June 6, 1967 L. C. JOHNSON 3,323,211

HOLDER FOR DETACHABLE BLADE

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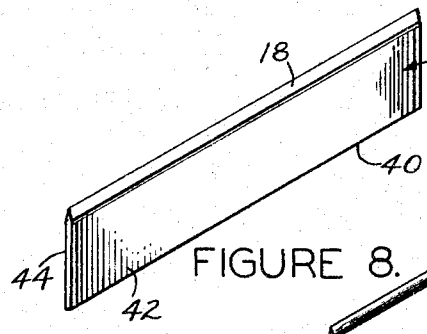


FIGURE 8.

FIGURE 1.

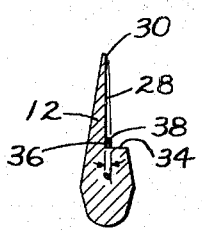


FIGURE 4.

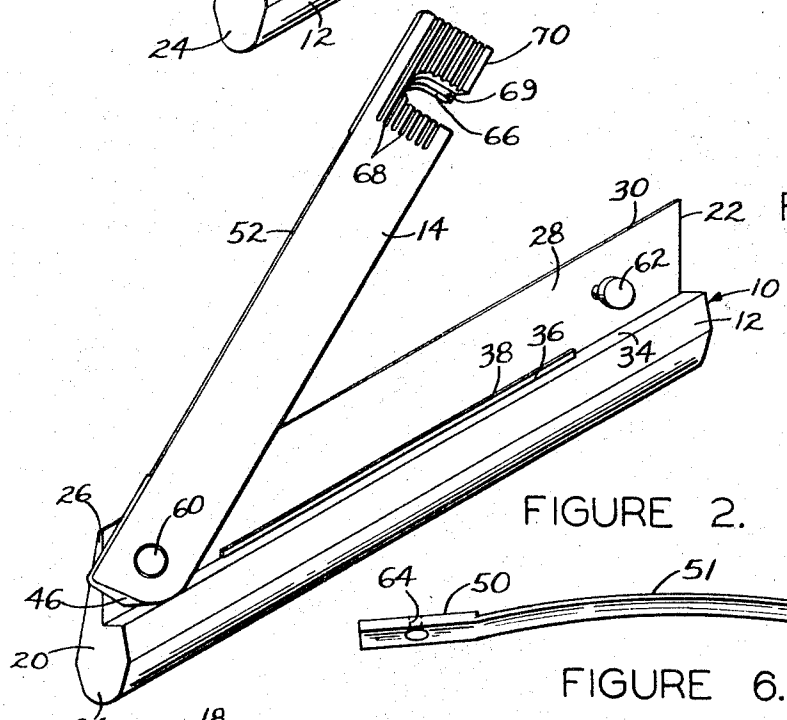


FIGURE 2.

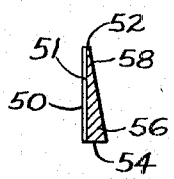


FIGURE 5.

FIGURE 6.

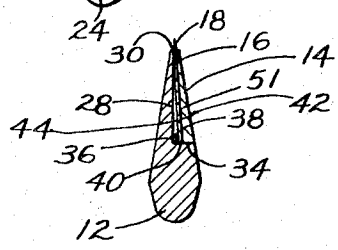


FIGURE 3.



FIGURE 7.

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HOLDER FOR DETACHABLE BLADE

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This invention relates to a holder for an elongated blade. More particularly, it relates to a device for rigidly supporting a relatively thin flat microtome blade.

A microtome is a well-known device for cutting biological specimens into thin slices for subsequent microscopic examination. Since the biological specimens are usually sliced while they are quite solid, the microtome blade must have a high quality cutting edge to be able to penetrate such solid specimen and produce the desired thin slice. The solid biological specimens can be sliced at room temperature while impregnated with a paraffin matrix, or they can be sliced at low temperatures while frozen. It is a well-known problem in the prior art that the microtome blades must be sharpened quite frequently in order to maintain the desired high quality cutting edge. Such frequent sharpening of prior art microtome blades is expensive and laborious.

As mentioned above, microtomes ordinarily slice biological specimens which are in a solid form. When the microtome blade comes in contact with the specimen, the impact can cause mechanical distortion in the cutting edge of the microtome blade and result in slices which are not uniform in thickness. In order to minimize any impact distortion of the cutting edge, the prior art microtome blades have been quite massive in order to impart rigidity to the cutting edge. The bulk of the blade was also employed to minimize any tendency of the cutting edge to vibrate during a cutting operation. Sharpening of the cutting edge of a prior are microtome blade required not only removal of the massive blade from the microtome blade holder but also handling such massive blade during the sharpening process. Moreover, if the microtome is to be usable while the blade is being sharpened, an expensive inventory of microtome blades must be maintained.

It has been suggested in the prior art that relatively thin blades, such as razor blades, be employed in a microtome. Such thin blades have the advantages of being easily replaceable when they become dull and are easier to handle than the massive blades. However, the use of such relatively thin blades has not heretofore been successful since no satisfactory blade holder was available which could properly support the thin blade in a manner to prevent substantial cutting edge distortion during slicing operations. Thin blades are more susceptible to impact distortion than the massive blades and for this reason have heretofore tended to produce unsatisfactory non-uniform specimen slices.

It is an object of the present invention to provide an improved holder for relatively thin microtome blades.

It is a further object of the present invention to provide a holder which rigidly supports relatively thin microtome blades and minimizes cutting edge impact distortion.

It is still a further object of the present invention to provide a holder for relatively thin microtome blades which has an overall size and configuration similar to prior art microtome blades and can thus be used in prior art microtome equipment.

FIGURE 1 is an isometric view of the improved microtome blade holder of the present invention supporting a relatively thin microtome blade;

FIGURE 2 is an isometric view similar to FIGURE 1 but showing the improved holder in an opened position with the microtome blade removed;

FIGURE 3 is a view along line 3—3 of the device of FIGURE 1;

FIGURE 4 is a view similar to FIGURE 3 but showing only the base member of the improved blade holder;

FIGURE 5 is a view similar to FIGURE 3 but showing only the clamp member of the improved blade holder;

FIGURE 6 is a plan view of the clamp member of the improved microtome blade holder, the camber of the clamp being exaggereated for purposes of illustration;

FIGURE 7 is an end view of a prior art microtome blade to the same scale as FIGURE 3; and

FIGURE 8 is an isometric view of the relatively thin microtome blade of FIGURE 1 removed from the improved blade holder.

In accordance with the present invention a novel holder is provided for rigidly supporting a relatively thin microtome blade. As shown in FIGURE 1, the holder **10** comprises a base member **12** and a clamp member **14**. A relatively thin microtome blade **16**, of the type shown in FIGURE 8, is adapted to be supported between the base member **12** and the clamp member **14** with its beveled cutting edge **18** exposed, as shown in FIGURE 1. The clamp member **14** is pivoted to base member **12** for movement between the closed position shown in FIGURE 1, wherein it cooperates with said base member to rigidly support microtome blade **16** and the open position shown in FIGURE 2, permitting removal and replacement of the microtome blade.

As shown in FIGURES 2 and 4, the base member **12** is an elongated member having a first end **20** and a second end **22** with a transverse cross-section which generally tapers from a relatively thick lower portion **24** to a relatively thin upper portion **26**. Base member **12** has a cut-out portion forming a generally flat vertical surface **28** terminating at its upper edge in a first longitudinal shoulder means **30** and at its lower edge intersecting a generally flat horizontal surface **34** substantially normal to said surface **28**. An elongated step **36** of rectangular cross-section defining a second shoulder means is positioned at the intersection of the surfaces **28** and **34** and extends longitudinally a distance preferably equal to the length of the relatively thin microtome blade **16** to be supported by the holder **10**. The specific dimensions as to height and width of the step **36** are not critical, however it is preferred to maintain the angle α shown in FIGURE 4 at a value not to exceed 1°. The angle α is measured between the plane of the surface **28** and the plane including the upper longitudinal edge **30** of surface **28** and the outer longitudinal edge **38** of the step **36**.

When the relatively thin microtome blade **16** is supported by holder **10**, the bottom edge **40** of blade **16** rests on the longitudinal surface **34** in contact with and in longitudinal registry with the step **36**. Pressure from clamp member **14** is applied to the outer face **42** of blade **16** (FIGURE 3) forcing the inner face **44** of said blade into contact with the upper longitudinal edge **30** of the flat face **28** and the edge **38** of step **36**, thus affording clamping engagement of the blade adjacent its upper and lower edges along the full length thereof which provides a highly efficient rigid support which minimizes any blade distortion or vibration. Shoulder means **30** and **38** each have a length at least as great as the microtome blade **16** and are spaced apart a distance slightly less than the distance between edges **18** and **40** of blade **16**.

Clamp member **14**, as shown in FIGURES 1, 2, 5 and 6, is an elongated member of truncated wedge shaped transverse cross-section having a generally flat inner vertical surface **50**, a longitudinal upper edge surface **52** and a longitudinal lower edge surface **54**. The distance between edge surfaces **52** and **54** is at least as great as the distance between shoulder means **30** and **38**. The trans-

verse cross-section of the clamp member **14** tapers from a relatively thick lower portion **56** to a relatively thin upper edge portion **58**. As viewed from the top in FIGURE 6, surface **50** of clamp member **14** has a middle portion removed to form a groove having a depth substantially equal to the thickness of a microtome blade **16** and having a longitudinal width slightly longer than the length of microtome blade **16**. This groove has a flat vertical surface **51** which is substantially parallel to surface **50**. As also shown in FIGURE 6, the clamp member **14** has a slight inwardly convex longitudinal camber or bow along the groove surface portion **51** of surface **50**. This camber provides the desired pressure against face **42** of the blade when the holder is closed as shown in FIGURES 1 and 3. The end portions of the clamp member beyond the groove surface **51** are tangent to the curve of the cambered portion.

The clamp member **14** is pivotally connected at one end to the base member by means of a first shoulder rivet **60** extending from the member **12** normal to the flat surface **28** and located near the first end **20** of said member. A second shoulder rivet **62** extends from the member **12** normal to the flat surface **28** and is located near the second end **22** of said member. Clamp member **14** has a counterbored passage **64** normal to surface **50** in which the shoulder rivet **60** is received, and it also has a rounded end portion **46** permitting pivotal movement about the axis of said rivet. Clamp member **14** also has a slot **66** at its other end extending upwardly from its lower longitudinal edge surface **54** in a position to cooperate with the rivet **62**. The slot **66** has a width slightly larger than the diameter of the shank of the rivet **62** and smaller than the head thereof. The outer face of the clamp member **14** is cut away at the margin of slot **66** to provide a U-shaped surface **69** substantially parallel with the inner surface **50** for engagement with the inner end surface of the head of the rivet **62** when the clamp member is in the closed position of FIGURE 1. When the clamp member **14** is in closed position with the blade **16** in the operative position described, the surface **51** of said member is in contact with substantially the entire outer surface **42** of the blade **16**, and the end portions of the surface **50** adjacent the rivets **60** and **62** are in contact with adjacent portions of the surface **28** of base member **12**. Thus, when the clamping member **14** is in the closed position shown in FIGURE 1, the normally bowed middle portion of said member is deflected to bring the inner surface **51** into substantial parallelism with the plane of the shoulder means **30** and **38**, and this deflection exerts substantial forces rigidly clamping the blade **16** between the member **14** and said shoulder means.

The clamping member **14** can be swung from the closed position of FIGURE 1 to the open position shown in FIGURE 2 permitting removal and replacement of the blade **16**. A plurality of stations **68** are located around the slot **66** to provide a friction surface to aid in moving the clamp member **14** on and off rivet **62**. Clamp member **14** also preferably has its lower edge portion cut away from the slot **66** to the adjacent end of said member to provide a surface **70** which is spaced from the horizontal surface **34** of the base member **12** when the clamp member **14** is in the closed position of FIGURE 1. A coin, for example, or a tool can be introduced between the surfaces **34** and **70** and turned to aid in releasing the member **14** from engagement with the rivet **62**.

As shown in FIGURES 1 and 3, the relatively thin microtome blade **16** is supported in a manner so that only the cutting edge **18** is exposed. This provides maximum support to the blade and minimizes distortion and vibration.

A comparison between FIGURES 3 and 7 shows that the overall size and configuration of the novel holder and supported thin blade shown in FIGURE 3 is substantially the same as the size and configuration of the prior art massive microtome blade shown in FIGURE 7.

This enables the novel holder to be used in microtome equipment designed to support the prior art massive blade without any further apparatus modifications.

In summary the present invention relates to an improved holder which supports a relatively thin microtome blade in a rigid manner which minimizes blade distortion and vibration.

What is claimed is:

1. A holder capable of rigidly supporting a relatively thin flat elongated blade having spaced opposite upper and lower longitudinaal edge portions, at least one of which terminates in a sharpened cutting edge, said blade also having an inner face and an outer face said holder comprising (1) a base member which comprises a generally flat surface with a first longitudinal edge forming a first shoulder means and a second longitudinal edge, said base member also having positioned along said second longitudinal edge an elongated step of rectangular cross-section with an outer longitudinal edge forming a second shoulder means, the plane between said first shoulder means and said second shoulder means forming an acute angle with the generally flat surface of said base member said first and second shoulder means each having a length at least as great as said blade and being spaced apart a distance slightly less than the distance between the opposite longitudinal edge portions of said blade, said holder being adapted to receive said blade in an operative position on said base member wherein the inner face of said blade abuts both said first and second shoulder means along the full length of said inner face (2) an elongated clamp member having a generally flat surface disposed in facing relation with said first and second shoulder means, said clamp member having at least a middle portion thereof normally bowed toward said shoulder means, said clamp member surface having a length at least as great as said blade and a width at least as great as the distance between said shoulder means, and (3) means connecting the end portions of said clamp member to said base member in a manner to deform said clamp member surface into contact with the outer surface of said blade and into substantial parallelism with said shoulder means, said holder thus being adapted to hold said blade in said operative position securely clamped between said clamp member and both of said shoulder means with the cutting edge of said blade exposed adjacent said first shoulder means.

2. A holder for a relatively thin flat microtome blade comprising base member and clamp member rotatably mounted to said base member and capable of supporting a relatively thin flat microtome blade between said clamp member and said base member, said base member comprising an elongated member having a first end and a second end and having a transverse cross-section which generally tapers from a relatively thick lower portion to a relatively thin upper portion, said base member having a longitudinal cut-out portion extending from the relatively thin portion of the cross-section taper toward the relatively thick portion of the cross-section taper, said cut-out portion providing a generally flat vertical surface and a generally flat horizontal surface, said generally flat vertical surface terminating at its upper edge in first longitudinal shoulder means and at its lower edge intersecting the generally flat horizontal surface, said cut-out portion also providing an elongated step of rectangular cross-section with an outer longitudinal edge defining second longitudinal shoulder means and located along the intersection of said vertical and horizontal surfaces, the plane between said first longitudinal shoulder means and said second longitudinal shoulder means forming an acute angle with the generally flat vertical surface of said base member, said base member also having a first shoulder rivet positioned normal to said generally flat vertical surface near said first end and a second shoulder rivet positioned normal to said generally flat vertical surface near said second end, said clamp member com-

prising an elongated member having a generally flat vertical surface, a longitudinal upper edge surface, a longitudinal lower edge surface and a transverse cross-section which generally tapers from a relatively thick portion located along the lower longitudinal edge to a relatively thin portion located along the upper longitudinal edge, said clamp member having a passage extending through the clamp normal to the generally flat vertical surface and located near one end of the clamp member and a slot located near the other end of the clamp member and extending transversely from the lower edge toward the upper edge, said generally flat vertical surface of the clamp having a slight convex longitudinal camber, said clamp member rotatably mounted to said base member whereby the first shoulder rivet of the base member extends through the passage of the clamp member and forms a pivot about which the clamp member rotates, said clamp member capable of being placed in a first position wherein the generally flat vertical surface of the clamp member is in proximity to the generally flat vertical surface and the elongated step of the base member, the lower longitudinal edge of the clamp abuts the horizontal surface portion of the base member and the slot in the clamp member is positioned around the second shoulder rivet of the base member, said clamp member also capable of being rotated to a second position wherein the generally

flat vertical surface of the clamp member is moved away from the generally flat vertical surface of the base member, said holder capable of supporting a relatively thin flat microtome blade having an inner face and an outer face with the outer face in contact with the convex longitudinal camber of the clamp member and the inner face abutting both the first and second longitudinal shoulder means of the base member when the clamp member is placed in said first position and capable of allowing the relatively thin flat microtome blade to be removed from the holder when the clamp member is placed in said second position.

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