June 22, 1937. H. J. HELLER 2,084,488

CUTTING MACHINE

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FIG. 1

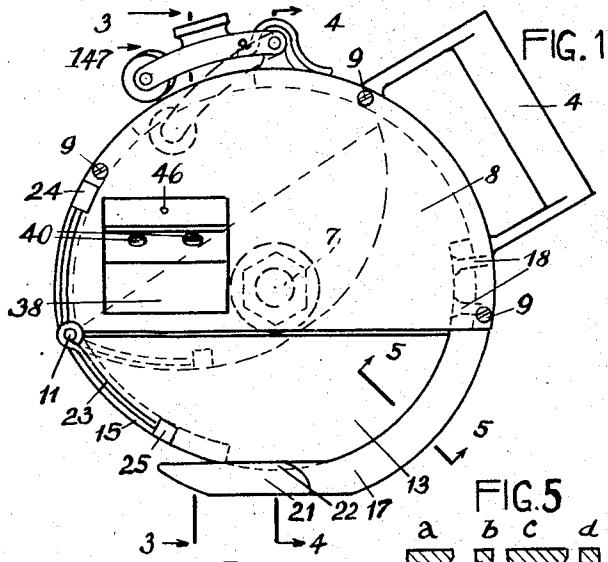


FIG. 2

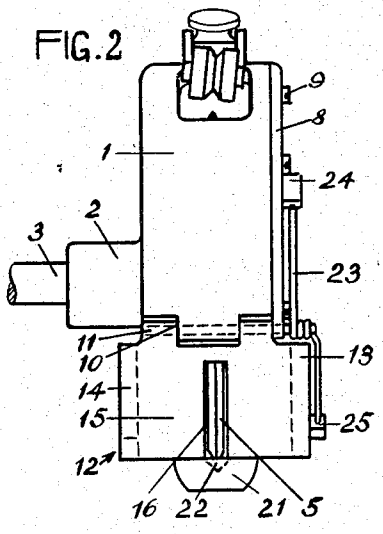


FIG. 5

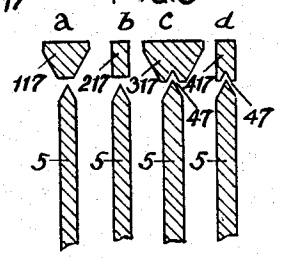


FIG. 3

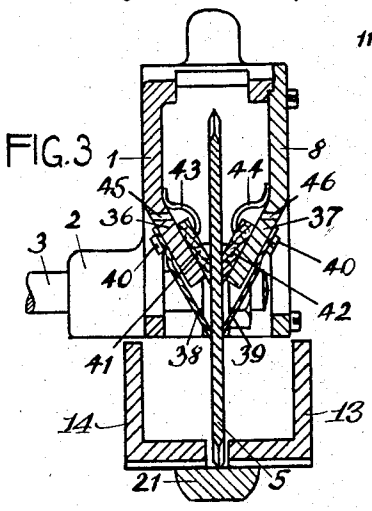


FIG. 4

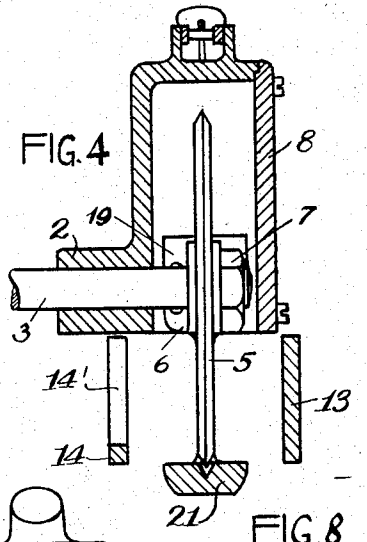


FIG. 7

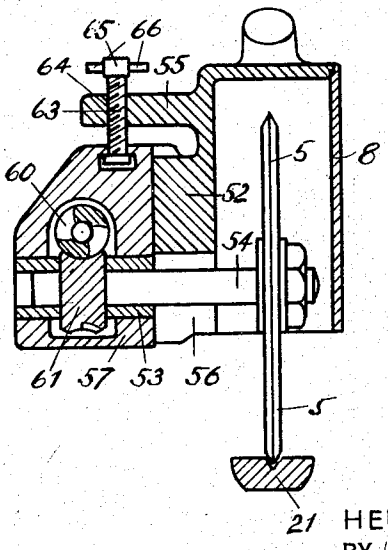


FIG. 8

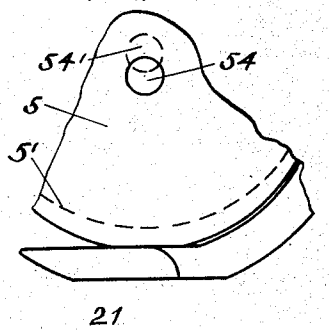
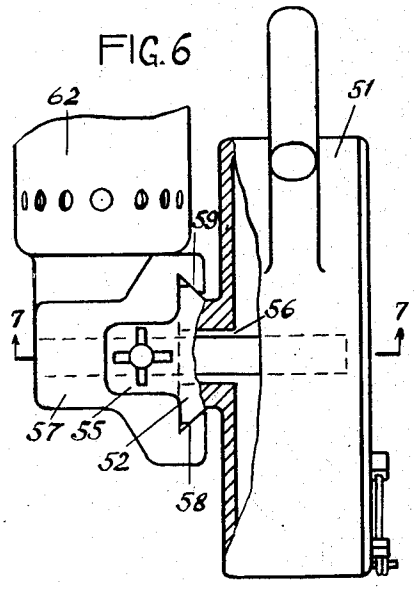


FIG. 6



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FIG. 9

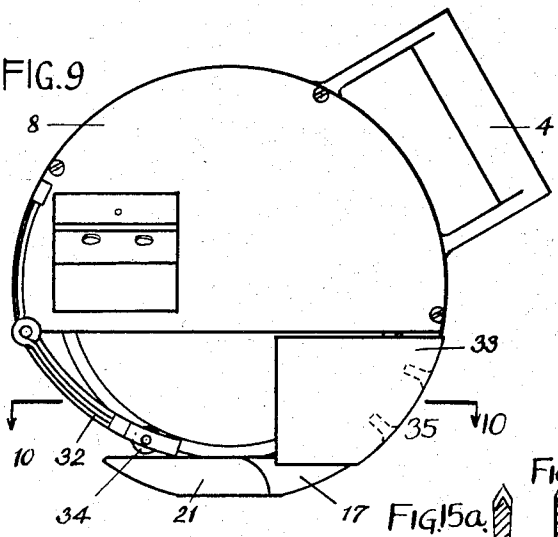


FIG. 11

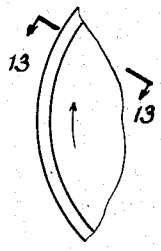


FIG. 12

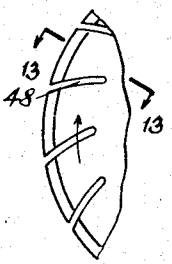


FIG. 13

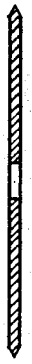


FIG. 15b.

FIG. 15a.

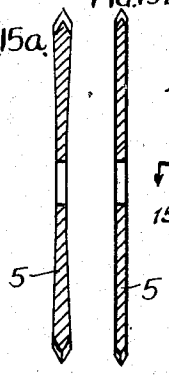


FIG. 14

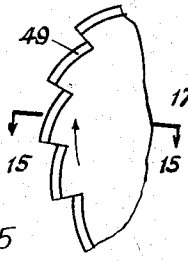


FIG. 16

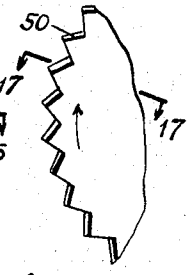


FIG. 17



FIG. 10

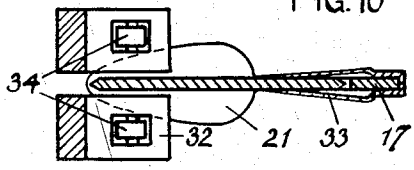


FIG. 20

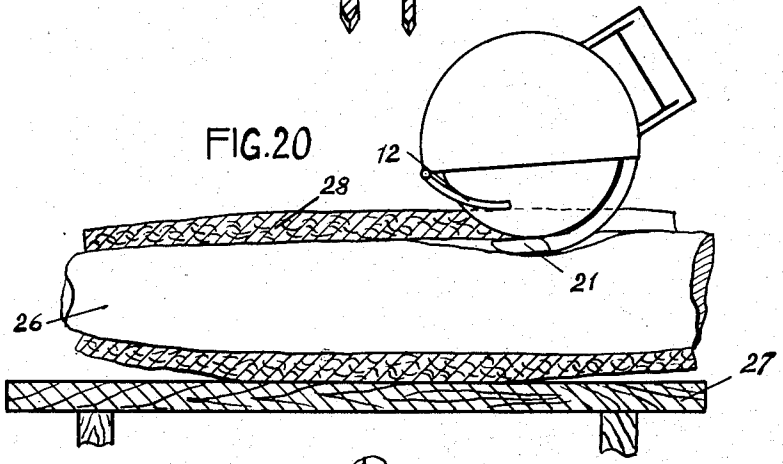


FIG. 18

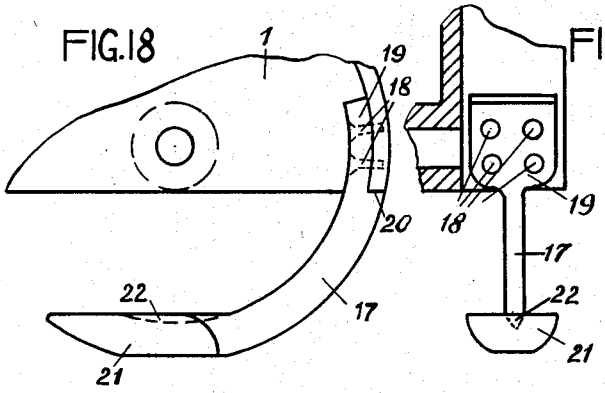


FIG. 19

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UNITED STATES PATENT OFFICE

2,084,488

CUTTING MACHINE

Herbert J. Heller, New York, N. Y.

Application June 15, 1935, Serial No. 26,769

5 Claims. (Cl. 128—317)

The present invention relates to a machine for cutting a hard cover of a yielding material. The main object of the invention is to provide means for easily cutting plaster casts, and to facilitate thus the physician's work when removing such cast from a limb of a person bandaged therewith.

Another object of the invention is to provide a machine of the above mentioned type which may be applied without any danger to the bandaged person.

Another object of the invention is to provide means for cutting plaster casts into two half shells in such a manner that these shells may be again attached to the limb from which the plaster cast had been removed by holding the shells together with for instance adhesive tape, bandages or the like.

The invention essentially consists of a cutter-blade, as for instance a rotating knife or saw disc, in a casing provided with a shoe adapted to be slid between the skin of the bandaged person and the cutting disc.

The invention furthermore consists of means for handling and guiding the cutter corresponding with its purpose, and it consists furthermore in means for releasing the bandaged person from pressure due to the weight of the cutting machine.

The invention also consists of certain means for guarding the bandaged person and the person applying the machine against injuries from the cutter-blade.

The invention furthermore consists of means resiliently supporting the cutter on the plaster cast to be cut, and guarding the bandaged person and the person operating the cutter against injuries by the cutting tool.

Further objects, details and advantages will be apparent from the following description and the drawings illustrating embodiments of my invention.

In the drawings are:

Fig. 1 a side elevation of the plaster cast cutter as per the invention;

Fig. 2 a front view;

Figs. 3 and 4 sectional views along lines 3—3 and 4—4 respectively of Fig. 1, certain accessorial parts being omitted;

Fig. 5 *a*, *b*, *c*, *d* sectional views of alternative modifications of the cutting edge and of the shoe arm at a place indicated by line 5—5 of Fig. 1;

Fig. 6 a top view and

Fig. 7 a sectional view of a modilcation;

Fig. 8 a schematical side view of parts of the modification of Figs. 6 and 7;

Fig. 9 a side view of another embodiment of my invention,

Fig. 10 a sectional view along line 10—10 of Fig. 9;

Figs. 11, 12, 14, and 16 side views of alternative modifications of cutter-blades partly broken away, Figs. 13 and 17 cross-sections along lines 13—13 and 17—17 of Figs. 11, 12, and 16 respectively, and Figs. 15*a* and 15*b* alternative cross-sections along line 15—15 of Fig. 14;

Figs. 18 and 19 side and front elevation respectively of a part of the embodiment illustrated in Figs. 1 to 4, and

Fig. 20 a schematical illustration of the application of the invention.

Referring now to the drawings and particularly to Figs. 1 to 4; a casing piece 1 is equipped with a bearing 2, in which a shaft 3 is journalled. A handle 4 is provided on casing piece 1 for carrying and operating the machine unit. Shaft 3 rotatable by any suitable means not shown carries a cutter-blade 5 coupled with the shaft 3 for rotation and pressed against collar 6 of the shaft by means of nut 7. A cover plate 8 is attached to casing piece 1 by means of screws 9, so that a larger segment of the cutter-blade 5 is housed within the casing formed by piece 1 and cover plate 8 while a smaller segment protrudes from the casing downward. At one of the lower edges of the circumference of casing piece 1, a hinge 10, with hinge bolt 11, is provided by means of which a guard 12 is pivotally connected with the casing. Guard 12 consists of two side portions 13 and 14 approximately of segment-shape, and of an arched bottom portion 15 which, however, is considerably shorter than the periphery of the side portions 13 and 14, and which is slotted opposite the cutter blade. The width of the bottom portion 15 is larger than the width of the casing piece 1 and its cover plate 8, and the width of the slot 16 in the bottom piece 15 is larger than the width of the cutter blade so that the guard 12 may be swung upward into the position indicated by dash-and-dot-lines in Fig. 1. In order to permit side 14 to clear bearing 2 for shaft 3 when the guard is being raised, side 14 is provided with a slot 14' as shown in Fig. 4.

Opposite hinge 10, a curved arm 17 is fastened to the lower portion of casing piece 1 for instance by means of screws 18. For this purpose, arm 17 has an upper plate-like extension 19 (see Figs. 18 and 19), recessed at 20 in relation to its outer contour in such a manner that the periphery of said arm forms the continuation of the contour of the casing piece 1. At its lower end, arm 17 carries a shoe or finger-like extension 21 tapered at its front portion and well rounded off all over so that said shoe may be easily and harmlessly passed between a plaster cast and the skin of the person bandaged with such plaster cast. Shoe

21 has a longitudinal groove 22 into which the lowest portion of the cutter blade 5 may enter.

In order to give further protection to the bandaged person as well as to the operator of the machine, the inner contour of arm 17 follows the circumference of the cutter blade with very little distance as illustrated in Figs. 5a and b. The cross section of arm 17 may either be rectangular as the arm 217 in Fig. 5b in order to spread the parts in the rear of the advancing cutter, or it may be of any other suitable form as for instance 117 in Fig. 5a. Further advantageous cross sections are shown in Figs. 5c and 5d in which the arm-cross sections 317 and 417 are provided each with a groove 47 entered by the cutter edge with little clearance. Groove 47 is the prolongation of groove 22 in shoe 21. The flanks of these grooves prevent, or make at least more difficult the entering of any matter between the cutting edge and arm 17.

Means are provided for resiliently supporting the machine unit upon the plaster cast during the cutting operation. For this purpose, a spring 23 is fastened with one end in a lug 24 of the cover plate 8, and wound around the hinge bolt 11. The other end of spring 23 is attached to a lug 25 of the guard 12 in such a manner, that it tends to urge the guard downward as to rest on shoe 21.

If now, as illustrated in Fig. 20, a bandaged limb, for instance a leg 26, is rested on a table 27, and if, the cutting machine is applied by sliding shoe 21 between the plaster cast 28 and the skin of the leg 26, then the guard 12 will be lifted against the tension of spring 23 shown in Figs. 1 and 2. Provided said spring being sufficiently strong, the weight of the cutting machine will entirely rest on the plaster cast proper which in turn is supported by the table 27, while shoe 21 is pressed upward against the inner surface of the plaster cast 28. Thus, leg 26 will be entirely released from the weight of the machine, and also from other operating forces, since the strength of a conventional plaster cast is amply sufficient to withstand all such forces which may accompany the cutting.

It is not necessary in the sense of my invention that part 12 is designed as a supporting member and simultaneously a guard as will be apparent from Figs. 9 and 10, in which accessorial parts are omitted for sake of clearness. In this case, member 32 is similar to bottom portion 15 of the guard 12 in Figs. 1 to 4 without side portions. Its main object is to resiliently support the machine unit upon the plaster cast during the cutting operation while its guarding effect is limited. Thus, any suitable means other than members 12 or 32 adapted to support the machine unit when bearing upon a plaster cast to be cut, are within the scope of my invention. In many cases, it is particularly advantageous to provide the supporting member with rollers such as for instance rollers 34 in order to facilitate the sliding of the machine over the surface of the plastic cast.

A separate and fixed guard such as 33 may be provided which consists of a metal plate bent as illustrated in Fig. 10 and resiliently bearing against the sides of the cutter blade 5. This guard 33 helps also to spread asunder the cut portions of the plaster.

Since the material of plaster cast, particularly if moist, has the tendency of sticking to the cutter, there is the danger that slot 16 in the supporting member 12, and groove 22 in shoe 21 become clogged. In order to prevent this drawback, I prefer to use scrapers, for instance such as illustrated in Figs. 1 and 3. For this purpose wall portions 36 and 37 of the casing piece 1 and the cover plate 8 respectively are inwardly inclined. Metal scraper sheets 38 and 39 are attached thereto as by screws 40 and bear against the sides of the cutter blade 5. The inclination of the scrapers has the result that material taken along by the cutter-blade will be transported to the outside of the casing. To the opposite sides of the inclined wall portions 36 and 37, pieces 41 and 42 of felt or the like are held by springs 43 and 44 so as to also bear against the sides of the cutter-blade 5. Greasing material may be applied to the felt pieces 41 and 42 through holes 45 and 46 respectively.

The machine may furthermore be equipped with a grinding appliance 147 as is conventional with rotary cutting tools of other designs.

I have found that for cutting plaster casts, tools of an actual cutting effect, that means of a cleaving effect, are preferable to those of a more saw-like, that means of a more ripping effect. Some embodiments of these preferable cutter-blades are illustrated in Figs. 11 to 17. In each case the cutting edge or edges are ground from both sides of the cutting blade or disc, the latter being either plane as in Figs. 13, 15b and 17, or biconcave as in Fig. 15a. The outer periphery of the cutter may either be an uninterrupted circle (Fig. 11) or it may be serrated as in Figs. 12, 14 and 16 in such a manner, however, that a so to speak cleaving, but not ripping edge of the individual tooth engages the material to be cut when the cutter blade rotating in the sense of the arrows in Figs. 12, 14 and 16 is advanced. In other words the blade may be provided with recesses 48 inclined in the direction of rotation as in Fig. 12, or teeth may be formed, the advancing edges 49 or 50 of which being ground from both sides as in Fig. 15 and 16 respectively.

In many instances, it may be desirable to cut not wholly through the entire plaster cast layer but to make only incisions of a predetermined depth. This may be done with the modified embodiment as illustrated in Figs. 6 and 7. In this case, the bearing of the cutter-blade shaft is movable in relation to the shoe 21. Casing piece 51 to which shoe 21 is fastened is provided with a dove tail extension 52 and a bracket 55. Extension 52 has a slot 56 in which the cutter blade shaft 54 may be moved in vertical direction. The bearing 53 of shaft 54 is part of a piece 57 grooved at 58 and 59 in such a manner, that it embraces the dovetail extension 52, and may thus be moved up and down with regard to the casing piece 51. For this purpose a threaded spindle 63 is so attached to piece 57, that it may be turned but not axially displaced with regard to this piece. Bracket 55 has a threaded bore 64 and forms the nut for the threads of spindle 63. The head 65 of the latter is provided with means for turning the spindle 63, for instance with wings 66. If it is desirable to attach an electric motor for driving shaft 54, directly to the machine unit, piece 57 may be designed as a transmission casing housing. A set of helical gears 60 and 61 which form the transmission between the motor 62 and the cutter-blade shaft 54 may be rigidly connected with casing 57 in any suitable manner.

If spindle 63 is turned, casing 57 together with motor 62, shaft 54 and cutter blade 5, is moved up or down with regards to casing piece 51 thus varying the distance between the cutter blade 5 and the shoe 21.

Fig. 8 schematically illustrates the variation of

this distance. The lowest position of the cutter-blade 5 and its shaft 54 is shown in solid lines, while the dotted lines indicate a raised position of the periphery 5' of the cutter-blade and of the shaft 54'.

The distance between the lowest point of the periphery 5' and the shoe 21 determines the thickness of the material remaining uncut when the machine is applied.

Although I have described the machine as per my invention in its application for cutting plaster casts, I wish to emphasize that it may be used with equal advantage for cutting or removing the hard cover of a yielding matter without injury thereto, for instance the armoring of insulated cable leads, provided there is a possibility of urging the shoe between the yielding matter and the inner surface of its cover.

Although several embodiments of the invention have been illustrated and described herein, it will be obvious to those skilled in the art, that various modifications may be made in the detail of construction without departing from the principle herewith set forth.

I claim:

1. A machine for cutting a hard cover of a yielding matter, such as a plaster cast of a bandaged limb, comprising a casing, a power driven shaft, a bearing for said shaft in connection with said casing, a cutter-blade fixed on said shaft, and protruding with its cutting portion from said casing, supporting means for said casing adapted to movably bear upon the outer surface of a given hard cover of a yielding matter, a shoe-like member in rigid connection with said casing, protruding beneath the cutting portion of said cutting blade and adapted to be slid between said hard cover and said yielding matter, means for adjustably altering the height of said bearing in relation to said casing, and resilient means attached to said casing and said supporting means, being of sufficient strength to counteract substantially the weight of the machine and cutting forces, and tending to decrease the distance between said supporting means and said shoe-like member whereby the machine may be supported by said supporting means from the cover to which it is applied.

2. A machine for cutting a hard cover of a yielding matter, such as a plaster cast of a bandaged limb, comprising a casing, a cutter-blade shaft, a cutter-blade protruding with its cutting portion from said casing, supporting means for said casing, adapted to movably bear upon the outer surface of a given hard cover of a yielding matter, a shoe-like member in connection with said casing, protruding beneath the cutting portion of said cutting blade, and adapted to be slid between said hard cover and said yielding matter, a transmission for said shaft, a transmission housing with bearings for said shaft connected with said casing, a motor connected with said transmission, means for adjusting the position of said transmission housing and said motor in relation to said casing as to the distance of said cutter-blade shaft from said shoe-like member, and resilient means attached to said casing and said supporting means, being of sufficient strength to counteract substantially the weight of the machine and cutting forces, and being adapted to decrease the distance between said supporting means and said shoe-like member whereby the machine may be supported by said supporting means from the cover to which it is applied.

3. A machine for cutting a hard cover of a yielding matter, such as a plaster cast of a bandaged limb, comprising a casing, a power driven shaft journaled in said casing, a cutter-blade fixed on said shaft, and protruding with its cutting portion from said casing, supporting means for said casing hinged to the front part thereof and extending backward in the direction of cutting and adapted to bear on the outer surface of a given hard cover of a yielding matter while the machine is being advanced for cutting said cover, a shoe-like member in rigid connection with said casing, protruding beneath the cutting portion of said cutting blade and adapted to be slid between said hard cover and yielding matter, resilient means connected with said supporting means and said casing and tending to lift the casing in relation to the supporting means bearing upon the hard cover, whereby said shoe-like member may be pressed against the inner surface of said hard cover.

4. A machine for cutting a hard cover of a yielding matter, such as a plaster cast of a bandaged limb, comprising a casing, a power driven shaft journaled in said casing, a cutter-blade fixed on said shaft, and protruding with its cutting portion from said casing, a slotted guard hinged to the forward edge of said casing and extending backward in the direction of the cutting and being adapted to bear on the outer surface of a given hard cover of a yielding matter, while the machine is being advanced for cutting said cover, a shoe-like member rigidly connected with said casing and adapted to be slid between said hard cover and said yielding matter, and a spring connected to said guard and said casing, said spring being of sufficient strength to substantially counteract the weight resting on said guard, and tending to lift the casing in relation to the guard bearing upon the hard cover whereby said shoe-like member may be pressed against the inner surface of said hard cover.

5. A machine for cutting a hard cover of a yielding matter, such as a plaster cast of a bandaged limb, comprising a casing, a power driven shaft journaled in said casing, a cutter blade fixed on said shaft and protruding with its cutting portion from said casing, supporting means for said casing resiliently mounted on said casing and having a bearing portion adapted to bear on the outer surface of a given hard cover of a yielding matter while the machine is being advanced for cutting said cover, a shoe-like member in rigid connection with said casing, protruding beneath the cutting portion of said cutting blade and adapted to slide between said hard cover and said yielding matter, the bearing portion of said supporting means being movable in a backward and upward direction in relation to the advancing machine against the force of said resilient mounting means, and said resilient mounting means being of sufficient strength to substantially counteract the weight resting upon said supporting means.

HERBERT J. HELLER.