular recesses 9 in which the cutter holders are mounted. While in the construction illustrated in Fig. 1 two diametrically opposite webs having cutter holders mounted therein are illustrated, it will be understood that a greater number may be employed as indicated in my previous patent.

The cutter holders comprise complementary plates 10 and 11 which are seated in the recesses 9 and are clamped together at their inner ends by suitable machine screws 12. The cutter holding members are fixedly secured in the longitudinally extending recesses 9 by suitable set screws 13 which are mounted in the enlarged end portions 8 of the webs 6. The cutter holders are provided with complementary preferably rectangular recesses forming a pocket to receive a resilient backing for the severing blade and are provided with parallel walls 14 and 15 so spaced apart as to provide a slit or guideway extending from the central portion of the upper wall of the pocket to receive and guide the severing blade.

The severing blade 16 which is mounted in the slit or guideway is of such width as to extend from the upper wall of the pocket slightly beyond an outer edge of the slit, and has an edge which is accurately finished properly to contact throughout its length with the platen when in cutting relation thereto. The severing blade preferably is of tempered steel and is of such width and thickness as will enable it to flex sufficiently in the direction of the cutting force applied to its edge during the cutting operation to cause its cutting edge to conform to the surface of the platen which is engaged by it.

In the preferred construction illustrated a thin flexible steel strip 19 engages the back of the severing blade 16 and resilient means, such as an homogeneous block of rubber 20 which is compressed laterally by the walls of the pocket in the holder member, engages the steel strip 19 throughout its length. A similar flexible steel strip 21 engages the opposite edge of the rubber block 20 and a slightly tapering wedge 22 of steel or other rigid material which is slidably interposed between the steel strip 21 and the bottom of the recess 18, provides means for adjustably pre-loading the blade as the wedge 22 may be forced longitudinally toward its narrow end to compress the resilient means 20 to such predetermined degree as to force the flexible strip 19 against the outer wall of the recess in the holder with the desired preloading pressure to be applied to the back of the severing blade during the severing operation.

By reason of this construction uniform pressure is applied to the back of the blade throughout its length and the blade is thereby enabled to yield or flex in the direction of the applied force in such manner that each portion of the edge thereof will conform accurately to the opposing surface of the platen at each point throughout its length and thereby insure clean cutting of the material which is interposed between the blade and platen.

In order to prevent detachment of the blade from the blade holder by centrifugal force or otherwise during the operation of the machine, frictional means are provided which will suf-

ficiently clamp the blade in the blade holder to prevent disengagement therefrom, but which will not interfere with the radial movements of the blade in response to the pressure imposed upon the blade.

In the preferred construction illustrated the blade holding member 10 is provided at intervals with sockets 23 in which are slidably mounted suitable balls 24 to engage one side of the blade and press it against the opposite surface 14 of the cooperating clamping member 11. Coiled springs 25 interposed between the balls and the bases of the respective sockets 23 are of such strength as to give the proper frictional engagement with the blade to prevent its detachment from the holder, the rolling contact between the balls and the blade being such as to enable the blade to yield in response to the pressure placed upon its edge by the platen.

In order to enable the blade to be readily removed from the blade holder for replacement or repair, the blade holding members 10 and 11 are provided at suitable intervals intermediate of the frictional holding means with recesses 26 so that the blade may be grasped by the fingers of the operator or by a suitable tool and the blade easily extracted from the holding members.

Desirably the blade-holding members 10 and 11 are so constructed that the blades 16 extend at a very slight angle to the axis 27 of the cutter-carrying member, as graphically illustrated in Fig. 4, so that the edge of the blade contacts with the cylindrical surface of the platen progressively lengthwise thereof, and by reason of the yieldability of the blade and the flexibility thereof in the direction of the applied yieldable force above described severs the material with a progressive cut, thus further insuring accurate and clean severance of the material throughout the length of the blade.

It will be understood that while the invention is illustrated and described herein as embodied in cooperating rotatable cutting members having respectively diametrically opposite cutting members and platens that any suitable number of cooperating blades and platens may be employed in accordance with the length of the sections to be cut from a sheet of material or of slits to be cut therein.

It will be further understood that while the invention is illustrated and described herein as embodied in a machine having rotatable cutting members it may also be employed in machines of other types.

It will also be understood that the invention includes any means for pre-loading the cutter or the complementary platen which will insure accurate severance of the material throughout the length of the cutting blade.

It will be further understood that various modifications in construction and arrangement of parts may be made within the spirit and scope of the following claims.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is:

1. Sheet-cutting mechanism comprising a platen and a relatively movable complementary cutter-carrying member having means for holding and guiding a severing blade in proper relation to the platen, a severing blade which is flexible in the direction of the applied cutting force mounted in said blade-holding means, means acting upon said severing blade to cause self adjustment of the edge thereof throughout its length in

conformity to the surface of the platen during the cutting operation and frictional means retaining the blade in said holding and guiding means.

2. Sheet-cutting mechanism comprising a platen and a relatively movable complementary cutter-carrying member having means for holding and guiding a severing blade in proper relation to the platen, a severing blade which is flexible in the direction of the applied cutting force mounted in said blade-holding means and adjustable pre-loading means acting upon said blade to cause self adjustment of the edge thereof throughout its length in conformity to the surface of the platen and so to adapt the pressure applied to the blade and the characteristics of the material being cut as to avoid undue wear to the cutting edge of the blade.

3. Sheet-cutting mechanism comprising a platen and a relatively movable complementary cutter-carrying member having means for holding and guiding a severing blade in proper cutting relation to the platen and having a longitudinally extending recess behind the blade-holding means, a severing blade which is flexible in the direction of the applied cutting force mounted in said blade-holding means, and resilient means in said recess acting continuously upon the back of said blade throughout its length to cause uniform engagement of the cutting edge throughout its length with the surface of the platen and frictional means retaining the blade in said holding and guiding means.

4. Sheet-cutting mechanism comprising a platen and a relatively movable complementary cutter-carrying member having means for holding a severing blade in proper cutting relation to the platen and having a longitudinally extending recess behind the blade-holding means, a severing blade mounted in said blade-holding means, resilient means in said recess acting upon the back of said blade to cause uniform engagement of the edge throughout its length with the surface of the platen, and means for frictionally engaging the sides of said blade to prevent disengagement of the blade from the cutter-carrying member without interference with the relative movements therebetween.

5. Sheet-cutting mechanism comprising a platen and a relatively movable complementary cutter-carrying member having means for holding a severing blade in proper cutting relation to the platen and having a longitudinally extending recess behind the blade-holding means, a narrow severing blade mounted in said blade-holding means, resilient means in said recess acting upon the back of said blade to cause uniform engagement of the edge throughout its length with the surface of the platen, and means for frictionally engaging the sides of said blade at suitably spaced intervals to prevent disengagement of the blade from the cutter-carrying member without interference with the relative movements therebetween, said cutter-carrying member having recesses intermediate of said frictional means giving access to the blade to permit the removal thereof from the cutting member.

6. Sheet-cutting mechanism comprising a platen and a relatively movable complementary cutter-carrying member having means for holding a cutting blade in proper cutting relation to the platen and having a longitudinally extending recess behind the blade-holding means, a severing blade mounted in said blade-holding means, resilient means in said recess acting upon the back of said blades to cause uniform engagement

of the cutting edge throughout its length with the surface of the platen, and means frictionally engaging the sides of said blade including a plurality of suitably spaced spring actuated balls engaging one side of said blades and forcing said blade against a flat opposite wall of said blade-holding means.

7. Sheet-cutting mechanism comprising a platen and a relatively movable complementary cutter-carrying member having means for holding a cutter blade in proper cutting relation to the platen and having a longitudinally extending recess behind the blade-holding means, a severing blade mounted in said blade-holding means, a flexible sheet metal strip engaging the back of said blade throughout its length, resilient means engaging said strip throughout its length, and frictional means for preventing disengagement of the blade from the cutter-carrying member.

8. Sheet-cutting mechanism comprising a platen and a relatively movable complementary cutter-carrying member having means for holding a cutting blade in proper cutting relation to the platen and having a longitudinally extending recess behind the blade-holding means, a severing blade flexible in the direction of the applied cutting force mounted in said blade-holding means, a flexible thin sheet metal strip engaging the outer wall of said recess and the back of said blade throughout its length, a block of homogeneous elastic material confined in said recess engaging said steel strip throughout its length, a thin rigid backing strip engaging the opposite edge of said elastic block throughout its length, and a slightly tapering wedge in said slot engaging said backing strip throughout its length adapted to be adjusted lengthwise to vary the pre-loading of said blade.

9. Mechanism for cutting a sheet of material comprising a rotatable member having a platen presenting a cylindrical surface, a complementary rotatable cutting member having means for holding a cutting blade in position to engage the platen surface in a substantially radial direction and provided with a longitudinally extending recess, a severing blade mounted in said blade-holding means, a flat resilient sheet metal strip engaging the back of said blade throughout its length, and resilient means within said recess engaging said strip acting to cause uniform engagement of the edge of said blade throughout its length with said platen, and means for preventing disengagement of the blade from the blade-holding means.

10. Mechanism for cutting a sheet of material comprising a rotatable member having a platen presenting a cylindrical surface, a complementary rotatable cutting member having means for holding a cutting blade in a slightly inclined position to the axis of said rotatable cutting member and to engage the platen surface in a substantially radial direction and provided with a longitudinally extending recess, a severing blade mounted in said blade-holding means, a flat resilient sheet metal strip engaging the back of said blade throughout its length, and resilient means within said recess engaging said strip acting to cause progressive uniform engagement of the edge of said blade throughout its length with the cylindrical surface of said platen, and means for preventing disengagement of the blade from the blade-holding means.

11. Mechanism for cutting a sheet of material comprising a rotatable member having a platen presenting a cylindrical surface, a complemen-

tary rotatable cutting member having means for holding and guiding a cutting blade in a slightly angular relation to the longitudinal axis of the rotatable cutting member and to permit substantially radial movement of said blade, a cutting blade which is flexible in the direction of the applied cutting force mounted in said blade holder, resilient means acting upon the back of said cutting blade uniformly throughout its length and exerting resilient pressure on the knife with the knife always in the same position to cause progressive uniform engagement between each portion of the edge of the blade and the platen thereby to produce a progressive shearing cut in the material.

12. Mechanism for cutting a moving sheet of very thin material comprising a rotatable drum having means for applying suction to a sheet of material passing thereover and having mounted therein a plurality of longitudinally extending platens presenting a hard surface, a complementary rotatable cutting member having longitudinally extending recesses complementary to said platens, blade-holding means in said recess, a narrow thin steel blade or blades having a sharp edge mounted in one or more of said recesses, resilient means acting on the back of said blade continuously throughout the length thereof yieldably to extend the blade edge slightly beyond the periphery of said blade-holding means, and frictional means engaging the side of the blade to prevent disengagement thereof from the blade-holding means during the rotation of the cutting members.

13. Mechanism for cutting sheet of webs of material comprising a surface to support the material when cut, a flexible severing blade which will conform to the surface of the support and resilient means for backing up the severing blade acting to exert resilient pressure on the blade with the blade always in the same position to cause all parts of the edge of the blade properly to contact throughout the length with the platen.

14. Sheet cutting mechanism comprising a platen and a relatively movable complementary cutter-carrying member having means for holding a cutting blade in proper cutting relation to the platen comprising a pocket one side of which has a slit to receive and guide a severing blade,

a severing blade capable of flexing to cause its edge to conform to the cooperating surface of the platen mounted in said slit, a flexible metal strip covering said slit at the pocket edge, yieldable means in said pocket forcing said metal strip against the wall of the slit opening in the pocket thereby to provide a predetermined pre-loading force for said blade and to limit the distance the edge of the severing blade projects beyond the holder.

15. Sheet cutting mechanism comprising a platen and a relatively movable complementary cutter-carrying member having means for holding a cutting blade in proper cutting relation to the platen comprising a pocket one side of which has a slit to receive and guide a severing blade, a severing blade capable of flexing to cause its edge to conform to the cooperating surface of the platen mounted in said slit, a flexible metal strip covering said slit at the pocket edge, yieldable means in said pocket forcing said metal strip against the wall of the slit opening in the pocket, and means for varying the amount of pressure imposed upon said flexible strip.

16. Sheet-severing means comprising cooperating severing and platen members, one of which is flexible in the direction of the applied cutting force, and resilient means acting upon the flexible member throughout the length of the cutting member during the severing operation to exert resilient pressure upon the same with the knife always in the same position to cause uniform engagement of said severing and platen members throughout the length of the severing member and to insure complete severance of the material.

17. Sheet-severing means comprising cooperating severing and platen members, one of which is flexible in the direction of the applied cutting force, and resilient means acting upon the flexible member throughout the length of the cutting member during the severing operation to cause uniform engagement of said severing and platen members throughout the length of the severing member, thereby to insure complete severance of the material, and adjustable means for causing said resilient means to apply a preloading force to the flexible member throughout the length of the severing member.

LEON E. LA BOMBARD.