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SEARCH ROOM

April 5, 1955 K. P. GEORGE ET AL 2,705,440

SLIT MECHANISM FOR MONOCHROMATOR

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T25 76

Fig. 1

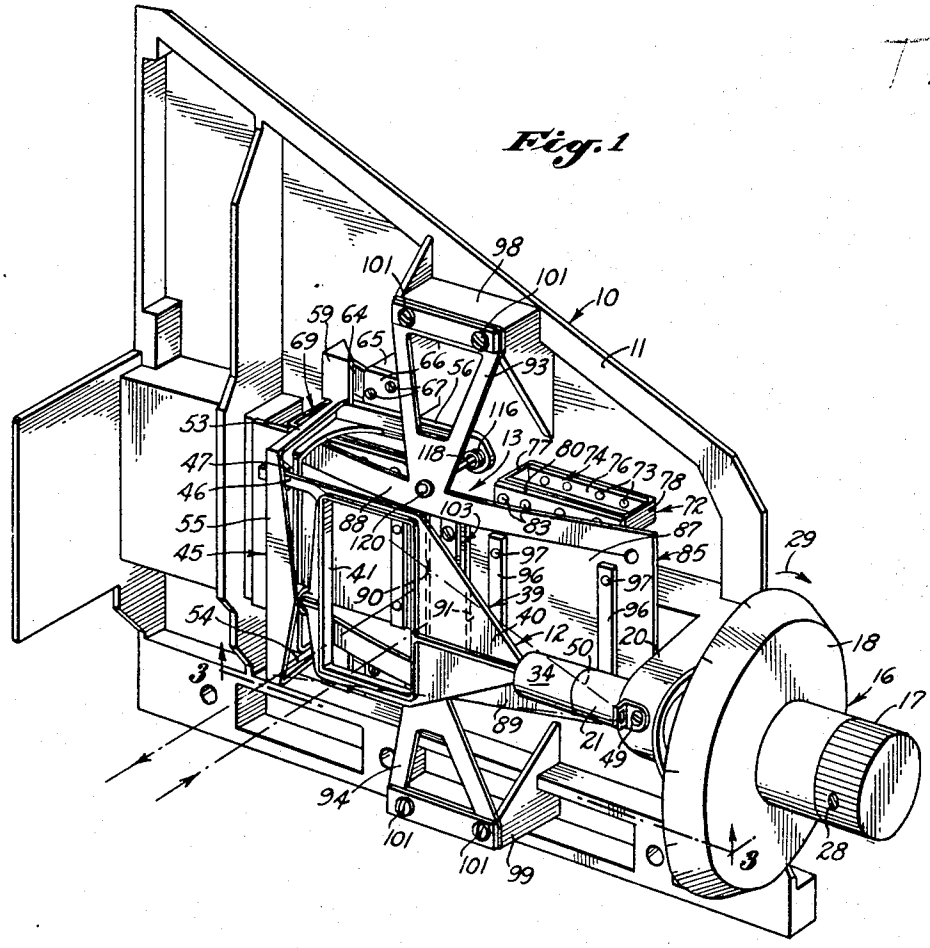
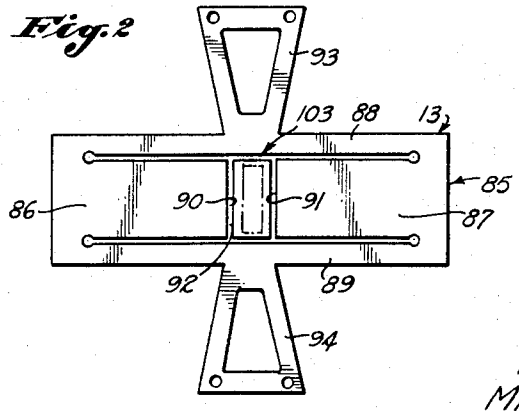


Fig. 2



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Fig. 3

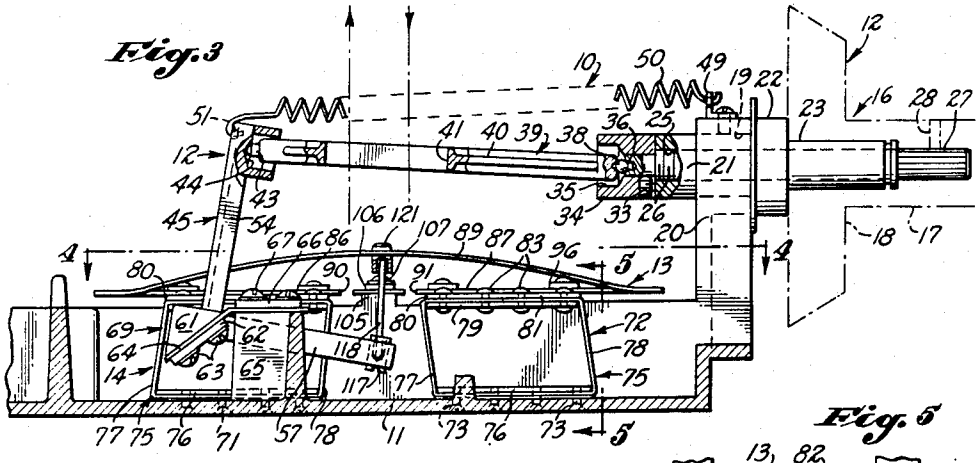


Fig. 5

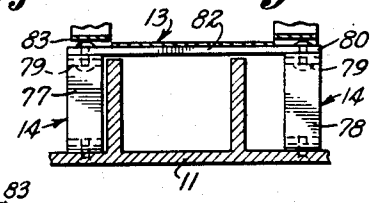


Fig. 4

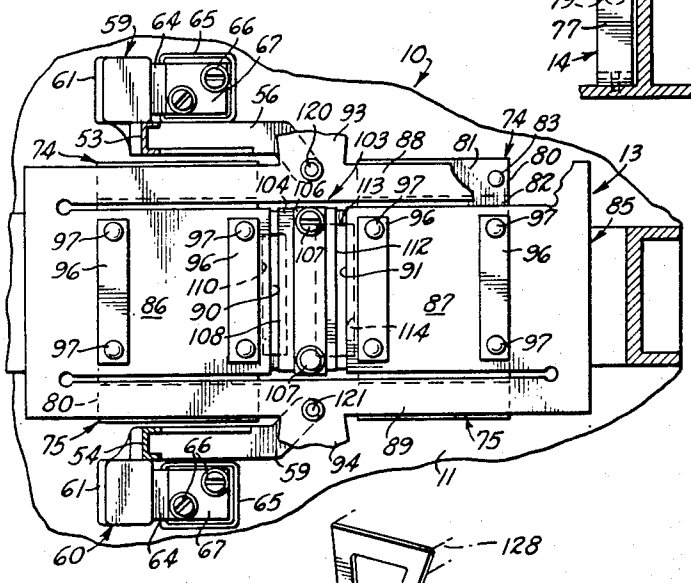
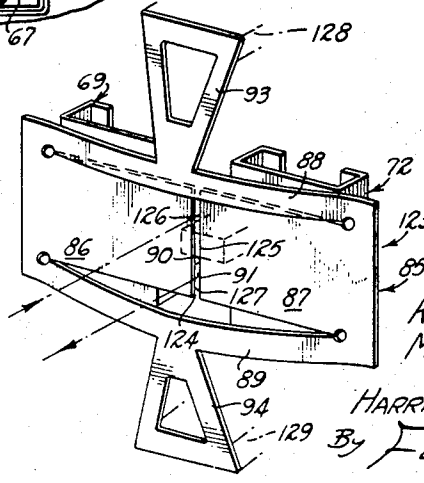


Fig. 6



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SLIT MECHANISM FOR MONOCHROMATOR

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Fig. 7

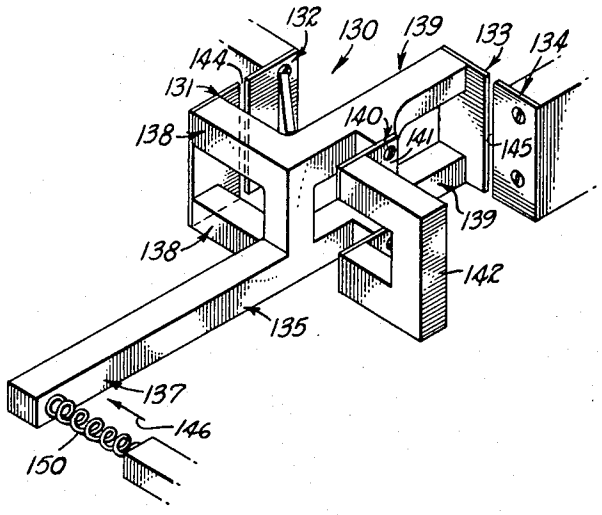
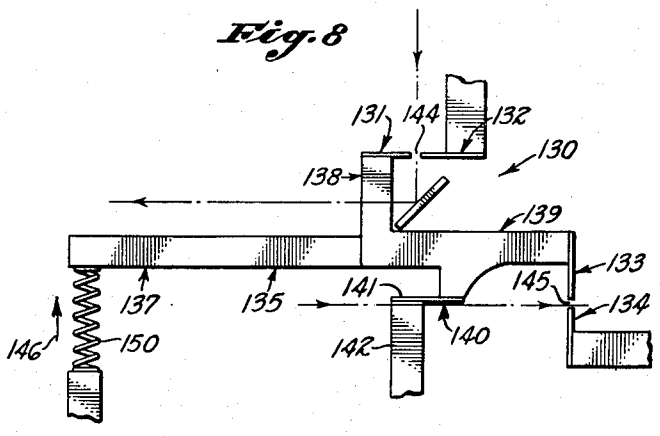


Fig. 8



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2,705,440

SLIT MECHANISM FOR MONOCHROMATOR

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Application October 8, 1949, Serial No. 120,348

19 Claims. (Cl. 88—61)

This invention relates to improvements in slit varying mechanisms and, more particularly, to improvements in slit varying mechanisms adapted for use with spectroscopic devices such as spectrophotometers.

In the past, variable slit mechanisms have utilized cams, wedges, or screws to actuate spring loaded jaws guided by dovetail or other types of ways to achieve the simultaneous and equal movement of bilateral jaws one with the other. Inherent in the use of such mechanical expedients have been the effects of hysteresis, lost motion and friction. For instance, the customary manner of mounting bilateral slit varying jaws is to secure them to guide plates which are mounted in ways and which are moved to cause the opening and closing of the jaws by a cam inserted between the ends of the guide plates. The frictional resistance of the guide plates to movement in the ways and the backlash encountered in the screw mechanism utilized to cause the rotation of the cam to cause the movement of the guide plates are disadvantages encountered generally in conventionally designed variable slit mechanisms. If, for example, slit widths of 0.05 mm. are used, movements of geometric width in as small increments as 0.025 micron are necessary to change output energy in steps of 0.1%. It is obvious that hysteresis, drag and frictional losses militate against such proper functioning of the slit varying mechanism.

It is, therefore, a primary object of our invention to provide a slit varying mechanism which is free from the deleterious effects of hysteresis, backlash and frictional losses and which dispenses with the conventional mechanical elements customarily utilized in slit varying designs.

The aforementioned desirable object is attained by pivotally mounting the jaw members of the slit varying mechanism in such a manner that the reduction and expansion of the slits are accomplished by pivoting said jaw members toward and away from each other.

An additional object of our invention is the provision of pivotally moving carriage means for the jaw members which carries the jaw members toward and away from each other to vary the widths of the slits.

A further object of our invention is the provision of jaw carriages of the aforementioned type in which resilient reed elements are utilized to accomplish the pivotal movement of said carriages and the consequent pivotal movement of the jaw members supported thereupon.

An additional object of our invention is the provision of pivotally movable and resilient carriage means for the jaw members which are characterized by resistance to both lateral and vertical dislocation, the jaw members being considered, for convenience, as moving toward and away from each other in a vertical plane.

One of the difficulties encountered in variable slit mechanisms manufactured in accordance with conventional designs and embodying conventional mechanical elements has been the fact that it is very difficult to move the two jaws of a bilateral slit mechanism so that the jaws will be moved simultaneously and equal distances. Discrepancies in the initiation of movement and the minute differences in the distances traveled by each jaw of a pair of jaws are attributable to the above-mentioned factors of hysteresis, backlash, and frictional drag.

It is, therefore, an additional object of our invention to provide a variable slit mechanism in which the movable jaw means of the mechanism are interrelated with

each other by a connecting means disposed therebetween in order that the movement of one jaw will be accompanied by the simultaneous and equivalent movement of its companion jaw.

A further object of our invention is the provision in a variable slit mechanism of connecting means of the aforementioned type which are resilient in nature and which are adapted to be deflected to draw the movable jaw means toward each other and to be released to permit the movable jaw means to move away from each other. An associated object of our invention is the provision of resilient connecting means which are formed integrally with the movable jaw means and which can be installed in the mechanism together with the movable jaw means, thus eliminating much assembly necessary with prior art mechanisms.

A further object of our invention is the provision of actuating means for causing the movement of the movable jaw means toward and away from each other, said actuating means being connected to the connecting means which join the jaw means together in such a manner that the deflection of the connecting means by the actuating means causes the movement of the jaw means toward and away from each other and thus induces the jaw means to pivot upon their resilient carriage means.

Another of the difficulties encountered in conventional slit mechanisms is the fact that the utilization of bilateral pairs of slits in which two jaw means must be moved simultaneously and for equal distances away from and toward each other necessitates the incorporation in the variable slit mechanisms of precision machined parts to govern and control such movement. In addition, distortion, mislocation and blurring of the spectral band due to the mislocation of one of the jaw means in reference to the other are frequently encountered in the use of such bilateral slit mechanisms.

A further object of our invention is the provision of a variable slit mechanism in which there is provided for each slit one movable jaw means and one fixed jaw means, the movable jaw means being carried toward and away from the fixed jaw means by the action of the actuating means upon the connecting means to which the movable jaw means are secured or with which they are integrally formed.

An additional object of our invention is the provision of a variable slit mechanism providing a pair of variable slits, each of the slits being constituted by one movable jaw means and one fixed jaw means, connecting means between the movable jaw means causing the simultaneous and equal movement of the movable jaw means toward and away from the fixed jaw means when actuating means is caused to act upon the connecting means. An associated object of our invention is a construction of the aforementioned type in which the movable jaw means of each slit is focused on the other movable jaw means.

Another object of our invention is the provision of a pair of movable jaw means spaced from each other and having positioned therebetween a fixed jaw member which, in conjunction with the movable jaw means, provides a pair of variable slits.

An additional object of our invention is the provision in a variable slit mechanism of a slit plate in which movable jaw means are formed integrally with each other. An associated object of our invention is the provision of integrally formed movable jaw means which are connected by means of a connecting means formed integrally therewith.

An additional object of our invention is the provision of a slit plate which may be formed by mass production methods, such as stamping, and which is formed of sheet spring stock so that integral and resilient connecting means joining the movable jaw means together may be provided.

An additional object of our invention is the provision of a variable slit mechanism which can be more easily and cheaply manufactured and assembled than conventional variable mechanisms.

Other objects and advantages of our invention will be apparent from the following specification and the ac-

companying drawings, which are for the purpose of illustration only, and in which:

Fig. 1 is a perspective view showing one embodiment of a variable slit mechanism constructed in accordance with our invention;

Fig. 2 is a plan view of the slit plate which constitutes an important part of our invention;

Fig. 3 is a vertical sectional view taken on the broken line 3—3 of Fig. 1;

Fig. 4 is a plan view of the variable slit mechanism;

Fig. 5 is a fragmentary vertical sectional view taken on the broken line 5—5 of Fig. 3;

Fig. 6 is a perspective view of an alternative form of the slit plate of our invention;

Fig. 7 is a perspective view of an alternative embodiment of the slit varying mechanism; and,

Fig. 8 is a plan view of the variable slit mechanism shown in Fig. 7 .

Referring to the drawings, and particularly to Figs. 1 through 5 thereof, we show a variable slit mechanism **10** which is supported upon a mounting plate **11** which constitutes an end wall of the monochromator housing (not shown). The variable slit mechanism **10** includes actuating means **12** which is connected to a slit plate **13** mounted upon carriage means **14**.

In considering the operation of the variable slit mechanism and its component elements, the directions of movement of the various portions of the mechanism will be described in reference to vertical mounting of the variable slit mechanism **10** upon the mounting plate **11** and the same terminology will be utilized in describing the movements of the parts in the various views although the orientation of the parts therein is not the same as the orientation of the parts as they are mounted upon the plate **11**.

The actuating means **12** includes adjusting means **16** comprising a control knob **17** mounted exteriorly of the monochromator housing (not shown) and having associated therewith an indicia-bearing dial **18** adapted, in conjunction with a primary reference point upon the housing of the monochromator, to indicate the adjustment of the variable slit mechanism. Pressed into a longitudinal bore **19** formed in a bearing boss **20**, which is integral with the mounting plate **11**, is a sleeve **21** which has integrally formed thereupon a collar **22** impinging on the exterior of the monochromator housing and a hub portion **23** upon which the dial **18** associated with the control knob **17** is adapted to be rotated.

Formed in the sleeve **21** is an axial, threaded bore **25** in which is mounted a rotatable, micrometer screw **26** having a splined outermost end **27** upon which the control knob **17** is positioned and upon which it is maintained by means of a set screw **28**. The rotation of the control knob in a clockwise direction, that is in the direction indicated by the arrow **29** in Fig. 1 of the drawings, will advance the micrometer screw **26**, and conversely, counterclockwise rotation of the control knob **17** will cause the retraction of the micrometer screw **26**.

Secured to the inner end of the micrometer screw **26**, as by means of a set screw **33**, is a collar **34** which prevents the retraction of the micrometer screw **26** within the threaded bore **25** beyond a predetermined point. Formed in the collar **34** is a recess **35** which provides a ball bearing seat **36**.

Seated upon the ball bearing seat **36** of the collar **34** is a ball bearing **38** which is retained in one end of a push rod **39** which is adapted to transmit the movement of the micrometer screw **26** in a manner which will be described in greater detail below. The push rod **39** is generally constituted by a web **40** which surrounds a rectangular aperture **41**, the aperture **41** being provided to permit the passage of the light beams from and to the slit mechanism and to thus prevent the push rod **39** from interfering with the passage of said beams. Pressed into the other end of the push rod **39** is another ball bearing **43** which is seated in a ball bearing seat **44** formed upon the upper end of and integrally with a bellcrank **45**. Formed upon one corner of the web **40** of the push rod **39** adjacent the bellcrank **45** is a stabilizing bar **46** which is received in an opening **47** formed in the bell-crank **45** and which, in conjunction with said opening, is adapted to prevent the rotation of the push rod **39** in the bearing seats **36** and **44** when the micrometer screw **26** is rotated. The stabilizing bar also serves, to a certain extent, to prevent the shifting

of the ball bearings **38** and **43** upon the seats **36** and **44**. Secured to a bracket **49** mounted upon the bearing boss **20** is the intermediate portion of a V-shaped tension spring **50**, the opposite ends of which are received in apertures **51** formed in the upper end of the bellcrank **45**. The spring **50**, in addition to preventing the dislodgment of the ball bearings **38** and **43** from the bearing seats **36** and **44** respectively, also serves to place a sufficient load on the micrometer screw **26** through the push rod **39** to prevent backlash in the micrometer screw.

The bellcrank **45** has two vertically spaced arms **53** and **54** connected by a bridge **55** in which are located the bearing seat **44** and the stabilizing bar opening **47**. Formed integrally with the arms **53** and **54** and at right angles thereto are vertically spaced arms **56** and **57**. Bellcrank mounting means **59** and **60** are located at junctures of the arms **53** and **56** and **54** and **57**, respectively, and include, Fig. 3, generally triangular blocks **61** having caps **62** secured thereto by means of screws **63** and adapted to receive therebetween the ends of resilient reeds **64** formed of beryllium copper or similar sheet spring stock. The opposite ends of the resilient reeds **64** are secured between mounting bosses **65** formed integrally with the mounting plate **11** and caps **66** are fastened thereto by means of screws **67**, or similar fasteners.

In this manner, the bellcrank **45** is adapted to pivot on the resilient reeds **64** when movement of the micrometer screw **26** is transmitted thereto through the push rod **39**. The mounting of the bellcrank **45** upon the resilient reeds **64** eliminates the possibility that lost motion or frictional drag may occur during pivotal movement of the bellcrank and the manner of so mounting the bellcrank **45** is an important feature of our invention.

Considering the carriage means **14** of the variable slit mechanism, first carriage means **69** is secured to the mounting plate **11** by means of screws **71** and oppositely disposed to said first carriage means is a second carriage means **72** similarly secured by means of screws **73**. Since the construction of the first and second carriage means **69** and **72** is identical in every respect, the first carriage means **69** is described and identical reference numerals are applied to the identical elements of the second carriage means. The first carriage means **69** includes vertically spaced side linkages **74** and **75**, each of said side linkages including a base strip **76** between which strip and the mounting plate **11** are fastened the ends of resilient reed members **77** and **78**, the upper ends of which are secured between a fastening strip **79** and opposite ends of a rectangular frame member **80** having horizontal side bars **81** and transverse bars **82** extending vertically between the side linkages **74** and **75**. Rivets **83** fasten the upper ends of the reed members **77** and **78** between the fastening strip **79** and the side bars **81** of the frame member **80**.

The first carriage means **69** and the second carriage means **72** are oppositely disposed to each other and, as indicated above, consist of vertically spaced side linkages **74** and **75** which have incorporated therein resilient reed members **77** and **78** which pivotally support vertically positioned, rectangular frame members **80** extending between the vertically spaced side linkages **74** and **75**. Each of the side linkages **74** and **75** of the carriage means **69** and **72** thus comprises what is known as a three bar linkage and is thus adapted for pivotal movement in reference to the mounting plate **11**. The utilization of the resilient reed members **77** and **78** as the crank links of the three bar linkages eliminates the possibility of hysteresis and backlash and the side linkages **74** and **75** thus support and carry the side bars **81** of the rectangular frame members **80** in a pivotal path with complete freedom of movement. Since the reed members **77** and **78** are resilient in nature, there is a tendency for the first and second carriage means **69** and **72** to be returned to a predetermined position, which tendency, however, is controlled by the movement of the micrometer screw **26** in a manner which will be described in greater detail below. The pivotal movement of the first and second carriage means **69** and **72** is a very important feature of our invention since it permits the carriage means to support the jaw means and to move them pivotally without the use of ways or other conventional mechanical expedients which have been hitherto utilized.

The slit plate **13**, Fig. 2, is formed from a single piece of sheet spring stock, such as beryllium copper, and in-

cludes a rectangular jaw plate **85** having a first jaw means **86** and a second jaw means **87** formed therein and connected with each other by means of integrally formed, resilient connecting means **88** and **89**. The edges **90** and **91** of the first and second jaw means **86** and **87** are spaced a considerable distance from each other to leave a gap **92** therebetween. Formed integrally with the connecting members **88** and **89** and positioned intermediate the ends thereof are stabilizing and securing wings **93** and **94**.

The jaw plate **85** is secured to the transverse bars **82** of the rectangular frame members **80** of the first and second carriages **69** and **72**, attaching strips **96** and rivets **97** serving to fixedly secure the first jaw means **86** to the first carriage means **69** and the second jaw means **87** to the second carriage means **72**. The outer ends of the stabilizing wings **93** and **94** are respectively secured to mounting flanges **98** and **99** formed integrally with the mounting plate **11** by means of screws **101**, or similar fasteners. The attachment of the first and second jaw means **86** and **87** to the first and second carriage means **69** and **72** prevents the horizontal mislocation of the first and second jaw means while the attachment of the securing and stabilizing wings **93** and **94** to the mounting flanges **98** and **99** prevents the vertical mislocation of the slit plate **13** as a whole.

Disposed in the gap **92** between the edges **90** and **91** of the first and second jaw means **86** and **87**, when said first and second jaw means **86** and **87** are mounted upon the first and second carriage means **69** and **72**, is a fixed jaw means **103**, Figs. 3 and 4, which includes a fixed jaw plate **104** secured to a mounting boss **105** formed integrally with the mounting plate **11** by means of a cap **106** and screws **107**. The fixed jaw plate **104** has an edge portion **108** which is adapted to cooperate with the edge portion **90** of the first jaw means **86** to form a first variable slit **109** which is adapted to receive a light beam from a fixed slit **110** formed in the mounting plate **11**. The fixed jaw plate **104** also provides an edge portion **112** oppositely disposed to the edge portion **108** and adapted, together with the edge portion **91** of the second jaw member **87**, to form a second variable slit **113** adapted to transmit light to a fixed slit **114** formed in the mounting plate **11**.

Securely mounted in the vertically spaced arms **56** and **57** of the bellcrank **45** are adjustable sockets **116** and **117** respectively which receive the lower ends of push rods **118** and **119**, the upper ends of which are positioned in sockets **120** and **121** attached respectively to the connecting means **88** and **89** intermediate the ends thereof. The adjustable sockets **116** and **117** permit the adjustment of the connecting means **88** and **89** by adjusting the push rods **118** and **119**. Thus, the movement of the vertically spaced arms **56** and **57** of the bellcrank **45** will cause the concomitant movement of the push rods **118** and **119**.

Considering the operation of the variable slit mechanism in greater detail, when the control knob **17** is rotated in clockwise direction as indicated by the arrow **29** of Fig. 1, the micrometer screw **26** is extended from the bore **25** to shift the push rod **39** to the left and to cause the bellcrank **45** to be pivoted upon the reed members **64** to move the ends of the vertically spaced bellcrank arms **56** and **57** in a direction away from the mounting plate **11** and to concomitantly shift the push rods **118** and **119** in the same direction. The movement of the push rods **118** and **119** in a direction away from the mounting plate **11** causes the simultaneous and outward bowing out of the resilient connecting means **88** and **89** and causes the concomitant and simultaneous movement of the first and second jaw means **86** and **87** toward the fixed jaw means **103** upon the first and second carriage means **69** and **72**. The movement of the first and second jaw means **86** and **87** toward the fixed jaw means **103** brings the edge **90** of the first jaw means **86** toward the edge portion **108** of the fixed jaw plate **104** while the movement of the second jaw means **87** brings the edge portion **91** of the second jaw means **87** toward the edge portion **112** of the fixed jaw plate **104**. Therefore, when the control knob **17** is rotated in a clockwise direction, the resilient connecting means **88** and **89** are urged outwardly by the action of the push rod **39**, the bellcrank **45** and the push rods **118** and **119** in a direction away from the mounting plate **11**, thus bowing the connecting means **88** and **89** and drawing the first and second jaw means **86** and **87** toward each other to reduce the width of the first and second variable slits **109** and **113**.

As the bowing outward of the resilient connecting means **88** and **89** takes place, the first and second carriage means **69** and **72** move toward each other, as permitted by the flexing of the resilient reed members **77** and **78** of the side linkages **74** and **75**, to pivotally carry the first and second jaw means **86** and **87** toward the intermediate fixed jaw means **103**. During the movement of the first and second jaw means **86** and **87** toward each other upon the first and second carriages **69** and **72**, there is a slight lateral displacement of the edges **90** and **91** of said jaw means in reference to the intermediate fixed jaw member edges **108** and **112**, but this slight movement is compensated for the focal length of the prism with which the variable slit mechanism is associated and, at any rate, is so slight as not to be an important factor in the operation of the variable slit mechanism.

When the control knob **17** is rotated in a counterclockwise direction, i. e., in a direction opposite to the direction of the arrow **29** of Fig. 1, the micrometer screw **26** is retracted into the bore **25**, permitting the push rod **39** to be shifted to the right by the action of the spring **50** connected to the upper end of the bellcrank **45** and by the action of the resilient connecting members **88** and **89** which move inwardly toward the mounting plate **11** and concomitantly carry the push rods **118** and **119** inwardly with them to accompany and, in some part, cause the inward movement of the ends of the vertically spaced arms **56** and **57** of the bellcrank **45**. As the connecting means **88** and **89** move inwardly toward the mounting plate **11**, the first and second jaw means **86** and **87** are shifted away from each other to carry the edge portions **90** and **91** thereof in a direction away from the edge portions **108** and **112** of the intermediate fixed jaw means **103**. This movement of the first and second jaw means **86** and **87** is accompanied and facilitated by the pivoting of the first and second carriage means **69** and **72** in a direction away from each other. The movement of the first and second jaw means **86** and **87** toward and away from the intermediate fixed jaw means **103** is accomplished without the drag or backlash commonly encountered in conventional variable slit mechanisms and the response of the variable slit mechanism is thus immediate and accurate.

We thus provide by our invention a variable slit mechanism characterized by the absence of hysteresis and backlash and incorporating therein movable jaw means which are pivotally suspended upon carriage means incorporating resilient reed members adapted to permit the pivotal movement of the jaw means away from and toward each other. In addition, we provide a slit construction in which first and second variable slits having only one movable jaw means allotted to each slit are provided, a third fixed jaw means cooperating with the first and second jaw means to constitute the first and second variable slits. Another major feature of our invention is the provision of a slit plate which has formed integrally therein the first and second jaw means of the variable slit mechanism connected by integral connecting means, the movement of which is adapted to cause the movement of the first and second jaw means toward and away from each other.

Shown in Fig. 6 of the drawings is an alternative embodiment of a slit plate **123**, which is essentially similar to the slit plate **13** described in the previously disclosed embodiment but which is utilized to provide two variable slits **126** and **127**, in a manner which will be described in greater detail below. Similar elements in the slit plate **123** are identified by reference numerals identical to those used in identifying the same elements in the slit plate **13**. The slit plate **123** includes a jaw plate **85** which incorporates a first movable jaw means **86** and a second movable jaw means **87** joined to each other by resilient connecting means **88** and **89** formed integrally with said first and second movable jaw means. The slit plate **123** is adapted to be incorporated in a variable slit mechanism similar to the one above described and similar actuating means may be used to cause the movement of the first and second jaw means **86** and **87** toward and away from each other. The first and second jaw means **86** and **87** are mounted upon first and second carriage means **69** and **72** and a somewhat smaller gap **124** exists between the first and second movable jaw means **86** and **87**. Attaching and stabilizing wings **93** and **94** are formed integrally with the first and second connecting means **88** and **89** and serve to secure the slit plate **123** to mounting members **128** and **129**.

The gap or space **124** formed between the first movable jaw means **86** and the second movable jaw means **87** is divided vertically by means of a separating member **125**

to form a first variable slit **126** and a second variable slit **127**. By utilization of this construction, the interposition of an intermediate, fixed jaw means between the first and second movable jaw means **86** and **87** is not necessary and the edge portions **90** and **91** of the first and second movable jaw means, as divided by a separating member **125**, constitute the first and second variable slits **126** and **127**. It is obvious that by removal of the dividing member **125** a single slit such as might be used in a spectroscope is provided.

An alternative embodiment of our invention is shown in Figs. 7 and 8 of the drawings, and constitutes a variable slit mechanism **130** which includes a first movable jaw means **131** adapted to cooperate with a fixed jaw means **132** to form a first variable slit **144**, and a second movable jaw means **133** adapted to cooperate with a second fixed jaw means **134** to form a second variable slit **145**. The first and second movable jaw means **131** and **133** are fixedly mounted upon a rigid connecting means **135** which has an elongated actuating arm portion **137** and mounting arms **138** for mounting the first movable jaw means **131** and mounting arms **139** for mounting the second movable jaw means **133**.

The rigid connecting means **135** is pivotally supported upon resilient carriage means **140** exemplified as a pair of flexible reeds **141** formed from spring stock, such as beryllium copper, and each reed having an end mounted upon a mounting bracket **142** and an opposite end connected to a mounting arm **139** for the second movable jaw means **133**. A tension spring **150** attached to the connecting means **135** holds the connecting means in such a position that the slits **144** and **145** are expanded. When a force is applied to the end of the actuating arm **137** of the connecting means **135** as indicated by the arrow **146** of Fig. 8, the carriage means **140**, and especially the resilient reed members **141** thereof, permits the first and second movable jaw means **131** and **133** to be pivotally moved toward the fixed jaw means **132** and **134** against the tension of the spring **150**.

When a force is applied to the end of the actuating portion **137** of the connecting means **135** in the direction of the arrow **146**, the first and second movable jaw means **131** and **133** are carried toward the first and second fixed jaw means **132** and **134**, since the force causes the deflection of the resilient reed members **141** to permit pivotal movement of the connecting means **135**. When the force applied to the end of the actuating portion **137** of the connecting means **135** is released, the spring action of the reed members **141** and of the spring **150** is sufficient to return the first and second jaw means **131** and **133** toward their original positions and the first and second variable slits **144** and **145** are thus expanded. It is obvious from the above description of the operation and construction of the variable slit mechanism **130** that the movable jaw means **131** and **133** are pivoted toward each other and that the suspension of the movable jaw means upon the resilient carriage means **140** eliminates the backlash and drag commonly encountered in conventional variable slit mechanisms.

Although we have shown and described preferred embodiments of our invention, it is obvious that modifications, changes and alterations may be made in the specific details thereof and we, therefore, do not desire to be limited to such specific details but prefer rather to be afforded the full scope of the following claims.

We claim as our invention:

1. In a variable slit mechanism, the combination of: a slit plate formed from a sheet of resilient material, said plate including jaw members defining a slit therebetween and having resilient connecting means structurally integral with and joining said jaw members; carriage means for supporting said jaw members; a base having said carriage means secured thereto for movement thereupon; and actuating means connected to said resilient connecting means for moving said carriage means to shift said jaw members in one direction to reduce said slit and in the other direction to expand said slit.

2. In a variable slit mechanism, the combination of: a slit varying plate formed from a single sheet of flat resilient material having jaw members with slit-defining edges extending toward each other in substantially the same plane and having elongated, reslient connecting means structurally integral with portions of said jaw members remote from said slit-defining edges; carriage means for supporting said jaw members; a base having said carriage means secured thereto for movement thereupon; and actuating means connected to said resilient connecting means for moving said carriage means to shift said jaw members in one direction to reduce said slit and in the other direction to expand said slit.

3. In a variable slit mechanism, the combination of: a slit plate formed from a sheet of resilient material, said plate having a centrally located transverse opening providing an optical slit therein and a pair of elongated, longitudinally oriented openings communicating with said transverse opening and defining a pair of jaw members having slit-varying edges juxtaposed to said transverse opening, said longitudinally oriented openings also defining resilient connecting means structurally integral with said jaw members; carriage means for supporting said jaw members; a base having said carriage means secured thereto for movement thereupon; and actuating means connected to said resilient connecting means for moving said carriage means to shift said jaw members in one direction to reduce said slit and in the other direction to expand said slit.

4. In a variable slit mechanism, the combination of: a slit plate formed of a sheet of resilient material, said plate including jaw members defining a slit therebetween and movable in substantially the same plane to enlarge or restrict said slit, said plate having resilient connecting means structurally integral with and joining said jaw members and movable in a plane normal to the plane of said slit to cause the movement of said jaw members in their plane; carriage means for supporting said jaw members; a base having said carriage means secured thereto for movement thereupon; and actuating means connected to said resilient connecting means for moving said carriage means to shift said jaw members in their plane in one direction to reduce said slit and in the other direction to expand said slit.

5. In a variable slit mechanism, the combination of: a slit plate formed from a sheet of resilient material, said plate including jaw members defining a slit therebetween and having resilient connecting means structurally integral with and joining said jaw members, said resilient connecting means having laterally extending stabilizing means secured thereto; carriage means for supporting said jaw members; a base having said carriage means secured thereto for movement thereupon and having said stabilizing means fastened thereto to prevent mislocation of said connecting means; and actuating means connected to said resilient connecting means for moving said carriage means to shift said jaw members in one direction to reduce said slit and in the other direction to expand said slit.

6. In a variable slit mechanism, the combination of: a slit plate formed from a sheet of resilient material, said plate including jaw members defining a slit therebetween and having resilient connecting means structurally integral with and joining said jaw members, said jaw members being movable in substantially the same plane toward or away from each other to restrict or enlarge said slit and said resilient connecting means being movable in a plane perpendicular to said plane of movement of said jaw members to cause the movement thereof; carriage means for supporting said jaw members; a base having said carriage means secured thereto for movement thereupon; and actuating means including actuating elements movable in the plane of movement of said connecting means and engageable therewith intermediate the ends thereof for causing the deflection of said connecting means and consequent movement of said jaw members.

7. In a variable slit mechanism, the combination of: a first movable jaw means; a second movable jaw means; three-bar linkage means mounting said first and second movable jaw means; a base having said three-bar linkage means mounted thereupon; first resilient connecting means connecting said first and second movable jaw means at one side of the ends thereof; second resilient connecting means connecting said first and second movable jaw means at the other side of the ends thereof; and actuating means operatively connected directly to said first and second resilient connecting means to shift said first and second movable jaw means toward or away from each other.

8. In a variable slit mechanism, the combination of: a slit plate formed from a sheet of resilient material, said plate including first and second movable jaw means defining a slit therebetween and having resilient connecting means structurally integral with and joining said jaw

means; three-bar linkage means mounting said first and second movable jaw means; a base having said three-bar linkage means mounted thereupon; and operating means directly connected to said resilient connecting means for deflecting said connecting means to shift said first and second jaw means toward or away from each other.

9. In a variable slit mechanism, the combination of: a slit plate formed from a sheet of resilient material, said plate having a centrally located transverse opening providing an optical slit therein and a pair of elongated, longitudinally oriented openings formed adjacent opposite edges of said plate and communicating with said transverse opening to form first and second movable jaw means in said plate and integral resilient connecting means connecting said jaw means for moving said jaw means toward or away from each other; three-bar linkage means mounting said first and second movable jaw means; a base having said three-bar linkage means mounted thereupon; and operating means directly connected to said resilient connecting means for deflecting said connecting means to shift said first and second jaw means toward or away from each other.

10. In a variable slit mechanism, the combination of: a slit plate formed from a sheet of resilient material, said plate having an H-shaped opening formed therein, the transverse bar of which defines opposite slit-defining edges and the longitudinal bars of which are disposed adjacent the edges of said plate to define first and second movable jaw means having said slit-defining edges thereupon and elongated resilient connecting means structurally integral with said jaw means for connecting and moving said jaw means; three-bar linkage means mounting said first and second movable jaw means; a base having said three-bar linkage means mounted thereupon; and operating means directly connected to said resilient connecting means for deflecting said connecting means to shift said first and second jaw means toward or away from each other.

11. In a variable slit mechanism, the combination of: a slit plate formed from a sheet of resilient material, said plate including jaw members defining a slit therebetween and having resilient connecting means structurally integral with and joining said jaw members; three-bar linkage means mounting said jaw members, said three-bar linkage means including resilient supporting means secured to opposite edges of said jaw members, said resilient means being deflectible to permit the movement of said jaw members toward or away from each other; a base having said resilient supporting means secured thereto; and actuating means operatively connected to said resilient connecting means to cause the movement of said connecting means whereby said jaw members may be moved on said three-bar linkage means toward or away from each other.

12. In a mechanism for varying slits, the combination of: a first movable jaw means; a second movable jaw means; first carriage means constituted by a three-bar linkage for pivotally moving said first movable jaw means; second carriage means constituted by a three-bar linkage for pivotally moving said second movable jaw means; a base supporting said linkages; resilient connecting means connecting said first and second movable jaw means; and actuating means operatively connected to said resilient connecting means to shift said first and second movable jaw means on said carriage means toward or away from each other.

13. In a mechanism for varying slits, the combination of: a slit plate formed from a single sheet of resilient material, said plate including first and second movable jaw means defining a slit therebetween and having resilient connecting means structurally integral with and joining said jaw means; first carriage means constituted by a three-bar linkage for pivotally moving said first movable jaw means; second carriage means constituted by a three-bar linkage for pivotally moving said second movable jaw means; a base supporting said linkages; and actuating means operatively connected to said resilient connecting means to shift said first and second movable jaw means on said carriage means toward or away from each other.

14. In a mechanism for varying slits, the combination of: a first movable jaw means; a second movable jaw means; first carriage means constituted by a three-bar linkage for pivotally moving said first movable jaw means; second carriage means constituted by a three-bar linkage for pivotally moving said second movable jaw means; a base supporting said linkages; resilient connecting means structurally integral with said jaw means, said connecting means being constituted by elongated strips disposed at the lateral edges of said jaw means; and an actuating mechanism including actuating elements engageable with said strips intermediate their ends for moving said strips to cause the movement of said jaw means toward or away from each other.

15. In a variable slit mechanism, the combination of: a slit plate formed from a sheet of resilient material, said plate including jaw members defining a slit therebetween and having resilient connecting means structurally integral with and joining said jaw members; carriage means for supporting said jaw members; a base having said carriage means secured thereto for movement thereupon; and actuating means connected to said resilient connecting means, said actuating means including an elongated push rod disposed adjacent said plate engageable with a bellcrank disposed adjacent one end of said plate and actuating elements disposed between said bellcrank and said connecting means for deflecting said connecting means upon movement of said bellcrank to move said jaw members toward or away from each other.

16. In a variable slit mechanism, the combination of: a slit plate formed from a sheet of resilient material, said plate including first and second movable jaw members having opposed edges at opposite sides of a centrally located opening in said plate and having resilient connecting means structurally integral with and joining said jaw members; fixed jaw means disposed in said opening in said plate and defining, in conjunction with said first and second movable jaw members, first and second variable slits; carriage means for supporting said jaw members; a base having said carriage means secured thereto for movement thereupon; and actuating means connected to said resilient connecting means for moving said carriage means to shift said jaw members in one direction to reduce said slits and in the other direction to expand said slits.

17. In a variable slit mechanism, the combination of: a slit plate formed from a sheet of resilient material, said plate including jaw members disposed and movable in substantially the same plane and defining a slit therebetween and having resilient connecting means structurally integral with and joining said jaw members, said connecting means being movable in a plane normal to the plane of movement of said jaw members; carriage means for supporting said jaw members; a base having said carriage means secured thereto for movement thereupon; and actuating means for moving said connecting means including a first elongated member disposed parallel to said plate and movable in a plane substantially parallel to the plane of movement of said jaw members and a second member disposed adjacent one end of said plate for transmitting movement of said first member to third members engageable with said connecting means intermediate their ends and movable in the same plane as said connecting means.

18. An optical slit varying plate formed from a single sheet of flat resilient material having jaw members with slit-defining edges extending toward each other in substantially the same plane and having elongated, resilient connecting means structurally integral with portions of said jaw members remote from said slit-defining edges whereby said connecting means may be bowed to move said slit-defining edges toward or away from each other, said connecting means having laterally extending, integral stabilizing portions for preventing displacement of said connecting means during movement thereof.

19. An optical slit varying plate formed from a single sheet of flat resilient material, said plate having a centrally located transverse opening providing an optical slit therein and a pair of elongated longitudinally oriented openings communicating with said transverse opening and defining a pair of jaw members having slit-defining edges juxtaposed to said transverse opening, said longitudinally oriented openings also defining resilient connecting means structurally integral with said jaw members at points remote from said edges whereby said connecting means may be moved to move said slit-defining edges toward or away from each other, said connecting means having laterally extending integral stabilizing portions for preventing displacement of said connecting means during movement thereof.

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