# United States Patent [19]

**Kuramochi**

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[54] **PENCIL SHARPENER**


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[51] **Int. Cl.** ..... **B23l 23/02**

[58] **Field of Search** ..... 144/28.1, 28.2, 28.3, 28.4, 144/28.5, 28.6, 28.7, 28.71, 28.72, 28.9, 30; 145/3.1, 3.5; 30/28.1



[56] **References Cited**

UNITED STATES PATENTS

3,712,351 1/1973 Kuramochi ..... 144/28.72



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*Assistant Examiner*—W. D. Bray
*Attorney, Agent, or Firm*—Stevens, Davis, Miller & Mosher



[57] **ABSTRACT**

A pencil sharpener including a sharpening blade, a feed member and associated apparatus for feeding a pencil into the sharpening blade and for removing a pencil from the sharpening blade, with a guide member associated with the feed member and mounted for tilting about an axis normal to the length of the guide member and about another axis extending parallel to the length of the guide member, an inclined guide surface for guiding a pencil into the guide member, with a regulating plate for regulating the feeding of pencils to the guide member, a feed actuator having a pencil holding passage therein and pivotally mounted for guiding pencils to the inclined guide surface, a vibratory plate mounted for supplying pencils to the feed actuator with a pivotally mounted lever engaging the vibratory plate, the feed actuator having serrated teeth or stops for engaging the pivotally mounter lever. Actuation of the lever triggers the apparatus to feed a pencil to and from the sharpening blade, and a plurality of pencils can then be successively sharpened by the apparatus without manually feeding them to the sharpening blade.


**2 Claims, 6 Drawing Figures**

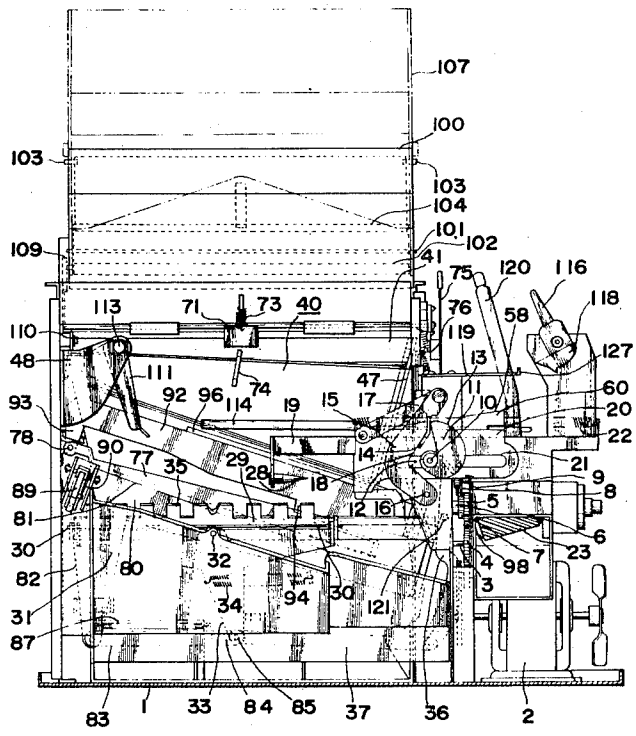

FIG. 1

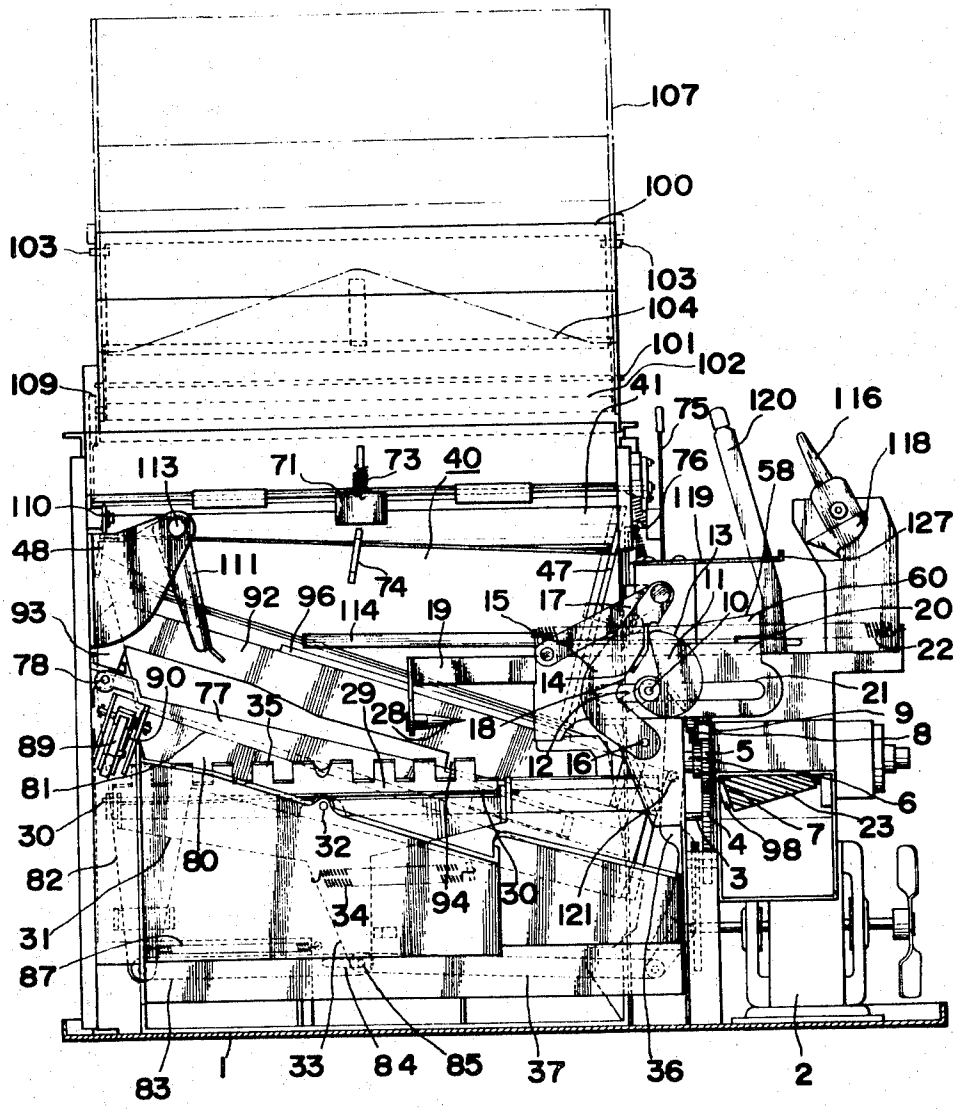
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FIG. 2

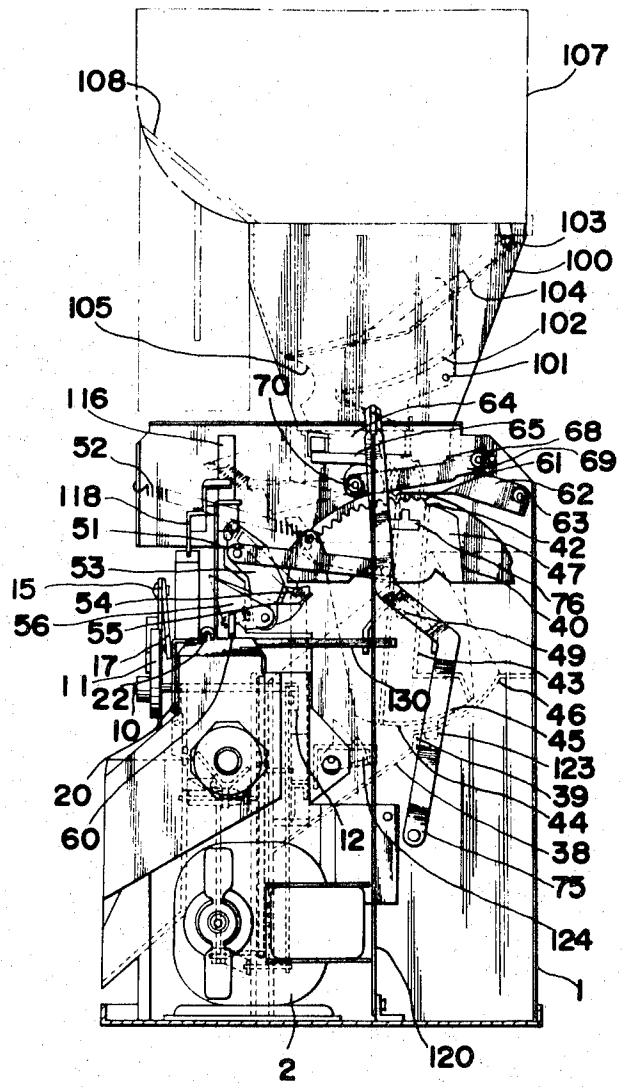
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FIG. 3

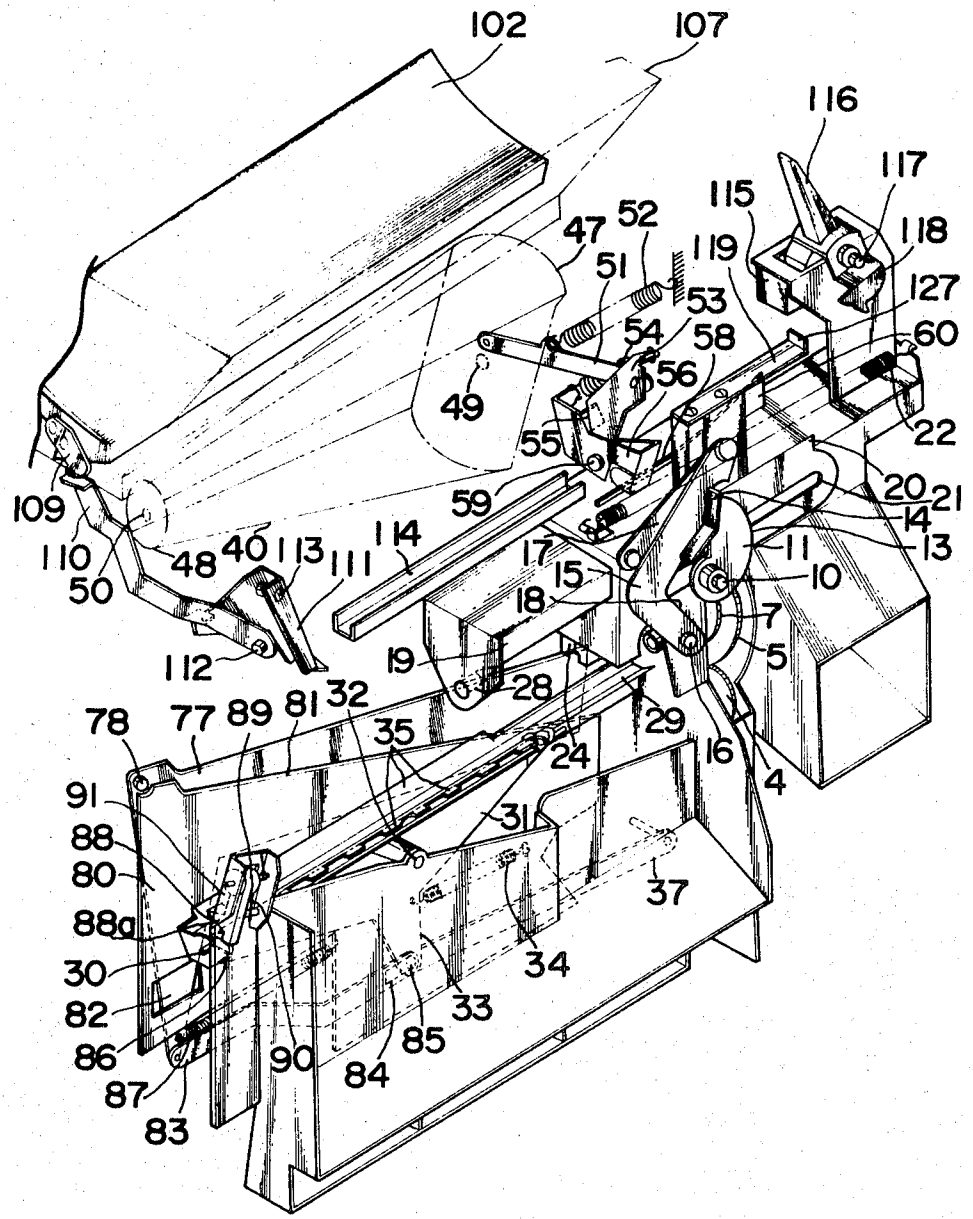
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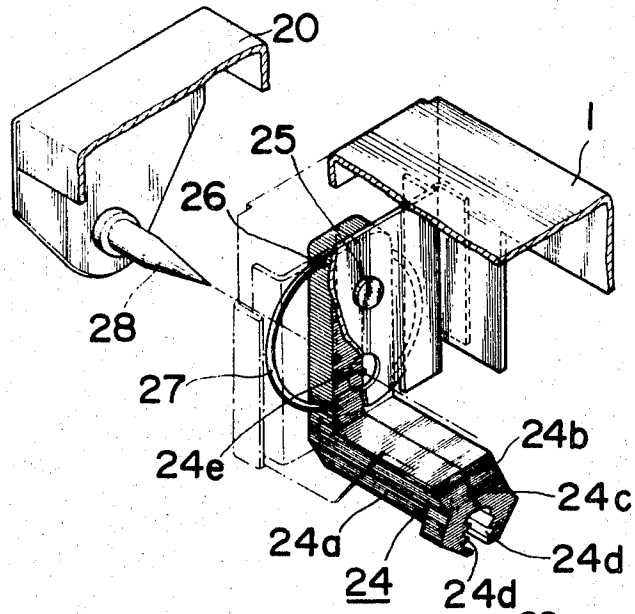
FIG. 4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24b
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24c
24a
24d
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FIG. 5

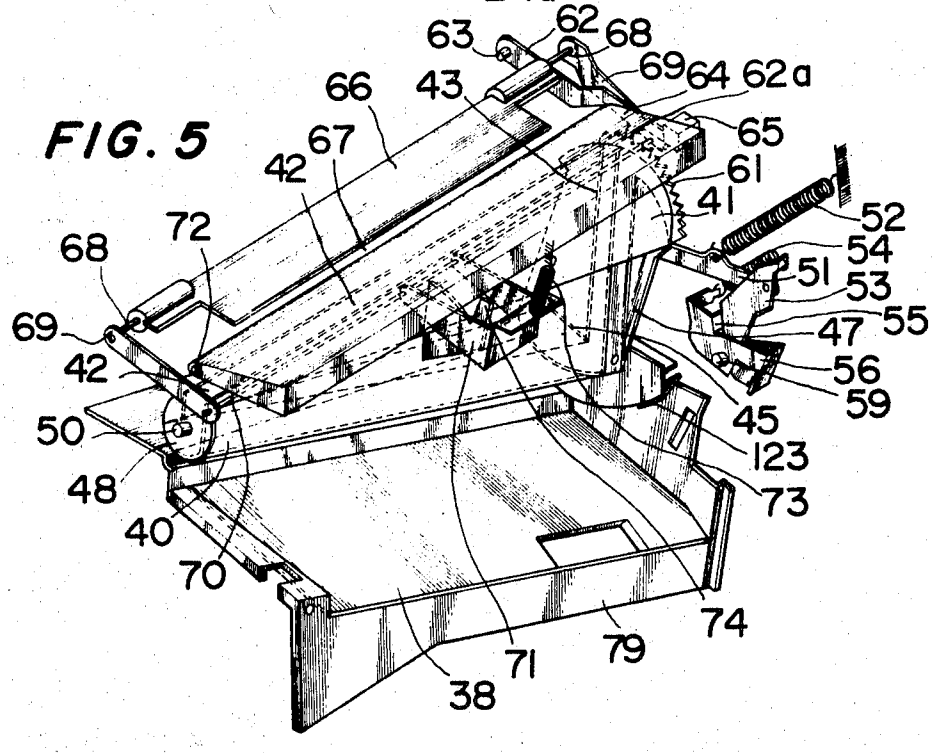
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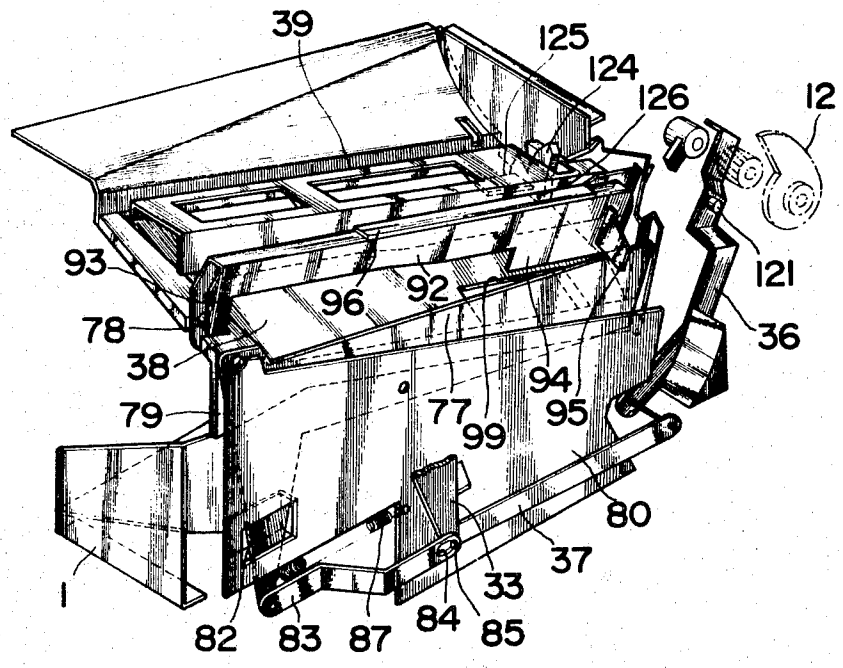
FIG. 6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# PENCIL SHARPENER

This invention relates to pencil sharpeners, and more particularly it is concerned with a pencil sharpener of the type which permits a number of pencils to be sharpened successively without requiring any manual attention.

Pencil sharpeners of the prior art require manual insertion of each pencil to be sharpened into a sharpening blade section. Pencil sharpeners of this type are low in efficiency when a large number of pencils are to be sharpened at a time, because it takes time to insert each pencil in the sharpening blade section one after another. Thus, the provision of a pencil sharpener which permits a large number of pencils to be sharpened continuously at high efficiency without requiring any manual attention has been sought.

In view of this situation, I have previously proposed to provide a pencil sharpener which permits a large number of pencils to be sharpened at a time at high efficiency by automatically and continuously sharpening one pencil after another supplied from the pencil case in association with a pencil sharpening operation.

An object of this invention is to provide, in the pencil sharpener of the type described, an improvement which consists in the provision of means whereby a large number of pencils contained in the pencil case can be fed smoothly one after another to the sharpening section.

Another object of the invention is to provide, in a pencil sharpener which permits a number of pencils to be successively sharpened at high efficiency without requiring manually feeding each pencil to the sharpening blade and which permits sharpened pencils to be guided by the guide member and discharged from the sharpener without any trouble so that a continuous pencil sharpening operation may be performed smoothly, an improvement consisting in the provision of means whereby the feed actuator is caused to pivot in association with the pencil sharpening operation to supply pencils to the guide surface while holding them, the pencils supplied to the guide surface are positively fed to the guide member by the regulating plate operating in association with a pencil sharpening operation, a large number of pencils are fed smoothly to the feed actuator because they are prevented from getting entangled with one another due to the vibration of the vibratory plate caused by the pivotal lever engaging the serration-like irregularities formed in the feed actuator, and the feeding of pencils is facilitated by the provision of the opening and closing plate which is moved back and forth in association with a pencil sharpening operation so as to open and close the pencil supply opening formed between the opening and closing plate and the vobratory plate moving in vibratory motion, whereby continuous sharpening of pencils at high efficiency can be performed.

Additional objects as well as features and advantages of the invention will become evident from the description set forth hereinafter when considered in conjunction with the accompanying drawings, in which:

FIG. 1 is a longitudinal sectional side view of one embodiment of the pencil sharpener according to this invention;

FIG. 2 is a longitudinal sectional front view of the embodiment shown in FIG. 1;



FIG. 3 is a perspective view of the essential portion of the pencil sharpener according to this invention;

FIG. 4 is a perspective view of the pencil holder; and

FIGS. 5 and 6 are perspective views of the pencil feeder according to this invention.

One embodiment of the present invention will now be explained with reference to the drawings. In FIG. 1, the pencil sharpener of this invention comprises a casing 1 which mounts on one side thereof an electric motor 2 which drives a rotary shaft 3 having mounted at one end thereof a gear 4. A gear 5 maintained in meshing engagement with the gear 4 is carried by a hollow rotary shaft 6 rotatably mounted to the casing 1. The shaft 6 also carries a gear 7 which is maintained in meshing engagement with a gear 8 carried by a rotary shaft 9 rotatably mounted to the casing 1. The shaft 9 also carries a worm (not shown) which is maintained in meshing engagement with a worm gear mounted on a rotary shaft 10 rotatably mounted to the casing 1 and extending across the width thereof. Cams 11 and 12 are secured to opposite ends of the shaft 10 respectively. The cam 11 is a segmental cam which is formed with a cam edge 13 in its periphery. An engaging edge 14 adapted to engage the cam edge 13 is formed in an operation plate 15 which is supported for rotation at its lower end by a shaft 16 rotatably mounted to the casing 1. A connection member 17 is pivotally connected at one end thereof to the upper end portion of the operation plate 15 which is formed at the rear edge thereof with a recess 18 for preventing the operation plate 15 from coming into contact with the rotary shaft 10 when the former moves in rotary motion. The connection member 17 is pivotally connected at the other end thereof to a feed member 20 adapted to slide along a guide rail 19. The feed member 20 is formed with a guide groove 21 for inserting the rotary shaft 10 therein. Mounted between the feed member 20 and the rail 19 is a coiled spring 22 which urges by its biasing force the feed member 20 to move toward a blade 23 operative in association with the electric motor 2. Provided in the front of the feed member 20 is a pencil holder 24 which consists of two holding members 24*a* and 24*b* as shown in FIG. 4. Arcuate serrated pencil holding edges 24*d* are formed in the lower ends of the adjacent surfaces 24*c* of the holding members 24*a* and 24*b*, and the holding members 24*a* and 24*b* are connected by a shaft 25 to the front surface of the feed member 20 for opening and closing motion. Substantially arcuate resilient members 27 are inserted at opposite ends thereof into holes 26 of opposite sides of the holding members 24*a* and 24*b* so as to urge the two members 24*a* and 24 *b* to move in a direction in which they hold a pencil therebetween. Formed between the adjacent surfaces 24*c* of the holding members 24*a* and 24*b* is a concaved portion 24*e* for receiving therein a sharp pointed conical opener 28 mounted on the forward end of the rail 19 and facing the direction in which the feed member 20 moves. If the conical opener 28 is introduced into the concaved portion, the two members 24*a* and 24*b* will be moved apart from each other.

A pencil feed guide member 29 is supported by a pivotal support member 31 through a pin 30 for pivotal movements about the longitudinal axis thereof. The pivotal support member 31 is supported by the casing 1 through a shaft 32 for pivotal movements about an axis normal to the longitudinal axis thereof. Mounted

between a projection 33 on the underside of the support member 31 and the casing 1 is a coiled spring 34 which urges by its biasing force the support member 31 to be disposed on a horizontal plane so that its forward end may be disposed in a position corresponding to the position of the pencil holder 24.

The guide member 29 is substantially U-shaped in cross-section so as to positively support a pencil therein. The member 29 is formed on opposite sides thereof with holding projections 35 except for the portion of the member 29 which is disposed on the side near the blade 23 where a cutout portion is formed.

A lever 36 (see FIG. 6) engaging the cam 12 at one end thereof is pivotally supported by a shaft 121. The level 36 is connected to the projection 33 of the support member 31 through a connecting rod 37. The lever 36 is maintained in engagement with the cam 12 by the biasing force of the spring 34.

Formed in the body 1 on one side of the guide member 29 is a guide surface 38 which is inclined transversely and downwardly toward the guide member 29 and which is inclined longitudinally such that it becomes parallel to the guide member 29 when the latter is tilted about the shaft 32. An introducing opening 39 (right and middle in FIG. 2) is disposed on one side of the guide surface 38 and upwardly thereof, and a feed actuator 40 is supported for pivotal motion about longitudinally extending shafts 49 and 50 above the introducing opening 39.

The upper surface of feed actuator 40 has an increasingly greater width in going toward its front end (right side in FIG. 5) and is formed with a convex arcuate surface 41. A pencil guide opening 42 is formed on one side of the convex arcuate surface 41, and there is formed a vertical pencil holding passage 43 communicating at its upper end with the pencil guide opening 42 and at its lower end with a lateral surface of a pencil shifting opening 45 formed in a bottom surface 44 of feed actuator 40 in a position biased in one direction from the pencil holding passage 43. The bottom surface 44 is curved in arcuate form so that it can be pivoted over and along an arcuate guide surface 46 disposed on one side of the introducing opening 39 and inclined transversely and downwardly toward the introducing opening 39 and having a front end (right side in FIG. 5) which is inclined downwardly.

A base plate 47 (see FIG. 3) of a major diameter is disposed at the front end of actuator 40 while a base disc 48 of a minor diameter is disposed at the rear end thereof. The centers of two base plates 47 and 48 are rotatably supported by shafts 49 and 50 connected to the body 1. A connecting rod 51 is pivotally connected at one end thereof to the base plate 47 in an eccentric position, and a coil spring 52 is mounted between connecting rod 51 and body 1 so as to normally urge by its biasing force the feed actuator 40 to move counter clockwise in FIG. 2 to bring the pencil shifting opening 45 into a position in which it is disposed on the arcuate guide surface 46. The connecting rod 51 is pivotally connected at the other end thereof to a pivotal member 53 pivotally supported by a shaft 59 connected to the body 1.

As shown in FIG. 3 and FIG. 5, a cam 56 is formed with an engaging edge 55 adapted to engage the pivotal member 53 and a coil spring 54 is mounted at the opposite end thereof to cam 56 and pivotal member 53 for maintaining the engaging edge 55 in engagement with the pivotal member 53. Cam 56 is pivotally supported by shaft 59, and a projecting member 60 formed with an engaging edge 58 adapted to engage the cam 56 as shown in FIG. 3 is disposed above the feed member 20. The engaging edge 58 is inclined upwardly so that it has a larger height in going toward the feed side as shown in FIG. 3.

Formed on the upper edge of the base plate 47 of feed actuator 40 are serration-like irregularities 61 which are engaged by a pivotal lever 62 pivotally supported by a shaft 63 connected to the body 1 as shown in FIGS. 2 and 5. A projection 65 formed at one side of a vibratory plate 64 engages the upper surface of the front end of pivotal lever 62. The vibratory plate 64 is pivotally supported at opposite ends of one side thereof by shafts 72. A pencil supply opening 67 is formed between the vibratory plate 64 and an opening and closing plate 66 which is mounted on one side of the vibratory plate 64 for movement toward and away from the vibratory plate 64.

A plurality of rods 68 extending from opposite ends of one side of the opening and closing plate 66 support at the ends thereof coupler rods 69 connected to each other by a connecting bar 70. A coil spring 73 mounted between a pivotal frame 71 secured to the middle portion of connecting bar 70 and the body 1 urges by its biasing force the opening and closing plate 66 to move toward the vibratory plate 64, so that the pencil supply opening 67 normally has a width smaller than the diameter of pencils.

A projection 74 adapted to be brought into and out of engagement with the connecting bar 70 is formed on the feed actuator 40, so that the pivotal movement of feed actuator 40 to feed pencils pushes and moves the connecting bar 70 and the opening and closing plate 66 is moved away from the vibratory plate 64 against the biasing force of spring 73. This increases the width of pencil supply opening 67. When the feed actuator 40 is restored to its original position, the opening and closing plate 66 is moved toward the vibratory plate 64 by the biasing force of spring 73, thereby reducing the width of pencil supply opening 67.

In FIG. 1, a pencil feed operation lever 75 is pivotally connected at its lower end to the body 1 and adapted to be engaged by a projection 76 formed on the base plate 47 of feed actuator 40. When manually operated, the lever 75 pivots to move the feed actuator 40 in pivotal motion to feed pencils and move the opening and closing plate 66 toward and away from the vibratory plate 64 and to vibrate the vibratory plate 64.

Interposed between the guide surface 38 and guide member 29 is a pencil feed regulating plate 77 which is pivotally supported at the upper portion of its rear end through a shaft 78 by a side portion 79 depending from the edge of guide surface 38 as shown in FIG. 6. The regulating plate 77 is adapted to swing about shaft 78 along the side portion 79. A fixed guide plate 80 for holding the regulating plate 77 is disposed between the regulating plate 77 and guide member 29 as shown in FIG. 3, the upper surface of the upper edge 81 of fixed guide plate 80 being inclined forwardly downwardly so that it may be in the same plane as the guide member 29 when the latter is inclined.

Formed in the lower portion of the rear end of regulating plate 77 is a projection 82 which pivotally supports one end of a connecting bar 83 which is formed at the other end thereof with a horizontal slot 84 re-

ceiving therein a shaft **85** for pivotally connecting the connecting rod **37** to the projection **33** of support member **31.** A spring **87** is mounted between the projection **82** and body **1** to normally cause the regulating plate **77** to extend upwardly away from the guide surface **38** by its biasing force.

As shown in FIG. **3,** a pivotal member **89** formed with a projection **88** adapted to be brought into and out of engagement with a projection **86** formed at one side of the rear end of guide member **29** is pivotally supported by the body **1.** The pivotal member **89** is urged by the biasing force of a spring **90** to move in a direction in which its projection **88** comes into engagement with the projection **86** of the guide member **29.** The projection **88** in pivotal member **89** is shaped such that its lower edge **88***a* extends horizontally and its upper edge **91** is inclined. Thus, when the support member **31** pivots clockwise about the shaft **32,** the projection **86** engages the horizontal edge **88***a* of projection **88** so that the guide member **29** may pivot clockwise about shaft **30** in FIG. **2.** When the support member **31** pivots counter clockwise about shaft **32** in FIG. **1,** the inclined edge **91** of projection **88** engages the projection **86,** so that the guide member **29** pivots counter clockwise in FIG. **2** about shaft **30.**

As shown in FIG. **6,** a checking member **92** is disposed above the guide surface **38** and formed at the underside of its rear end with a projection **93** which is pivotally supported by shaft **78.** The checking member **92** is formed at its front end portion with a large width checking portion **94** adapted to be brought into and out of engagement with the guide surface **38,** and a gap small enough to permit one pencil to be disposed therein is formed between the checking portion **94** and regulating plate **77.** A lateral projection **95** adapted to engage the upper edge of regulating plate **77** is formed on the front end portion of checking member **92.** A weight **96** is disposed on the upper surface of checking member **92** to bring the projection **95** into engagement with the upper edge of regulating plate **77.** The checking member **92** pivots as the regulating plate **77** pivots, so that the checking portion **94** is brought into and out of engagement with the guide surface **38.**

As shown in FIG. **2** and FIG. **6,** a pivotal member **124** adapted to engage a projection **123** formed on the feed actuator **40** is pivotally supported by a shaft **126** connected to the body **1.** A controller **125** adapted to be brought into and out of engagement with the guide surface **38** for controlling the supply of pencils is provided on the pivotal member **124.**

The blade **23** for sharpening pencils which is of the same construction as known blades for sharpening pencils is rotatably mounted on a rotary frame **98** which is rotated by the hollow rotary shaft **6.** A pencil is fed to the blade **23** through the bore of the hollow rotary shaft **6** disposed against the holding member **24.**

An outlet **99** is formed at the front side of guide surface **38** as shown in FIG. **6** for discharging short pencils therethrough.

In FIG. **1** to FIG. **3,** a pencil case **100** is detachably mounted on the body **1** in a position above the vibratory plate **64** and opening and closing plate **66.** A tilting feed vibratory plate **102** is pivotally supported at one side of pencil case **100** by shaft **101.** Pencils are dropped on to the vibratory plate **64** through a gap **105** formed between the other side edge of feed vibratory plate **102** and the inner wall of pencil case **100.** A cover plate **104** is pivotally connected at one side thereof to one side of pencil case **100** by shafts for opening and closing motion, so that the pencils in the case **100** may be pressed against the feed vibratory plate **102.**

An ancillary pencil case **107** is detachably mounted above the pencil case **100.** When a large number of pencils are to be treated, pencils are supplied from the ancillary pencil case **107** to the pencil case **100.** The ancillary case **107** is formed therein with a tilting guide surface **108** for supplying pencils to the pencil case **100.**

Formed at one end surface of feed vibratory plate **102** and disposed longitudinally thereof is a projection **109** (see FIG. **3**) adapted to be engaged by the free end of a vibratory lever **110** which is pivotally supported at its base by a shaft **112** connected to the body **1.** A push-up lever **111** adapted to engage the vibratory lever **110** is pivotally supported at its front end by a shaft **113** connected to the body **1** and has a base which is disposed in the path of movement of a projecting bar **114** formed at the rear end of feed member **20.** When the feed member **20** moves rearwardly, the push-up lever **111** is pushed and moved by the projecting bar **114** to push up the vibratory lever **110** and push the projection **109,** so as to thereby cause the feed vibratory plate **102** to pivot clockwise in FIG. **2.** When the feed member **20** moves forwardly, the push-up lever **111** is released from the influence of projecting bar **114** and the feed vibratory plate **102** is restored to its original position. Thus, the feed vibratory palte **102** is caused to vibrate each time a pencil is sharpened.

In FIG. **3,** a switch **115** with a knob **116** for actuating the switch **115** is mounted on the upper surface of body **1.** The knob **116** is supported by a rotary shaft **117** which mounts a lever **118** adapted to engage an engaging portion **127** formed in a resilient pusher **119** disposed on the feed member **20.**

In FIG. **1,** there is provided a lever **120** for applying an impact to the feed member **20.** When the lever **120** is manually manipulated, an impact is applied to a projection **130** formed on the feed member **20** as shown in FIG. **2** so as to actuate the same when it fails to operate as planned.

In operation, when the cover plate **104** is moved to its open position, the pencils contained in the ancillary pencil case **107** are shifted through the inclined guide surface **108** to the pencil case **100,** roll on the feed vibratory plate **102,** and placed on the vibratory plate **64,** so that a pencil is disposed in the pencil supply opening **67** formed between the vibratory plate **64** and opening and closing plate **66.**

If the operation lever **75** is moved clockwise in FIG. **2** at this time, lever **75** will be brought into engagement with the projection **76** and cause the feed actuator **40** to pivot clockwise in FIG. **2** about shafts **49** and **50.** The pivoting of feed actuator **40** causes the projection **74** to push and move the connecting bar **70** rightwardly in FIG. **2** against the biasing force of spring **73.** The connecting bar **70** pushes and moves the opening and closing plate **66** through the coupler rods **69** as shown in FIG. **5,** so that the dimension of the pencil supply opening **67** between the opening and closing plate **66** and vibratory plate **64** is increased and the pencil disposed on the supply opening **67** moves to the convex arcuate surface **41** of feed actuator **40.** As the actuator **40** further pivots and the pencil supply opening **67** is brought into index with the pencil guide opening **42,**

the pencil moves through the guide opening **42** to the bottom surface **44** of feed actuator **40.**

If the operation lever **75** is released, the feed actuator **40** will be restored to its original position by the biasing force of spring **52** mounted between the body **1** and connecting rod **51,** so that the pencil on the bottom surface **44** drops through pencil shifting opening **45** on to the guide surface **38** and is brought into contact with the regulating plate **77** to be held thereby. If the knob **116** is manipulated to close the switch **115** at this time, electric motor **2** will be actuated to rotate rotary shaft **10** through the gear train. As the result, cam **12** is rotated and the lever **36** adapted to be driven by cam **12** is caused to pivot clockwise in FIG. **6** about a shaft **121.** This causes, through connecting rod **37,** the support member **31** to pivot together with the guide member **29** clockwise in FIG. **1** about shaft **32.**

At this time, the projection **86** is brought into engagement with the pivotal member **89** by virtue of inclination of the guide member **29** as shown in FIG. **3** so that the guide member **29** is caused to pivot clockwise in FIG. **3** about shaft **30.** If there is a sharpened pencil present on the guide member **29** at this time, such pencil is discharged in a direction away from the plane of FIG. **1** and introduced into a receiver (not shown) connected to one side of the body **1.** The projection **86** is released from engagement with the projection **88** formed in pivotal member **89** as the support member **31** for the guide member **29** pivots counter clockwise in FIG. **3** about shaft **32,** the guide member **29** is permitted to be restored to its original position by pivoting by its own weight about shaft **30.**

If the support member **31** pivots clockwise in FIG. **3** as cam **12** rotates, the regulating plate **77** will be caused, through the connecting bar **83,** to pivot clockwise in FIG. **3** about shaft **78,** so that the regulating plate **77** becomes parallel to the inclined guide member **29.** Thus, the pencil on the guide surface **38** is allowed to move in rolling motion on the inclined guide surface **38,** drop on to the guide member **29** and slide forwardly (rightwardly in FIG. **1**) along the inclined guide member **29.**

When the pencil is going to be placed on the guide member **29,** the checking member **92** maintained in engagement with the regulating plate **77** through projection **95** has been caused to pivot clockwise in FIG. **6** about shaft **78** by the weight of weight **96** as the result of aforementioned pivoting of regulating plate **77** as shown in FIG. **6.** Thus, the checking portion **94** of checking member **92** is brought into contact with the guide surface **38** to preclude feeding of more than one pencil to the guide member **29.**

A short pencil not worth sharpening disposed on the guide surface **38** is discharged through the outlet **99** opening on the guide surface **38** and drops downwardly. A further rotation of cam **12** causes the support member **31,** through the lever **36** and connecting rod **37,** to pivot counter clockwise about shaft **32** in FIG. **1** into its original position, so that the guide member **29** is maintained in a horizontal position. The regulating plate **77** is caused, through the connecting bar **83,** to pivot counter clockwise about shaft **78** in FIG. **6** and to extend between the guide member **29** and guide surface **38,** thereby preventing the next following pencil from being shifted to the guide member **29.** The checking member **92** is caused to pivot upwardly into its oirginal position by its projection **95** engaging the regulating plate **77,** with the checking portion **94** moving upwardly to permit pencils to move between the checking member **92** and guide surface **38.** This permits the pencils to move in a rolling motion toward the regulating plate **77.**

The rotation of the shaft **10** causes the cam **11** to move in pivotal motion, with a result that the operation plate **15** is moved in pivotal motion in an anticlockwise direction in FIG. **1.** This causes the connection member **17** pivotally connected to the operation member **15** to move the feed member **20** rearwardly (to the left in FIG. **1**) along the rail **19** against the biasing force of the spring **22.** This brings the conical opener **28** into engagement with a concaved portion **24***e* of the holder **24** provided in the feed member **20,** and the opener **28** forces the two members **24***a* and **24***b* of the holder **24** apart from each other against the biasing force of the resilient member **27.** Further rotation of the rotary shaft **10** results in the feed member **20** being started to its original position by the engagement of the cam **11** with the operation plate **15** and the biasing force of the spring **22** urging the feed member **20.** Upon the starting of the feed member **20** to its original position, the opener **28** is released from engagement with the concaved portion **24***e* of the holder **24,** so that the two members **24***a* and **24***b* of the holder **24** are forced by the biasing force of the resilient member **27** to move toward each other so as to hold the pencil on the guide member **28** therebetween. Upon release of the cam **11** from engagement with the operation plate **15,** the feed member **20** is caused by the biasing force of the spring **22** to return abruptly to its original position so as to feed the pencil held by the holder **24** to the blade **23** being rotated through the gear **5.** Thus, the pencil is sharpened by the blade **23.** Further rotation of the rotary shaft **10** causes the feed member **20** to move rearwardly (to the left in FIG. **1**) through the operation plate **15** actuated by the cam **12** and the connection member **17.** When the conical opener **28** is inserted in the concaved portion **24***e* of the holder **24** formed in the feed member **20,** the two members **24***a* and **24***b* of the holder **24** are moved apart from each other by the opener **28,** so that the sharpened pencil is released from the holder **24** and placed on the guide member **29** again. Further rotation of the rotary shaft **10** causes the lever **36** to be moved by the cam **12** in pivotal motion in a clockwise direction in FIG. **6** about the shaft **121.** This causes the support member **31,** through the connecting rod **37,** to move in pivotal motion in a clockwise direction in FIG. **1** against the biasing force of the spring **34,** so that the guide member **29** tilts such that the portion of the guide member **29** disposed nearer to the blade **23** (to the right in FIG. **1**) is disposed in a lower level than the rest of the guide member **29.** As the guide member **29** tilts, the projection **86** is brought into engagement with the horizontal edge **88***a* of the projection **88,** so that the guide member **29** moves in pivotal motion in a clockwise direction in FIG. **3** about the shaft **30.** This causes the sharpened pencil on the guide member **29** to drop downwardly from the guide member **29** into a receiving tray provided on one side of the casing **1.**

In this way, the pencils are supplied successively to the guide member **29,** sharpened as cams **11** and **12** rotate, and discharged from the sharpener.

A movement of the feed member **20** leftwardly in FIG. **3** causes the cam **56** engaged by the projecting

member **60** to pivot clockwise about shaft **59** in FIG. **2.** The cam **56** and pivotal member **53** are caused to pivot as a unit by the engagement of the engaging edge **55** of cam **56** with the pivotal member **53** and the biasing force of spring **54.** This causes the feed actuator **40** connected to the pivotal member **53** through the connecting rod **51** to pivot clockwise about shafts **49** and **50** in FIG. **2.** Pivoting of the feed actuator **40** results in the projection **74** pushing and moving the connecting bar **70** against the biasing force of spring **73,** so as to move the opening and closing plate **66** and increase the dimension of pencil supply opening **67.** Thus, a pencil on the vibratory member **64** is fed through the pencil supply opening **67** to the pencil holding passage **43** and moved in rolling motion to the guide surface **38** as the feed actuator **40** pivots to its original position.

When the feed member **20** moves rightwardly in FIG. **1,** cam **56** is brought into engagement with the inclined engaging edge **58** of projection **60,** so that cam **56** is pivoted into its original position. The pivotal member **53** connected to cam **56** by spring **54** is also caused to pivot to its original position, so that the feed actuator **40** is caused to pivot to its original position through the connecting rod **51** loaded with spring **52.**

At the time the feed actuator **40** is caused to pivot to its original position as aforementioned, the pivotal lever **62** is caused to oscillate up and down about shaft **63** because the projection **62***a* in pivotal lever **62** is maintained in engagement with the serration-like irregularities **61,** thereby causing the vibratory plate **64** to vibrate. This shakes and puts the pencils on the vibratory plate **64** in order so that they may successively move in rolling motion toward the pencil supply opening **67.**

When the feed actuator **40** pivots between two positions, the projection **123** of actuator **40** engages the pivotal member **124** and causes the latter to pivot. This causes the controller **125** which is integral with the pivotal member **124** to move upwardly away from the guide surface **38,** thereby permitting the pencil held in place on the guide surface **38** by the controller **125** to move in rolling motion toward the regulating plate **77.**

When the feed member **20** moves leftwardly in FIG. **1** as aforementioned, the projecting bar **114** pushes and moves the push-up lever **111** which pushes and moves upwardly the vibratory lever **110.** This pushes upwardly the vibratory plate **102** through projection **109,** so that the pencils in the pencil case **100** are supplied smoothly on the vibratory plate **64.**

Thus, the cycle of the aforementioned pencil feeding and sharpening operations is repeated. In the absence of a pencil for feeding on the guide member **29,** the feed member **20** moves a greater distance forwardly (to the right in FIG. **1**) that when a pencil is held by the holder **24** as the cam **11** is released from engagement with the operation plate **15,** with a result that the feed member **20** pushes and moves the lever **118** by the pusher **119.** This opens the switch **115** so that the motor **2** is shut-off.

While the invention has been shown and described as being automatically operated by an electric motor, it is to be understood that the pencil sharpener according to this invention can be operated manually by turning a handle.

I claim:

**1.** A pencil sharpener comprising a sharpening blade, a feed member for feeding a pencil to said sharpening blade and for moving a sharpened pencil from the sharpening blade in association with a sharpening operation of the sharpening blade, a guide member disposed in said feed member for tilting about an axis normal to the length of the feed member for guiding a pencil toward the sharpening blade in association with the operation of the feed member and for pivoting about an axis parallel to the length of the guide member, for guiding a sharpened pencil to be discharged from the pencil sharpener, an inclined guide surface for guiding pencils to said guide member, a regulating plate pivotally mounted for feeding to said guide member in association with a pencil sharpening operation the pencils supplied to said inclined guide surface, a feed actuator having a pencil holding passage for pivoting in association with a pencil sharpening operation for guiding pencils to said guide surface, a vibratory plate for supplying pencils to said feed actuator, and a pivotal lever engaged by said vibratory plate, said feed actuator having serration-like irregularities therein for engaging said pivotal lever.

**2.** A pencil sharpener as claimed in claim **1** further comprising an opening and closing plate defining between said vibratory plate and the opening and closing plate a pencil supply opening for supplying a pencil therethrough to said feed actuator, said opening and closing plate mounted for pivotal movement toward and away from the vibratory plate in association with a pencil sharpening operation to thereby close and open the pencil supply opening.

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