July 19, 1966 A. J. HORN 3,261,600

SPECIMEN HOLDER FOR MICROTOME VISES

Filed Oct. 28, 1963 2 Sheets-Sheet 1

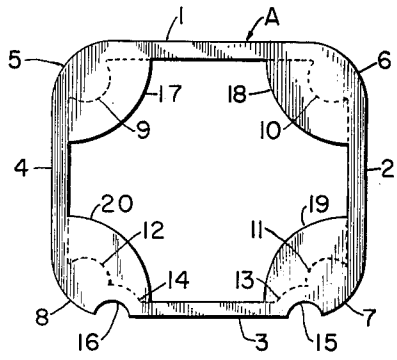



FIG. 1

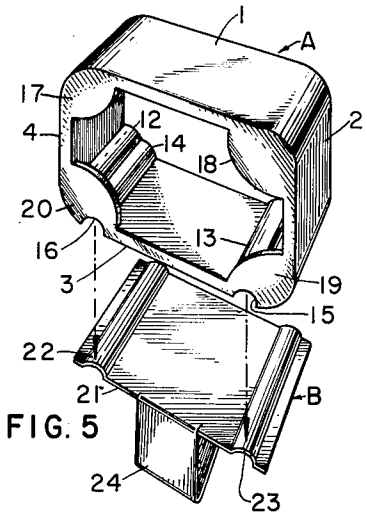



FIG. 5

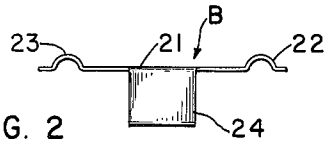



FIG. 2

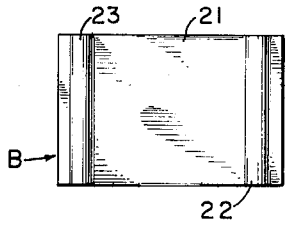



FIG. 4

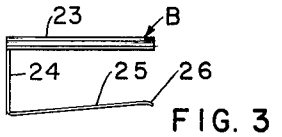



FIG. 3

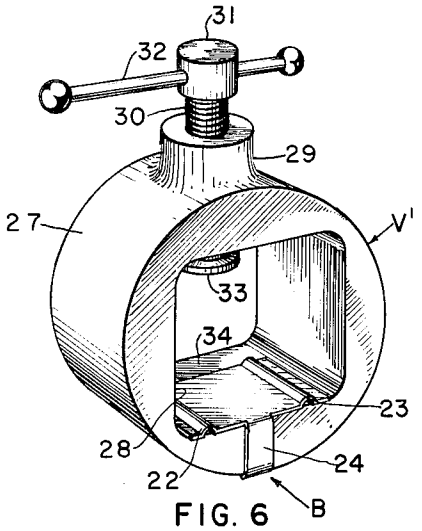



FIG. 6

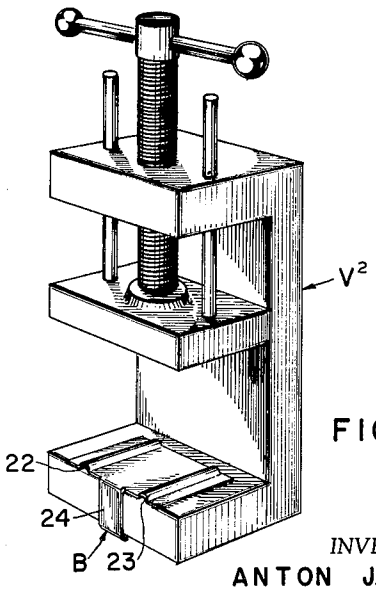



FIG. 7

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SPECIMEN HOLDER FOR MICROTOME VISES

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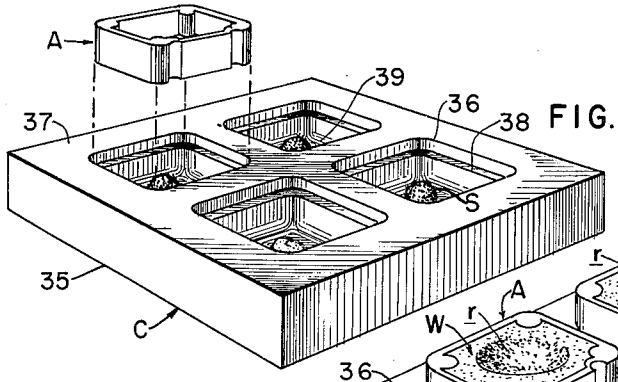



FIG. 8

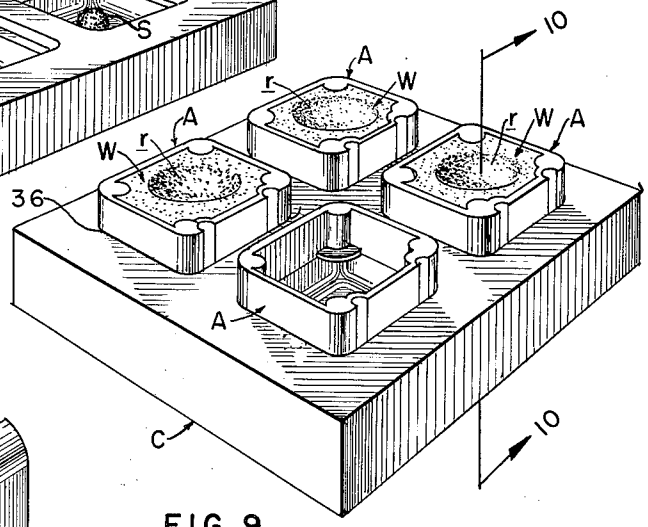



FIG. 9

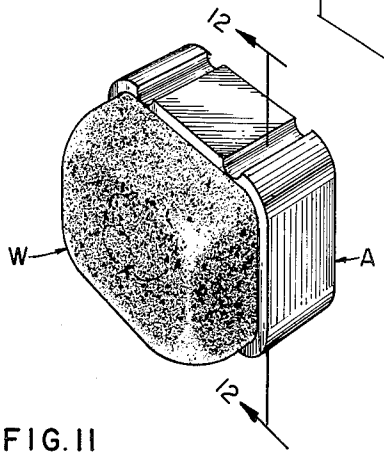



FIG. 11

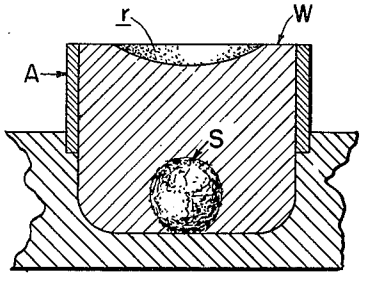



FIG. 10

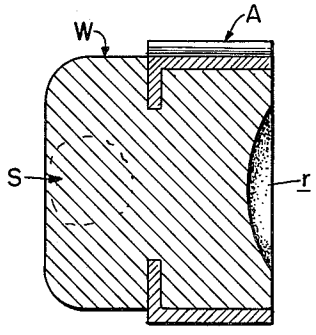



FIG. 12

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United States Patent Office 3,261,600 Patented July 19, 1966



3,261,600

# SPECIMEN HOLDER FOR MICROTOME VISES

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Filed Oct. 28, 1963, Ser. No. 319,145
11 Claims. (Cl. 269—321)

This invention relates in general to certain new and useful improvements in the technique of preparing biological tissue-specimens for microscopic examination, and, more particularly, to specimen holders for use in the vises or clamps ordinarily employed in microtomes.

At the present time, it is common practice to prepare samples of tissue for microscopic examination by embedding the tissue in a block of wax or other similar thermoplastic material, and chilling the tissue-carrying block until it is sufficiently firm so that it can be easily handled. The block is thereupon placed in a suitable clamp or vise which is part of a conventional microtome, and sliced into any desired number of very thin sections which are then mounted, in the usual manner, upon glass plates or so-called microscope slides. The wax blocks are ordinarily somewhat fragile and do not withstand clamping pressure. Therefore, it is conventional practice to mount such blocks upon the end face of a rod like handle or holder.

The conventional types of holders now in use, however, are somewhat cumbersome and cannot, after having been previously used, be reinserted in the microtome vise in a position which is accurately aligned with the position previously occupied. Consequently, if a series of slices are made from the specimen upon one occasion and it becomes desirable later on to make a series of further slices from the same specimen, the subsequent slice or slices will, in all probability, not be cut along the same plane as the earlier slices.

It is, therefore, the primary object of the present invention to provide a specimen holder and adapter for use in association therewith, whereby the specimen holder can be quickly and conveniently mounted in any type of vise or clamping device used with or forming part of a microtome.

It is another object of the present invention to provide a specimen holder and adapter for use in association therewith which affords means whereby the specimen holder can be removed from and inserted back into a microtome vise in substantially precise planar parallelism each time.

It is a further object of the present invention to provide a device of the type stated and means cooperative therewith for mounting a specimen in suitable thermoplastic embedding material quickly, conveniently, and precisely.

It is likewise an object of the present invention to provide a specimen holder and adapter for use in association therewith which are simple, convenient, and economical.

With the above and other objects in view, my invention resides in the novel features of form, construction, arrangement, and combination of parts presently described and pointed out in the claims.

In the accompanying drawings:

FIG. 1 is an end elevational view of the specimen holder constructed in accordance with and embodying the present invention;

FIGS. 2, 3, and 4, are end elevational, side elevational, and top plan views, respectively, of the adapter forming a part of the present invention;

FIG. 5 is an exploded perspective view of the specimen holder and adapter showing the manner of operative association therebetween;

FIGS. 6 and 7 are perspective views of two different commonly used types of microtome vises showing the manner of application thereto of the adapter forming a part of the present invention;



FIG. 8 is a partially exploded perspective view of a tissue-embedment plate forming a part of the present invention showing the manner in which the specimen holder is mounted thereon;

FIG. 9 is a perspective view of the tissue embedment plate, further illustrating the manner in which the tissue-specimen is embedded;

FIG. 10 is a fragmentary sectional view taken along line 10—10 of FIG. 9;

FIG. 11 is a perspective view of a specimen holder with a block of embedment material disposed therein in finally embedded form, the specimen holder being shown in upside-down position for clarity of illustration; and

FIG. 12 is a transverse sectional view taken along line 12—12 of FIG. 11.

Referring now in more detail and by reference characters to the drawings which illustrate practical embodiments of the present invention, A designates a specimen holder which is preferably die-cast from a suitable aluminum alloy or other similar material and integrally includes four rectilinearly arranged side walls 1, 2, 3, 4, which are endwise connected by arcuate corners 5, 6, 7, 8, the interior faces of which are thickened or enlarged to provide inwardly protruding pillar-like fillets 9, 10, 11, 12, adapted to serve dual functions of reinforcing the corners 5, 6, 7, 8, and providing additional retention surface within the interior of the specimen holder A, all as best seen in FIGS. 1 and 5 and for purposes presently more fully appearing.

The fillets 11, 12, merge into auxiliary fillets 13, 14, which are also of arcuate and somewhat pillar-like configuration, being concentric with outwardly opening channels 15, 16, formed in and extending transversely across the wall 3. Also formed integrally with the side walls 1, 2, 3, 4, and extending across the corners 5, 6, 7, 8, are corner flanges 17, 18, 19, 20, which are of quarter-circle shape and are flush on their outwardly presented or bottom faces with the bottom edge-faces of the side walls 1, 2, 3, 4. Moreover, as will be seen in FIGS. 1 and 5, the corner flanges 17, 18, 19, 20, are relatively thin in the transverse direction and are substantially larger in diametral size than the fillets 9, 10, 11, 12, so as to project inwardly for a substantial distance into the area bounded by the side walls 1, 2, 3, 4.

Provided for cooperation with the specimen holder A is an adapter B stamped or otherwise suitably formed from a piece of sheet metal and integrally including a substantially flat, rectilinear base-plate 21 having a pair of upwardly curved arcuate ribs 22, 23, which are of substantially the same cross-sectional shape as the channels 15, 16, and are adapted to fit snugly and precisely therein. It will, of course, be obvious in this connection that the transverse distance between the ribs 22, 23, is exactly the same as the transverse distance between the channels 15, 16. Moreover, the ribs 22, 23, are located a short distance inwardly from the transverse parallel margins of the plate 21, all as best seen in FIGS. 2 and 4.

Centrally of one of its longitudinal margins, the plate 21 is provided with a flat integral bight-member 24 which is, in turn, integrally provided at its lower margin with a rearwardly extending, substantially flat, spring-arm 25. As will be seen from FIG. 3, the spring-arm 25 is substantially as long as the transverse width of the plate 21 and is normally bent upwardly at a slight angle with respect thereto so as to have resilient spring-like gripping action. At its rear or so-called "open" end, the spring-arm 25 is rounded off to provide a slightly arcuate entry-lip 26, also as best seen in FIG. 3 and for purposes presently more fully appearing.

The adapter B can be mounted upon one conventional

type of microtome vise $V^1$ substantially as shown in FIG. 6. This type of microtome vise $V^1$ consists of a cylindrical metallic block **27** having a rectangular bore **28** extending axially and symmetrically therethrough. The block **27** is integrally provided with a radially outwardly projecting boss **29** which is centrally bored and internally tapped for receiving a clamping screw **30** which is integrally provided at one end with a head **31** having a diametrally extending rod-like handle **32**. At its other end, the clamping screw **30** is operatively provided with a somewhat loosely mounted rotatable clamping foot **33** which is disposed in somewhat parallel relation to the internal bottom face **34** of the bore **28**. The spring-arm **25** of the adapter B is slipped over the side wall of the block **27** so that the plate **21** comes to rest snugly upon the face **34**, and the inwardly presented surface of the bight-member **24** abuts against the flat forwardly presented surface of the block **27**. As will be seen by reference to FIG. 6, the ribs **22, 23**, project inwardly into the bore **28** and are more or less equidistantly on opposite sides of the clamping foot **33**. Once installed, the adapter B may be left permanently in place within the microtome vise $V^1$, and thereafter, any specimen holder A can be interchangeably placed within the microtome vise $V^1$ by simply backing off the clamping screw **30** and setting the specimen holder A within the bore **28** so that the channels **15, 16**, thereof, will be engaged with the ribs **22, 23**. Thereupon, the clamping screw **30** can be turned down until the clamping foot **33** is firmly engaged against the side wall **1** of the inserted speciment holder A, thereby holding it firmly within the microtome vise $V^1$. The interengagement between the channels **15, 16**, and the ribs **22, 23**, will serve to position the specimen holder A within the microtome vise $V^1$ in a position which is substantially central and coaxial within the bore **28**. Moreover, the adapter B will, of course, maintain a constant position of reference with respect to the microtome vise $V^1$ so that all specimen holders A which are inserted therein will assume the same relative position. Since the spring arm **25** will grip the block **27** very firmly, there is no tendency for the adapter B to change or shift its position if the microtome vise $V^1$ is handled with reasonable care. However, since the inner surface of the bight-member **24** is flat and abuts against the forwardly presented face of the block **27**, it serves as a referencing element, and, therefore, it is merely necessary to see that it is always pushed firmly into abutment as shown in FIG. 6. It is always possible, although not very likely, that the adapter B may slip slightly in a sidewise direction while the microtome vise $V^1$ is being handled, but this is not important, even if it happens to occur, because as long as the bight-member **24** is pushed into snug-fitting abutment against the forwardly presented face of the block **27**, the ribs **22, 23**, will be truly coaxial within the bore **28** and will accordingly position a specimen holder A in true coaxial position. As long as the specimen holder A is coaxial within the bore **28**, the specimens sliced on the outer surface thereof will be truly parallel-faced, and this is the really important consideration.

As users of microtomes will readily understand, the front-to-rear position of the specimen holder A within the microtome vise $V^1$ is not highly significant because the chuck of the microtome is always provided with some type of annularly operable feeding screw or other feeding mechanisms by which the microtome vise and specimen held therein can be carefully and precisely fed up to the plane of operation of the slicing-nut. Microtomes are also usually provided with visual scales or other gauging devices by which the user can determine the thickness of the slice which is to be cut. Inasmuch as microtomes and the operative elements thereof just mentioned are entirely conventional, no description or illustration thereof is included herein.

Another type of commonly used microtome wise $V^2$ is illustrated in FIG. 7 and the adapter B can be mounted therein as shown.

Provided for cooperation with the specimen holder A is a mounting plate C which consists preferably of a rectangular aluminum block **35** having a plurality of pockets or recesses **36**. Each of the pockets or recesses **36** is contoured around its top or upper end to conform to the external cross-sectional shape of the specimen holder A. A short distance downwardly from the top surface **37** of the mounting plate C each of the pockets **36** is provided with a narrow flat shoulder or ledge **38** which is approximately of the same width and the thickness of the side walls **1, 2, 3, 4**, of the specimen holder A. The lower portion of each of the pockets **36** is preferably rounded at the corners and side margins so that its side faces merge smoothly and arcuately into a flat bottom wall **39**, all as best seen in FIG. 8.

In this connection, it should be noted that the mounting plate C may be fabricated from a solid slab of aluminum by conventional machining techniques, but may, with equal facility, be made by either a sand-casting or die-casting process. It is also possible to employ other materials than aluminum, such as a synthetic resin, so long as the material used is capable of being finished to a rather smooth surface and possesses a reasonably acceptable co-efficient of heat-transfer as presently will become more fully apparent. It will also be obvious that, although the mounting plate C as shown and described herein has four recesses **36**, it is also possible to provide a larger or smaller number of such recesses **36**, if desired.

In use, a series of specimens S are placed within the pockets or recesses **36** of the mounting plate C and are manually placed in a more or less centralized position upon the bottom **39**, substantially as shown in FIG. 8. Thereupon, specimen holders A are set into the recesses **36** upon the ledges **38** and a molten embedment-material such as paraffin, for example, is poured into each of the recesses **36** so that it will flow around each specimen S and up into the specimen holders A until substantially level with the top surface thereof. Thereupon, the paraffin is allowed to cool until it solidifies, and this may be accomplished in any desired manner, although it is customary to place the mounting plate C in a suitable cooling chamber or refrigerator for this purpose.

As it cools, the paraffin or other embedment material will form a solid block W around the specimen S and, in cooling, will shrink slightly, thereby forming a shallow somewhat concave recess *r* in the outer end face. Because the normal shrinkage produces the recess *r*, the block W will remain in tight mechanical contact with the specimen holder A, but, neverthless, the downwardly projecting portion of the block W which is within the lower part of the recess **36**, will shrink just enough so that it will become slightly loose, and, as a result, the specimen holder A with the block W securely held therein can be readily lifted from the mounting plate C when the mounting procedure is finished, and the specimen S will be securely held within the outwardly protruding portion of the block W, thereby forming a completely mounted specimen, substantially as shown in FIG. 11.

It should be understood that changes and modification in the form, construction, arrangement, and combination the several parts of the specimen holder for microtome vises may be made and substituted for those herein shown and described without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

**1.** Means for positioning and holding a biological specimen in a microtome vise, said means comprising, in combination, a specimen holder including a rigid element adapted to engage and support a block of thermoplastic embedment material in which a biological specimen is mounted; said rigid element having indexing means, and an adapter comprising means for securely engaging the microtome vise whereby the adapter can be attached to said microtome vise in a fixed position, said adapter also having means adapted for engagement

with the indexing means of the specimen holder so that the specimen holder can thereby be inserted into and held within the microtome vise in a predetermined orientation.

2. A means for positioning and holding a biological specimen in a microtome vise as claimed in claim 1 wherein said rigid element has a plurality of indexing means thereon.

3. A means for positioning and holding a biological specimen in a microtome vise as claimed in claim 1 wherein said indexing means on said rigid element is comprised of grooves and said adapter has means for engagement with said grooves of the specimen holder so that the specimen holder can thereby be inserted into and held within the microtome vise in a predetermined orientation.

4. A means for positioning and holding a biological specimen in a microtome vise as claimed in claim 3 wherein said grooves in said rigid element are parallel, and wherein said adapter has means adapted for engagement with said parallel grooves.

5. A means for positioning and holding a biological specimen in a microtome vise as claimed in claim 1 wherein said adapter comprises spring clip means for engaging the microtome vise.

6. A means for positioning and holding a biological specimen in a microtome vise as claimed in claim 1 wherein said rigid element has grooves and wherein said adapter has ribs adapted for engagement with said grooves of the specimen holder.

7. A means for positioning and holding a biological specimen in a microtome vise according to claim 6 wherein said grooves in said rigid element are parallel and wherein said ribs in said adapter are parallel for engagement with the parallel grooves of the specimen holder.

8. A means for positioning and holding a biological specimen in a microtome vise according to claim 6 wherein said adapter has spring clip means for securely engaging said microtome vise.

9. A means for positioning and holding a biological specimen in a microtome vise according to claim 7 wherein said adapter has spring clip means for securely engaging the microtome vise.



10. Means for positioning and holding a biological specimen in a microtome vise, said means comprising, in combination, a specimen holder including a rigid element having side walls connected to form a hollow frame, a plurality of inwardly projecting flat flanges adapted to engage and support a block of thermoplastic embedment material in which a biological specimen is mounted; said rigid element having indexing means, and an adapter comprising means for securely engaging the microtome vise whereby the adapter can be attached to said microtome vise in a fixed position, said adapter also having means adapted for engagement with the indexing means of the specimen holder so that the specimen holder can thereby be inserted into and held within the microtome vise in a predetermined orientation.

11. Means for positioning and holding a biological specimen in a microtome vise, asid means comprising, in combination, a specimen holder including a rigid element having a plurality of flat flanges adapted to engage and support a block of thermoplastic embedment material in which a biological specimen is mounted; said rigid element having indexing means, and an adapter comprising means for securely engaging the microtome vise whereby the adapter can be attached to said microtome vise in a fixed position, said adapter also having means adapted for engagement with the indexing means of the specimen holder so that the specimen holder can thereby be inserted into and held within the microtome vise in a predetermined orientation.

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