

July 5, 1932.

R. H. PIETZSCH

1,865,539

MICROTOME

Filed June 21, 1929

Fig. 1.

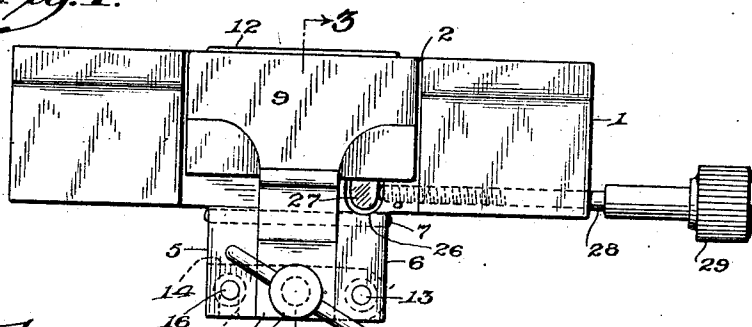


Fig. 2.

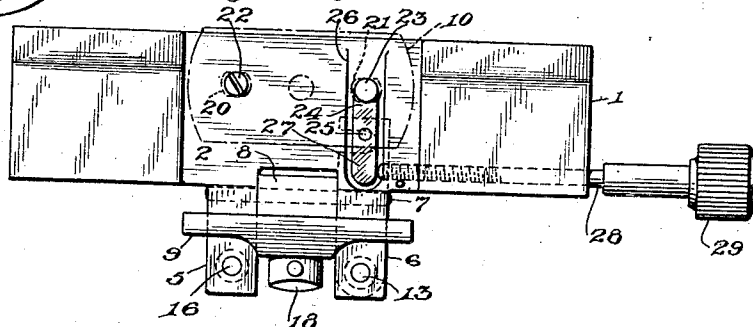


Fig. 3.

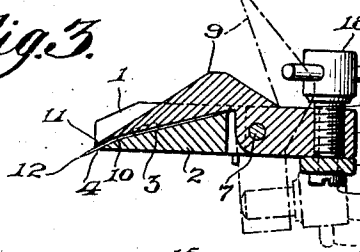


Fig. 5.

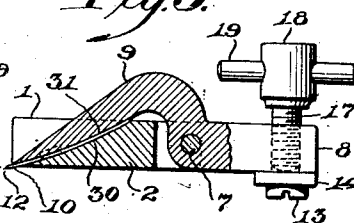
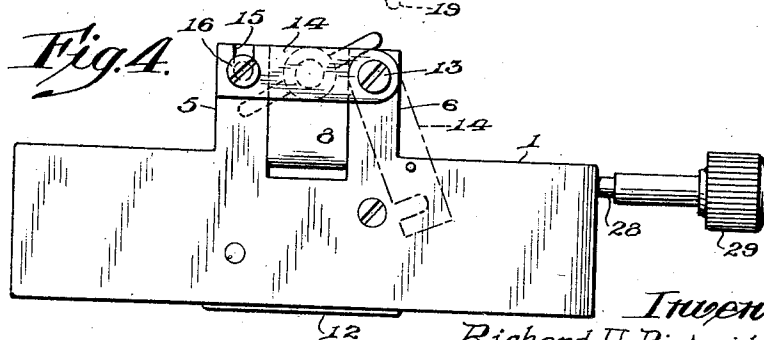


Fig. 4.



Inventor,
Richard H. Pietzsch,

by *J. Stuart Freeman,*
Attorney.

Witness:
Walter Chism.

UNITED STATES PATENT OFFICE

RICHARD H. PIETZSCH, OF PHILADELPHIA, PENNSYLVANIA

MICROTOME

Application filed June 21, 1929. Serial No. 372,587.

The object of the invention is to provide improvements in microtomes, and particularly in the means whereby the actual cutting edge of the blade is maintained to all intents and purposes unyieldingly in its holder or support, so that its predetermined shape or direction is positively maintained throughout the operation of cutting substantially any kind of material for which such a device is designed.

Primarily it should be understood that a microtome is an instrument used by various classes of research workers and students but principally those interested in the microscopic examination of micrometrically thin sections of biological and similar subjects. Such sections measure but a few thousandths of a millimeter in thickness and have at times been produced as thin as one-fifty-thousandths of an inch, or thereabouts.

The cutting of such a section requires not only an extremely sharp edged blade or knife, but demands a high grade of instrument as well. For this purpose the type of microtome knife heretofore employed has resembled a very heavy razor having concave opposite surfaces to produce the necessarily reinforced cutting edge. However, as certain tissues tend to rapidly dull a blade of even the finest grade of steel, a great amount of valuable time has been wasted by scientists in the frequent honing and stropping of the blade.

This deficiency has led to the use of the much thinner and much less expensive flexible blades of the so-called safety-razor type, but all known attempts along this line have resulted in failure, except for the cutting of relatively soft tissue and that in not too thin sections. This is due to the fact that the ordinary safety razor blade because of its thinness vibrates, or more properly speaking flexes, while passing through a relatively tough section such as through a bundle of muscles, nerves, gristle, or the like.

Such deficiency has been definitely overcome by securing the usual thin and ordinarily very flexible blade between opposed surfaces of a clamp which imposes upon the blade a lateral or transverse strain or tension, while upon said blade there is simulta-

neously imposed a relatively high degree of longitudinal strain or tension, with the result that for all intents and purposes the cutting edge of the blade is positively maintained in its predetermined position and direction, and frequently to an even greater degree than the free edge portion of a relatively much heavier and therefore stiffer blade such as has heretofore been used as above described.

Thus, by employing this improved blade holder a great saving of time is made possible, while the cost of the blades is very much less than those previously available. Also, if instead of always replacing a dulled blade by a new one, the first blade is to be sharpened, it is well-known that many devices have been perfected for the automatic and thorough grinding and honing of a flexible safety-razor blade, which could not possibly be used, and of which there is no counterpart for use, in sharpening a rigid, relatively heavy blade of the character referred to.

Having in mind these objects thus broadly stated, the present invention comprises further details of construction and operation, which are fully brought out in the following description, when read in conjunction with the accompanying drawing, in which Fig. 1 is a top plan view of the improved blade holder; Fig. 2 is a similar view with the clamping element in withdrawn position; Fig. 3 is a section on the line 3—3 of Fig. 1; Fig. 4 is a bottom plan view of the device shown in Fig. 1; and Fig. 5 is a section also on the line 3—3 of Fig. 1, but showing a slightly modified form of the device.

Referring to the drawing, the blade holder comprises a body portion 1, the central portion 2 of which has what will be referred to as an upper surface 3, extending in a diagonal direction so as to meet the normal under surface of the body at an edge 4, laterally disposed upon the opposite sides of the central portion 2, the body being of any suitable shape sufficient to insure rigidity and afford portions for clamping or otherwise securing the device in operative position in a machine.

The normal rear side of said central portion is provided with spaced parallel arms 5

and 6, between which is pivotally supported upon a pin 7 the supporting arm 8 of a blade-securing member, having a head portion 9, which is adapted to lie parallel with the surface 3 and secure a flexible blade 10 therebetween, said head being tapered in a normal forward direction to a terminal edge portion 11 which registers with the edge 4 of the blade-supporting portion 2, said blade when in operative position providing a freely extending cutting edge 12, as clearly shown in the drawing.

Pivotally secured by any suitable means 13 to the normal under side of the arm 6 is a link or auxiliary arm 14, which at its opposite end is provided with a U-shaped recess adapted to normally receive a lug or bolt 16, which cooperates with the pivotal means 13 to normally secure said link in substantially tight sliding-fit relation with the under surface of said arms. The arm 8 of the clamping member is in turn provided with a bolt 17, having a head 18, provided with finger-engaging wings or pins 19, whereby when in operative position, as shown in full lines in Fig. 3, screwing said bolt downwardly until it extends through its supporting arm and engages the link 14, causes a variable pressure of predetermined degree to be imposed by the head 9 upon the blade 10 between said supporting surfaces. In order to remove said blade for reclamping, replacement, or readjustment, the bolt 17 is released until free of engagement with the link 14, after which said link is oscillated into the dot-and-dash position shown in Fig. 4, so that the arm 8 is then free to oscillate into its dot-and-dash position, as shown in Fig. 3, thereby removing the head 9 from its normal position adjacent to and in binding relation with the blade.

It is also to be noted that it is preferable to provide the adjacent surfaces of the blade-supporting portion 2 and the head 9 with a slight degree of curvature adjacent to their free edge portions in order to cause both the longitudinal and transverse stiffening of the blade, in addition to the tension means hereinafter described. This also insures the blade's cutting edge 12 projecting beneath the plane of the lower surface of the body 1.

While any desired type of blades may be used in this device, a well-known type of blade has been illustrated as being provided with spaced apertures 20 and 21. Through the aperture 20 normally extends a lug 22 fixedly carried preferably by the supporting section 2, though it might be carried by the clamping head 9. Through the second aperture 21 extends a lug or projection 23 carried by a lever 24, which is pivotally secured at 25 within a transversely extending recess 26 in the surface of the blade-supporting portion 2 of the holder. The opposite end portion 27 of said lever is normally engaged

by a screw 28, having a preferably knurled finger-engaging and freely extending end portion 29. Thus, when the blade has been positioned upon the supporting portion 2 and clamping head 9 secured in position with a certain initial pressure imposed thereby upon the blade, rotation of the screw head 29 causes the lever 24—27 to be moved upon the pivotal portion 25 in such manner that the distance between the centers of the lugs 22 and 23 is increased, thereby imposing upon the blade a distinct and, if desired, very great longitudinal tension, after which the remainder of the desired clamping tension may be imposed upon the blade by further tightening the bolt 17. Obviously, to release the blade, this series of operations is reversed, so that by reversely rotating the head 29, the screw 28 permits the lever lug 23 to approach the fixed lug 22 and release the blade as soon as the bolt 17 has also been released and the link 14 has been rotated into inoperative position.

Referring to Fig. 5, similar numerals are employed to designate parts which are substantially the same as those shown in Fig. 3, but it will be noted that the upper face 30 of the central portion 2 of the holder is slightly concave, and that the oppositely disposed lower face 31 of the oscillatory head portion 9 is correspondingly convex, with the result that a blade secured therebetween is slightly flexed, in order that the freely projecting edge 12 lies more nearly in the plane of the under surface of said central portion 2 than is the case in that form of the device shown in Fig. 3. As a result of this construction the cutting head with a blade operatively supported thereby tends to permit the production of much thinner and more uniform cross sections, than is possible with that form of the device first described.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States is:—

1. A blade holder, comprising a body portion having a blade-supporting surface, a member pivoted to said body and having a surface opposed to said first surface, said body and said member having arms together extending upon the side of the pivot opposite to said surfaces, and means to adjust the relative positions of said arms to vary the pressure upon a blade between said surfaces.

2. A blade holder, comprising a body portion having a blade-supporting surface, a member pivoted to said body and having a surface opposed to said first surface, said body and said member having arms together extending upon the side of the pivot opposite to said surfaces, an auxiliary arm pivotally carried by one of said arms and means carried by the other of said arms and engaging said auxiliary arm when in operative position to adjust the relative positions of said arms

to vary the pressure upon a blade between said surfaces.

3. A blade holder, comprising a body portion having a blade-supporting surface that is irregular, a member pivoted to said body and having a similarly shaped surface opposed to said first surface, said body and said member having arms together extending upon the side of the pivot opposite to said surfaces, and means to adjust the relative positions of said arms to vary the pressure upon and the shape of a blade between said surfaces.

4. A blade holder, comprising a body portion having a blade-supporting surface that is irregular, a member pivoted to said body and operative with said surface to flex a blade into substantial conformity with said surface, said body and said member having arms together extending upon the side of the pivot opposite to said surfaces, and means carried by one arm and engaging the other arm to adjust the relative positions of said arms to vary the pressure upon and the shape of a blade between said surfaces.

5. A blade holder, comprising a body portion having a blade-supporting surface provided with fixed and relatively movable projections, a member carried by said body and having a surface opposed to said first surface, means to secure said body and member together with a blade therebetween having edge portions in engagement with said projections, and means to adjust said movable projection with respect to said fixed projection to place upon the blade a tension.

6. A blade holder, comprising a body portion having a blade-supporting surface provided with fixed and relatively movable projections, a member pivoted to said body and having a surface opposed to said first surface, means to adjustably secure said body and member together with a blade therebetween having edge portions in engagement with said projections, and means to adjust said movable projection with respect to said fixed projection to place upon the blade a variable longitudinal tension.

7. A blade holder, comprising a body portion having a blade-supporting surface, and a member pivoted to said body and having a surface opposed to said first surface, said body and said member having arms together extending upon the side of the pivot opposite to said surfaces, one arm having a pivotal extension and the other arm carrying an adjustable screw engageable with said extension when in operative position, to adjust the pressure upon a blade between said surfaces.

8. A blade holder, comprising a body portion having a blade-supporting surface, a member pivoted to said body and having a surface opposed to said first surface, said body and said member having arms together extending upon the side of the pivot opposite

to said surfaces, one arm having spaced projections, a link movably mounted upon one projection and normally engageable with the other projection, and a screw carried by the other arm and engageable with said link, to vary the relative positions of said arms and thereby vary the pressure upon a blade between said surfaces.

9. A blade holder, comprising a body portion having a blade-supporting surface, a member pivoted to said body and having a surface opposed to said first surface, said body and said member having arms together extending upon the side of the pivot opposite to said surfaces, one arm having spaced projections, a link movably mounted upon one projection and normally engageable with the other projection, and a screw carried by the other arm and engageable with said link, to vary the relative positions of said arms and thereby vary the pressure upon a blade between said surfaces, said link being movable upon the release of said screw free from said second projection to permit the second arm to swing between the projections of the first arm in separating said surfaces to remove the blade from therebetween.

10. A blade holder, comprising a body portion having a blade-supporting surface, a member carried by said body and having a surface opposed to said first surface, means to hold one portion of a blade between said surfaces relatively fixed longitudinally, and means to engage another portion of said blade and movable in the plane of the blade to place an adjustable longitudinal tension upon the same.

11. A blade holder, comprising a body portion having a blade-supporting surface, a member carried by said body and having a surface opposed to said first surface, means to hold one portion of a blade between said surfaces relatively fixed longitudinally, and means to engage another portion of said blade and movable in the plane of the blade to place an adjustable longitudinal tension upon the same in the plane of the blade.

12. A blade holder, comprising a body member having a blade-supporting surface, a second member carried by said body member and having a surface opposed to said first surface, means to hold one portion of a blade between said surfaces relatively fixed, a lever pivotally carried by one of said members and extending between them, said lever having a blade-engaging portion, and adjustable means to oscillate said lever to impose upon said blade a tension in its own plane.

13. A blade holder, comprising a body member having a blade-supporting surface, a second member carried by said body member and having a surface opposed to said first surface, an upstanding lug to hold one portion of a blade between said surfaces relatively fixed, a lever pivotally carried by one of

said members and extending between them, said lever having an upstanding blade-engaging lug, and a screw to oscillate said lever to impose upon said blade a tension in its own plane.

14. A blade holder, comprising a pair of pivoted members, means to secure one portion of a blade relatively fixed between said members, adjustable means to engage another portion of such blade and to impose thereupon a variable tension in the plane of the blade, and means to adjustably bind said members together to prevent undesired flexing of the blade due to said tension.

15. A blade holder, comprising a pair of pivoted members, a projection of one member being adapted to engage an edge portion of a blade between said members, a lever carried by one of said members and having a projection adapted to engage another edge portion of such blade, means to adjustably oscillate said lever to tension said blade in its own plane, and means to adjustably clamp said members together to predetermine the permissible degree of flexing of the blade when under tension.

16. A blade holder, comprising a body portion having a curved blade-supporting surface, a member pivoted to said body and having a curved surface conforming with and opposed to said first surface, said body and said member having arms together extending upon the side of the pivot opposite to said surfaces, and means to adjust the relative positions of said arms to vary the curvature and pressure upon a blade between said surfaces.

17. A blade holder, comprising a body portion having a curved blade-supporting surface, a member pivotally carried by said body and operative to force a flexible blade into conformity with said first surface, means to hold one portion of a blade between said surfaces relatively fixed longitudinally, blade-engaging means movable with respect to said first means and operative to place upon said blade a longitudinal tension, and means to adjustably clamp said body and said member together to curve a blade between them and to predetermine the permissible degree of flexing of such blade.

In testimony whereof I have affixed my signature.

RICHARD H. PIETZSCH.