US012180631B2

(12) **United States Patent**
Bagley

(10) **Patent No.: US 12,180,631 B2**
(45) **Date of Patent: Dec. 31, 2024**

(54) **INDEXABLE, LOCKING HOPPING FOOT**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 10 days.

(21) Appl. No.: **18/183,016**

(22) Filed: **Mar. 13, 2023**

(65) **Prior Publication Data**

US 2023/0287614 A1 Sep. 14, 2023

Related U.S. Application Data

(60) Provisional application No. 63/269,279, filed on Mar. 14, 2022.

(51) **Int. Cl.**
D05B 35/12 (2006.01)
D05B 29/08 (2006.01)
D05B 29/12 (2006.01)

(52) **U.S. Cl.**
CPC ***D05B 35/12*** (2013.01); ***D05B 29/08*** (2013.01); ***D05B 29/12*** (2013.01)

(58) **Field of Classification Search**
CPC D05B 35/00; D05B 35/06; D05B 35/12; D05B 29/08; D05B 29/12
See application file for complete search history.

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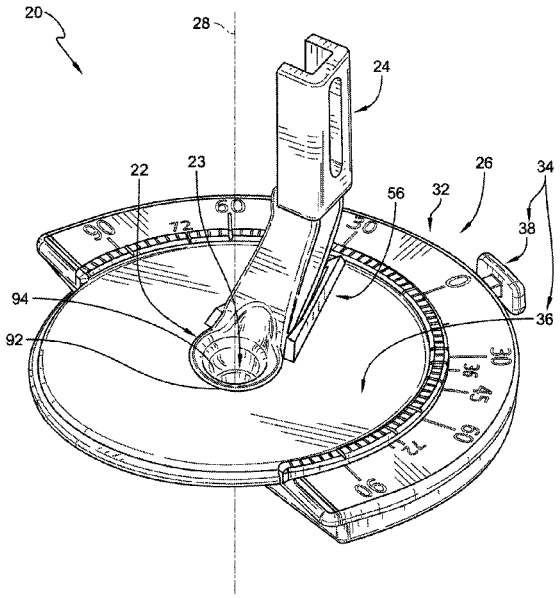
(57) **ABSTRACT**

A hopping foot assembly for a sewing machine having a needle comprises a hopping foot base and a hopping foot arm extends axially from the hopping foot base relative to an axis. The hopping foot base is shaped to include an opening that extends axially through the hopping foot base relative to the axis. The hopping foot arm is configured to be coupled to the sewing machine to fix the hopping foot base relative to the sewing machine.

20 Claims, 13 Drawing Sheets



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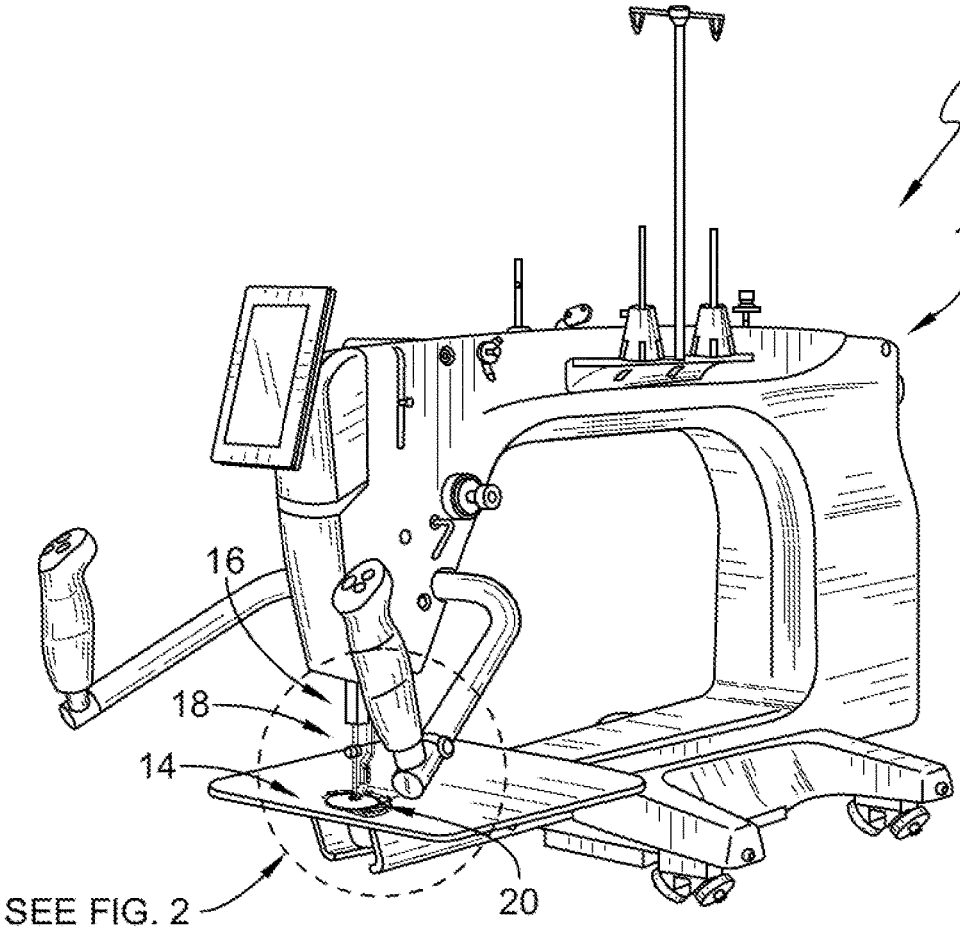

FIG. 1

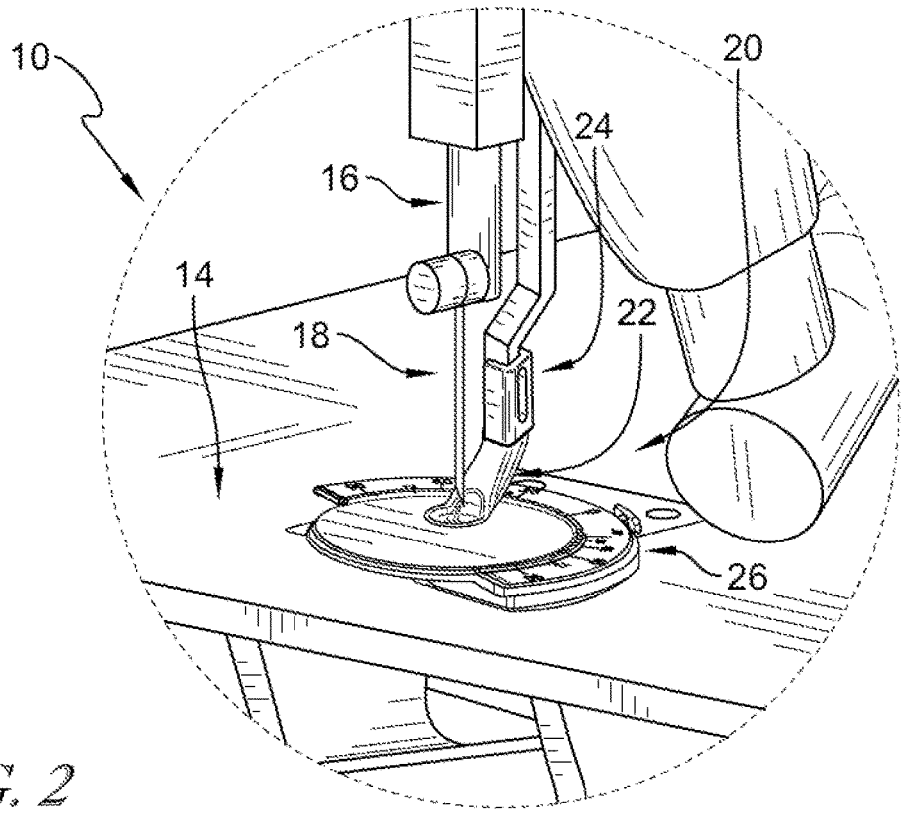

FIG. 2

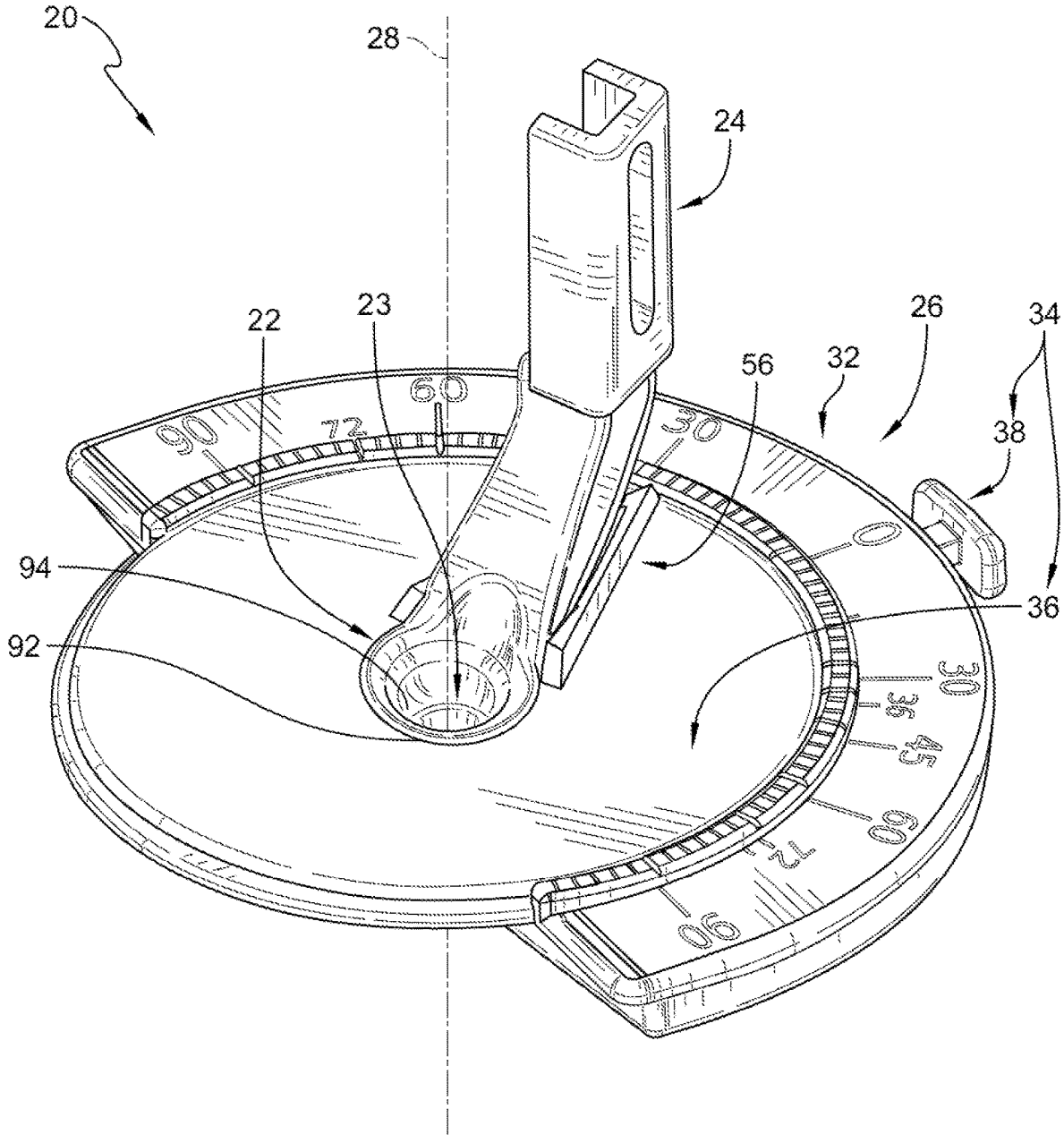

FIG. 3

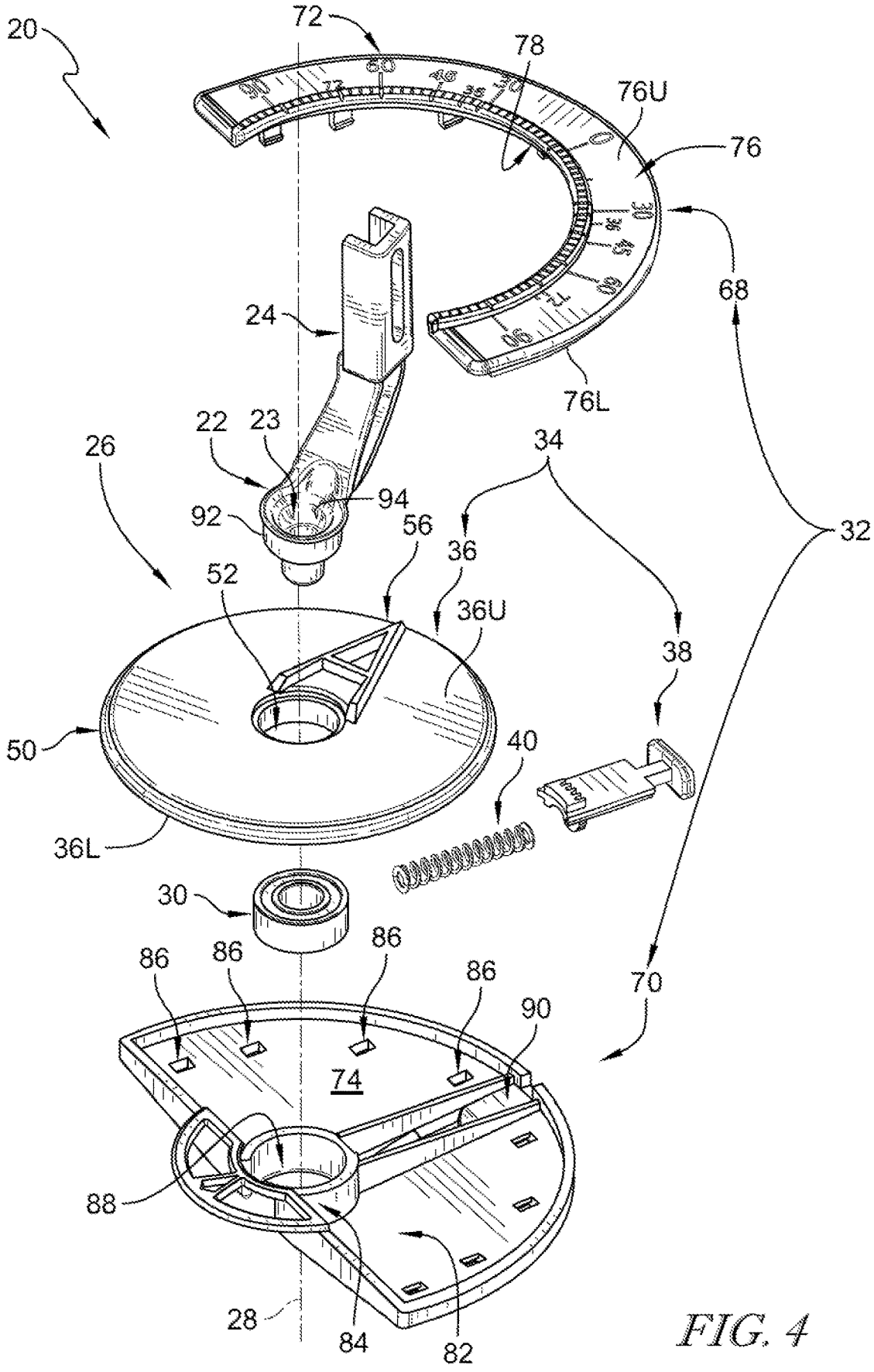
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FIG. 4

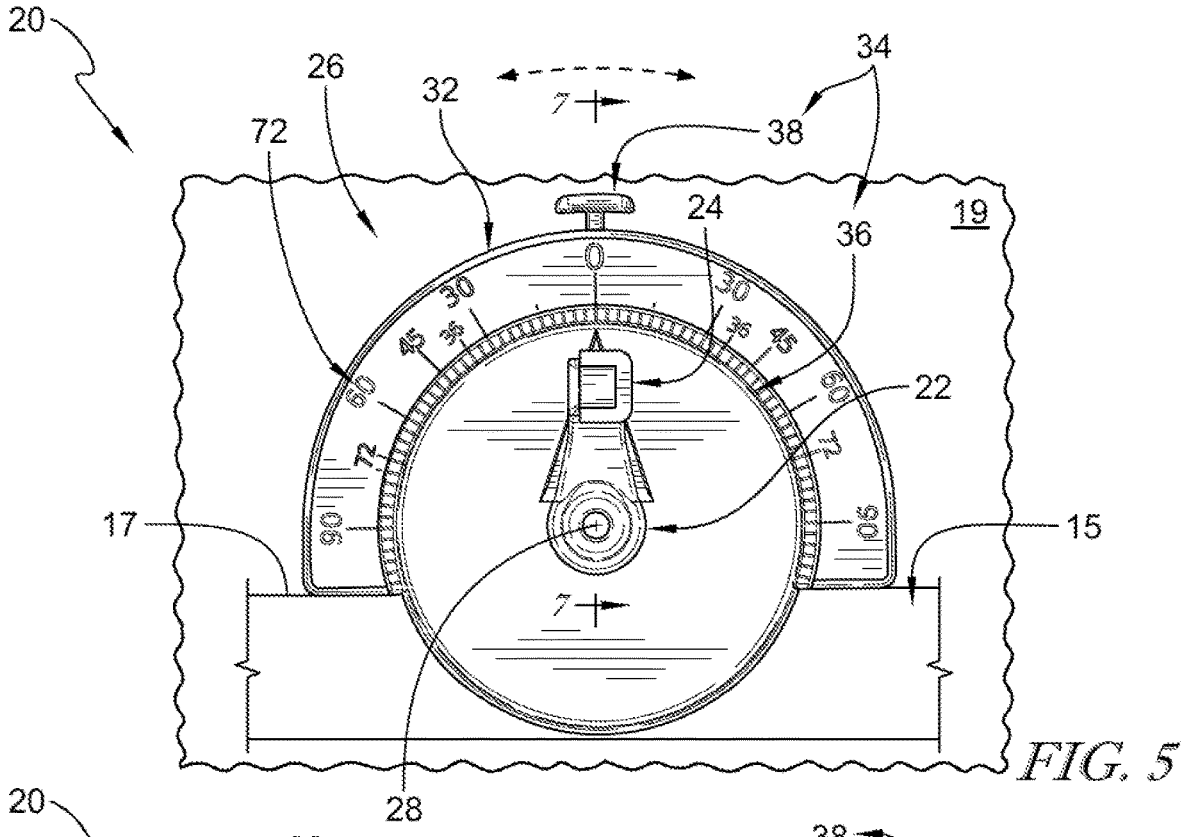
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FIG. 5

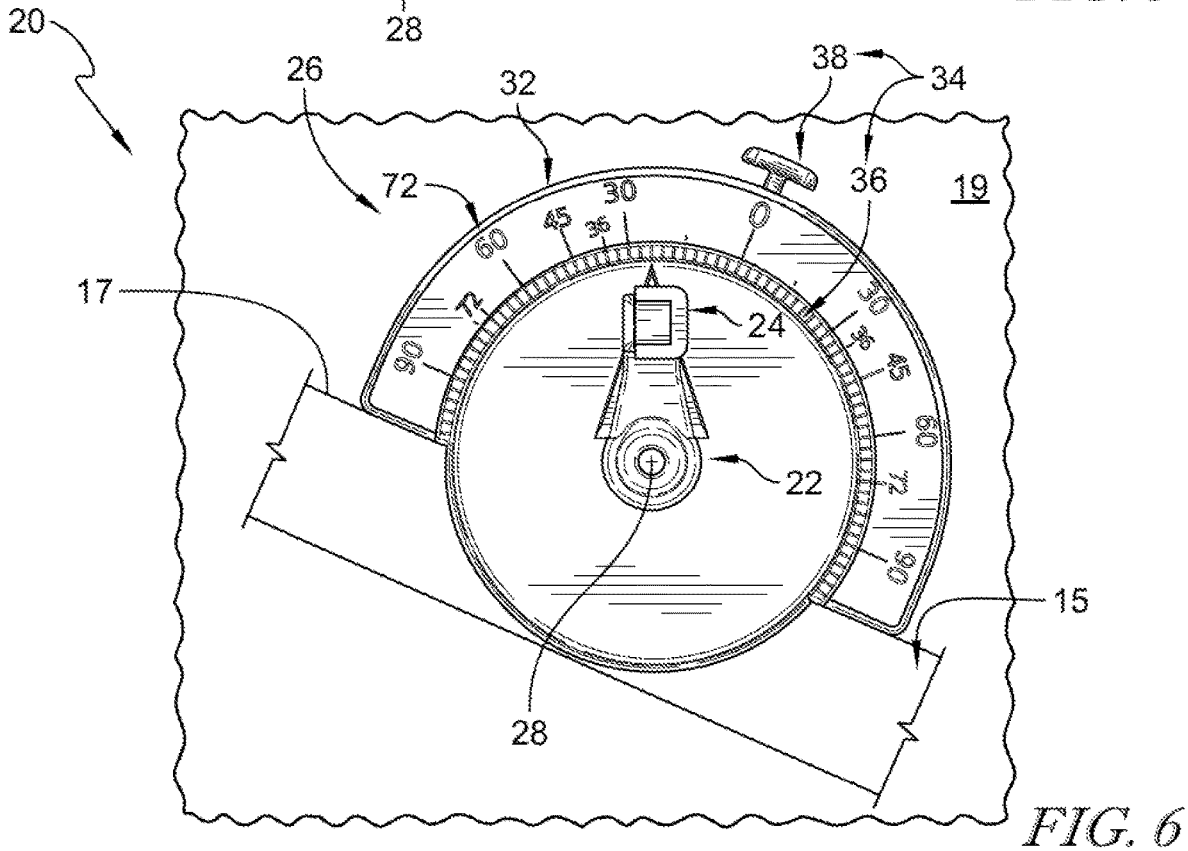
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FIG. 6

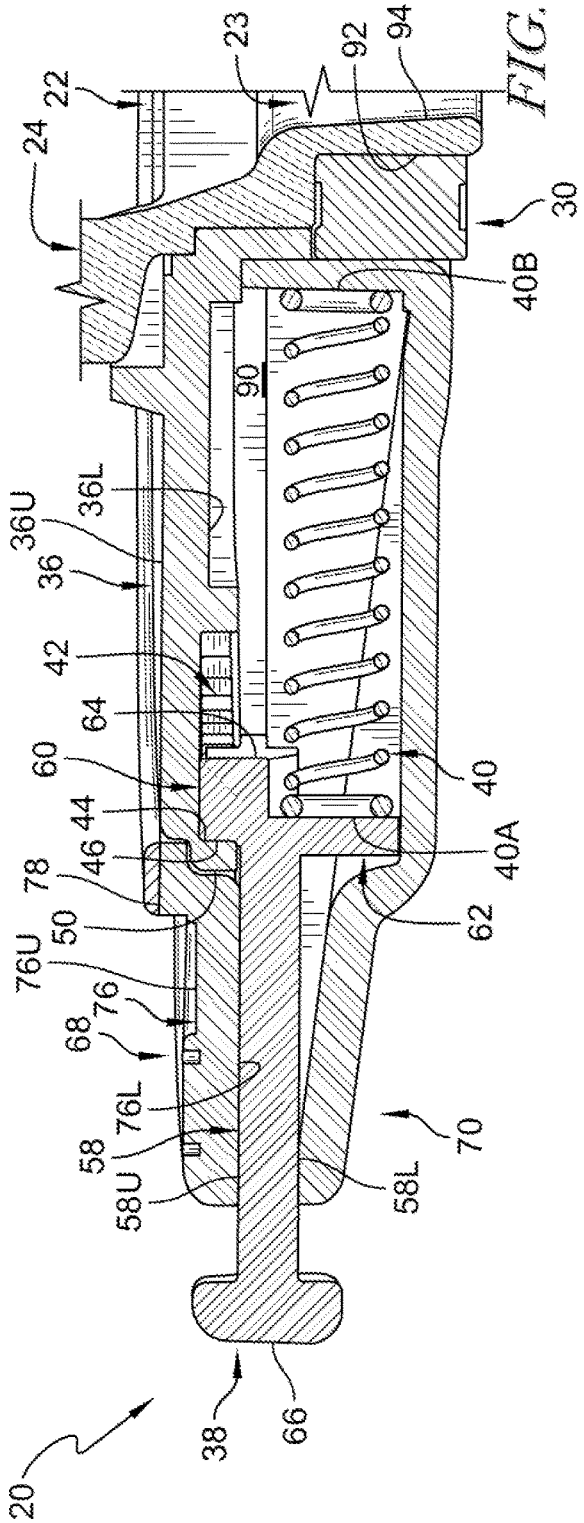
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FIG. 7

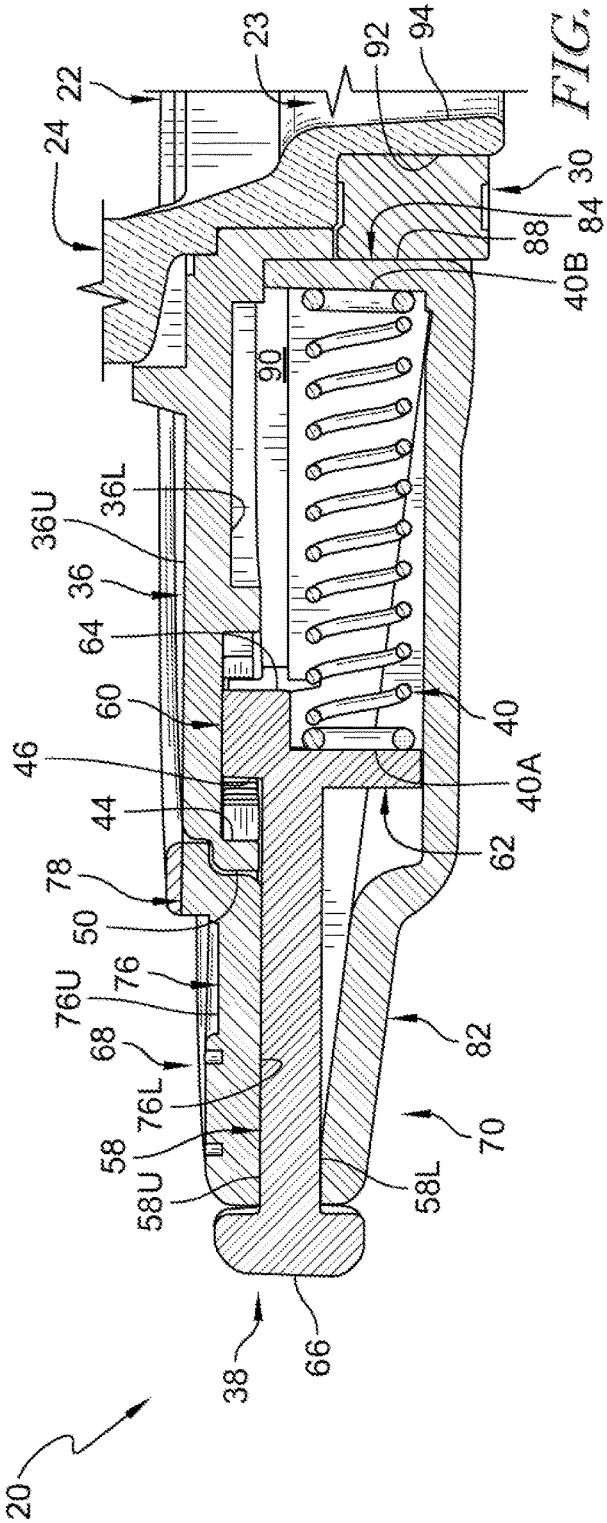
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FIG. 8

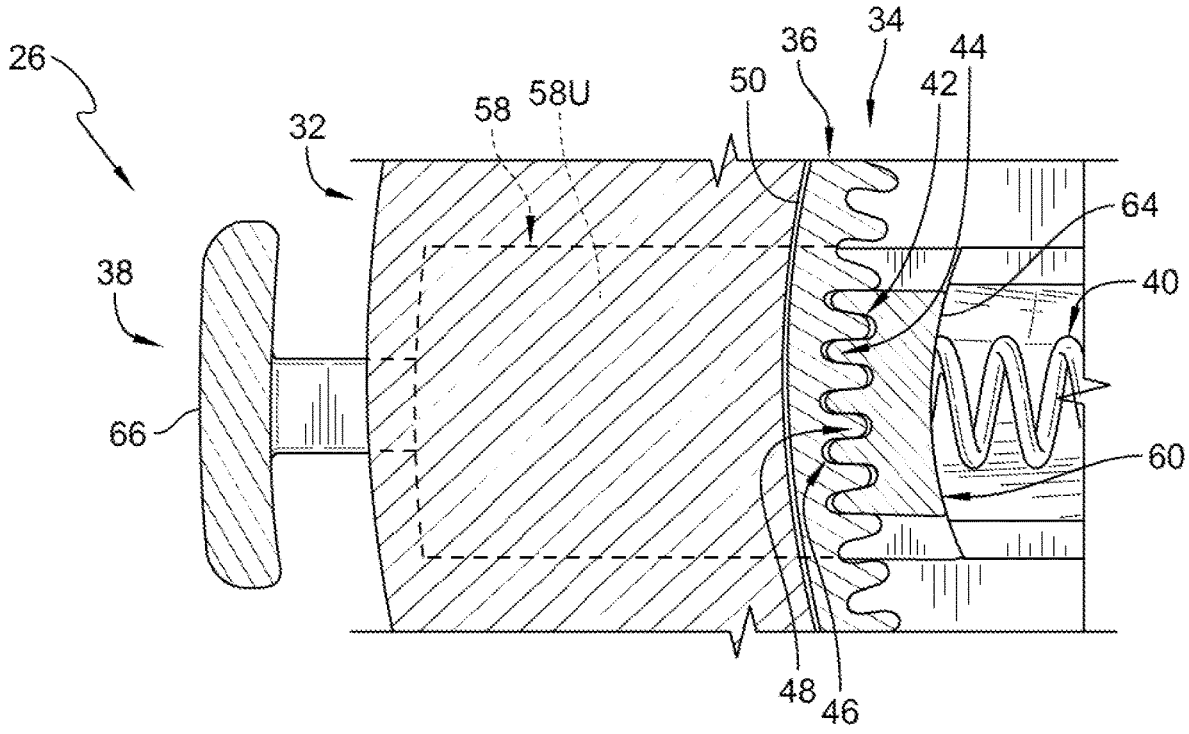
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FIG. 7A

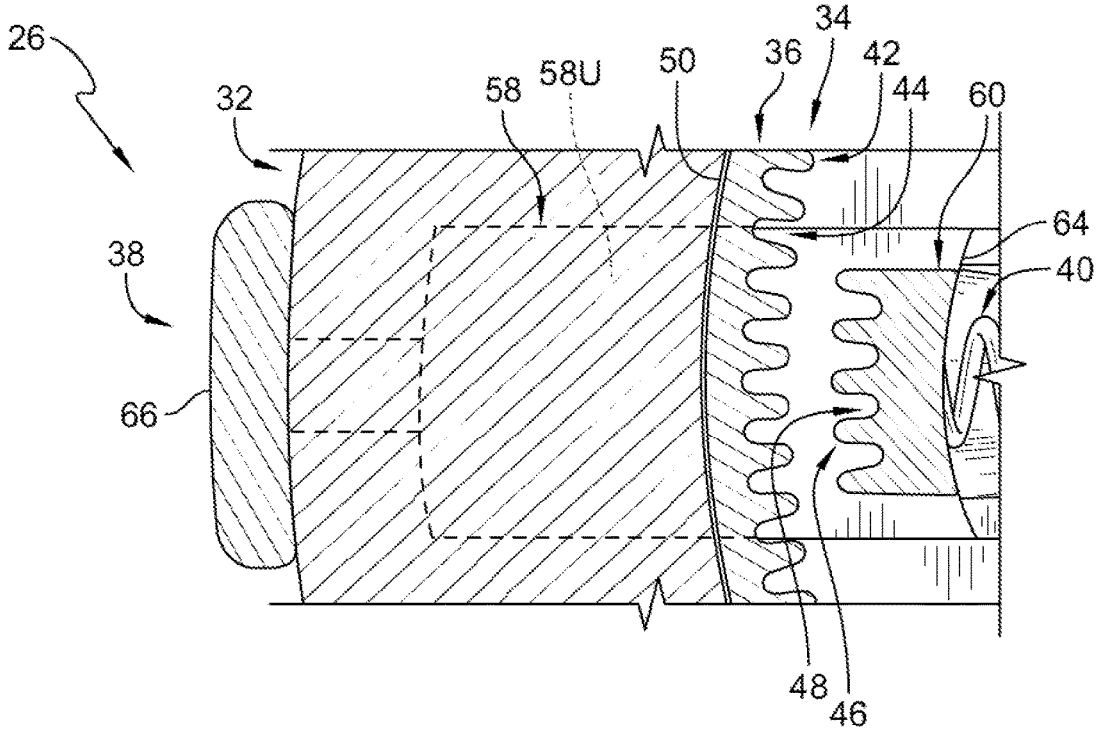
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FIG. 8A

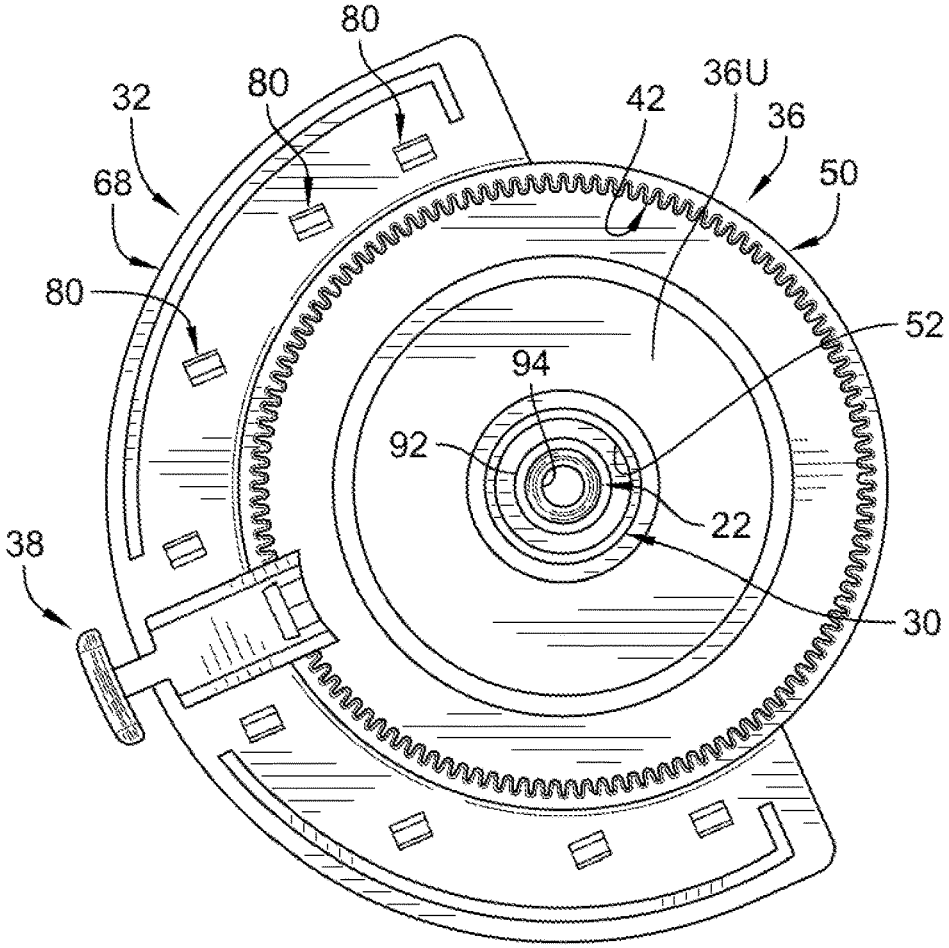
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FIG. 9

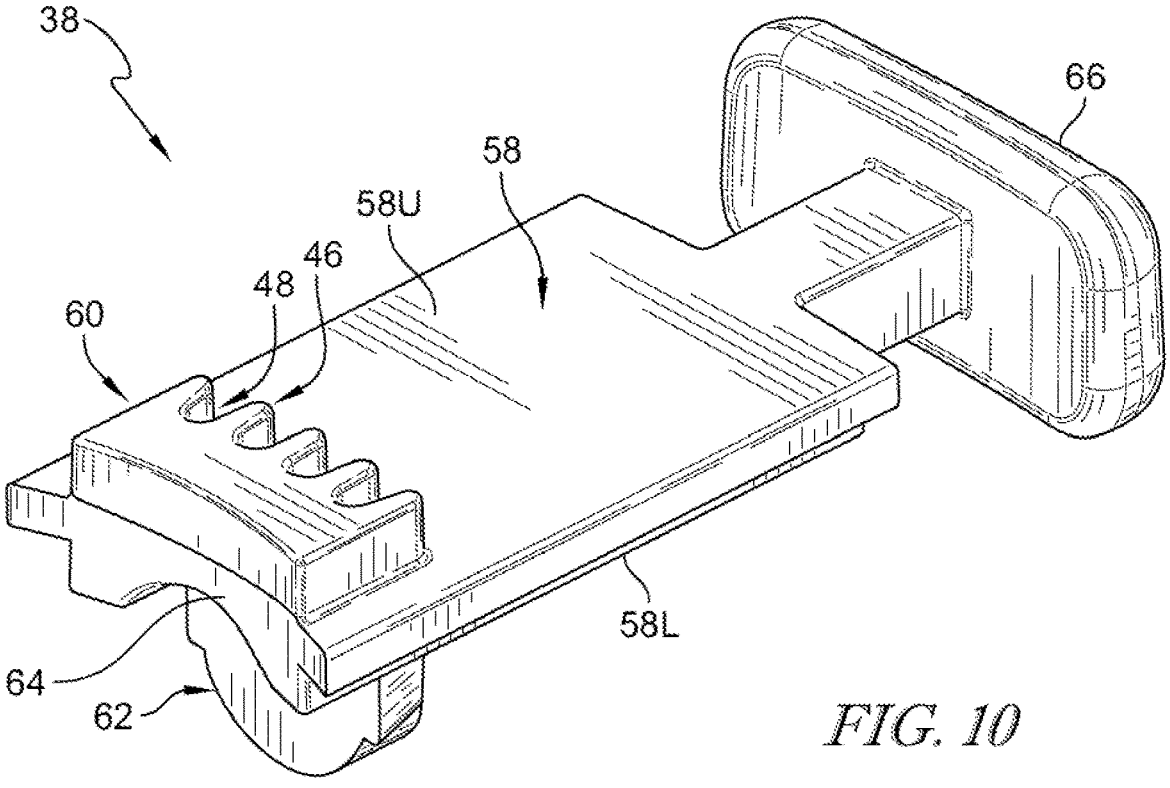
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FIG. 10

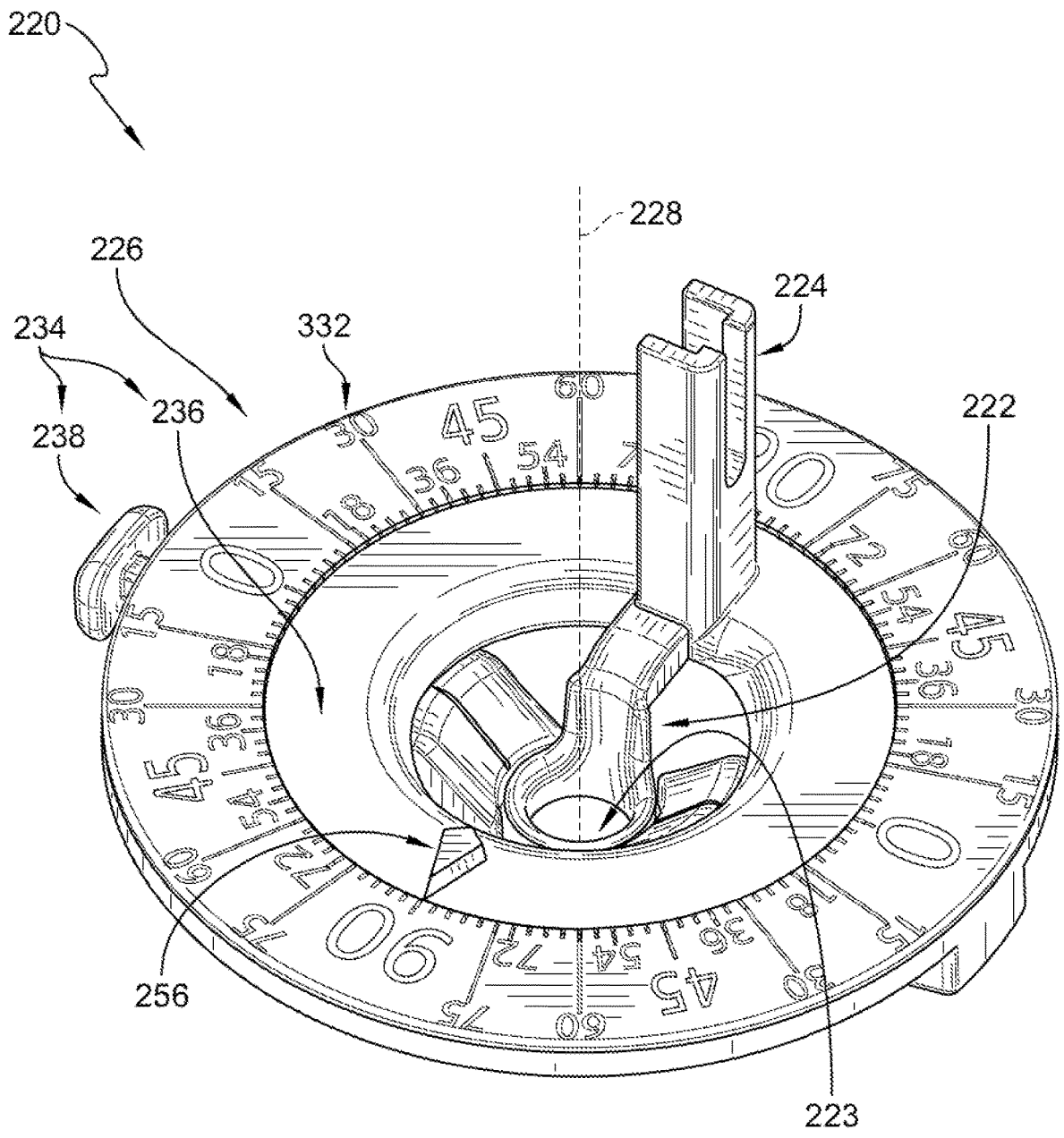

FIG. 11

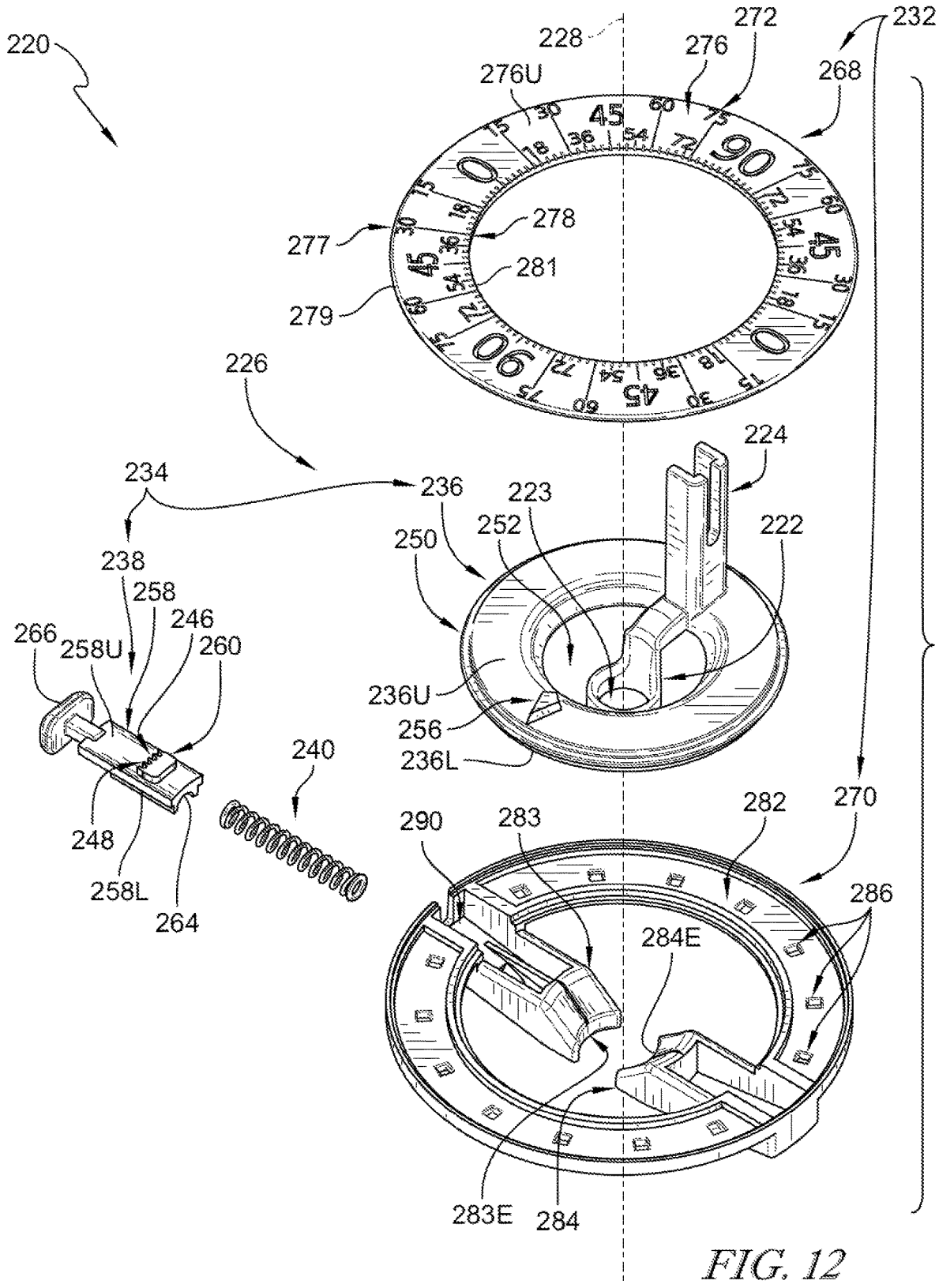
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FIG. 12

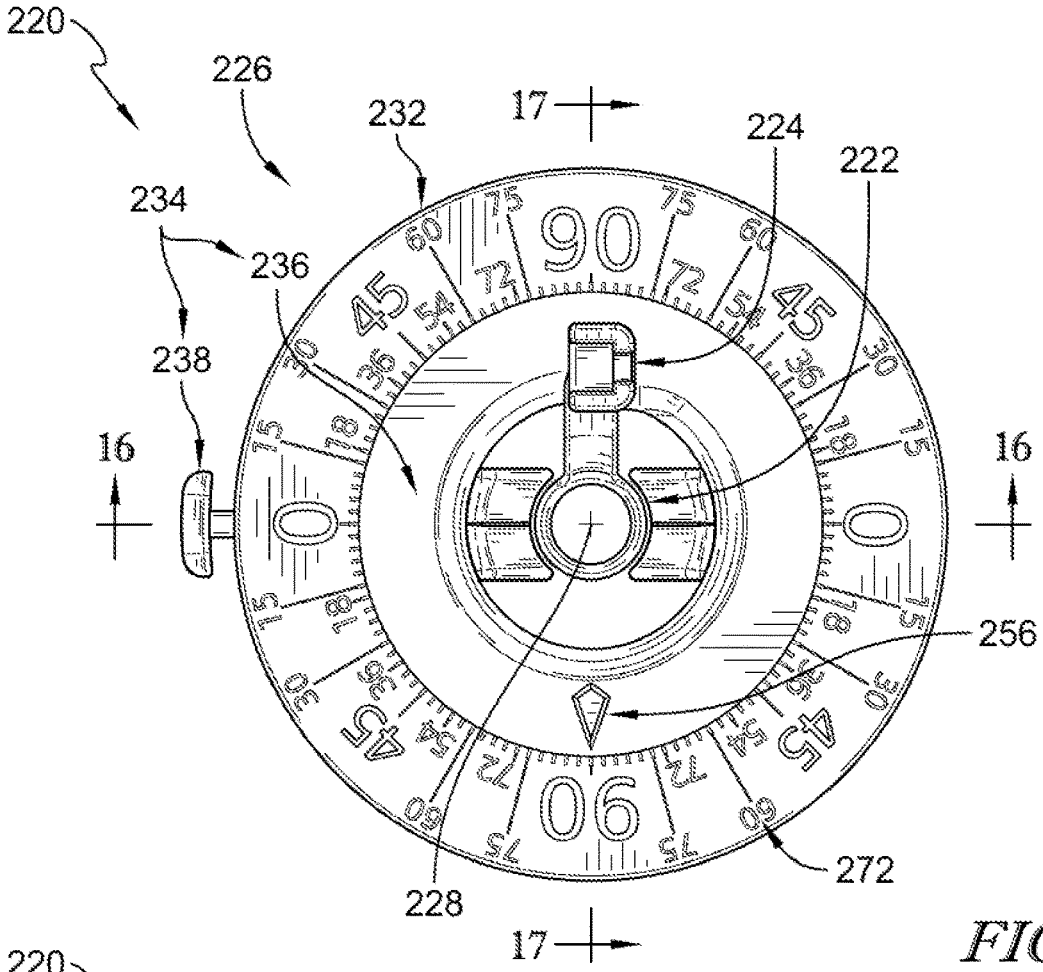
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FIG. 13

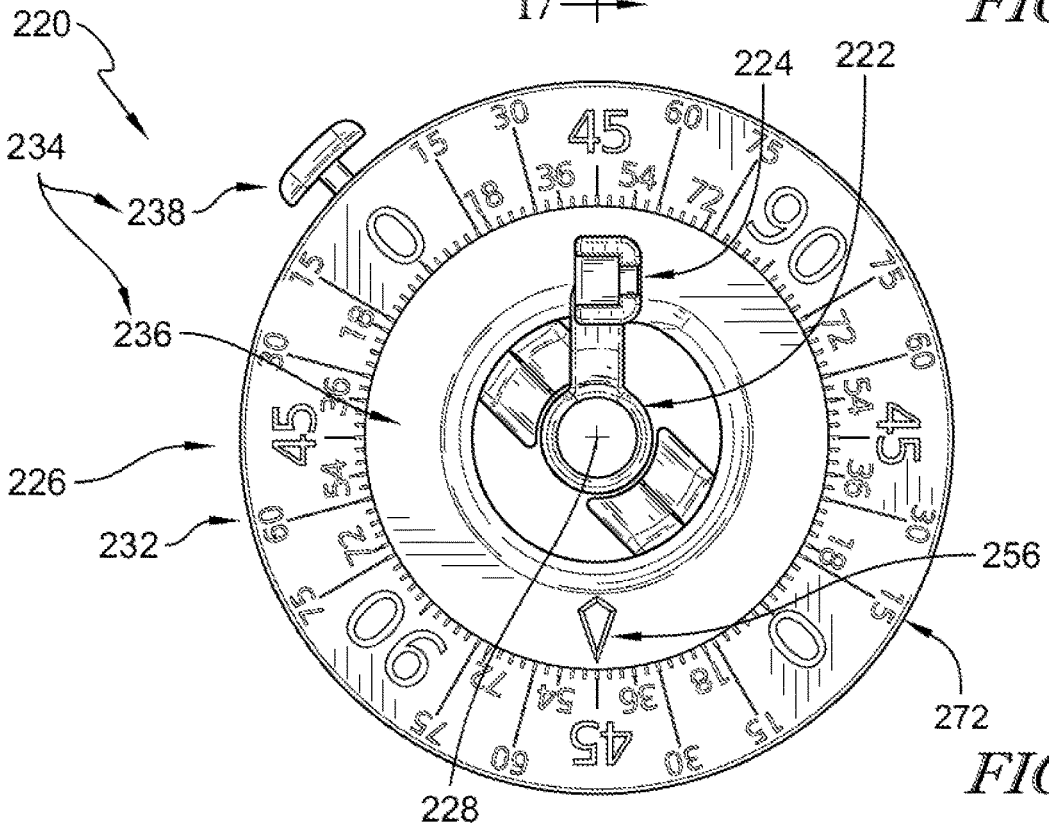
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FIG. 14

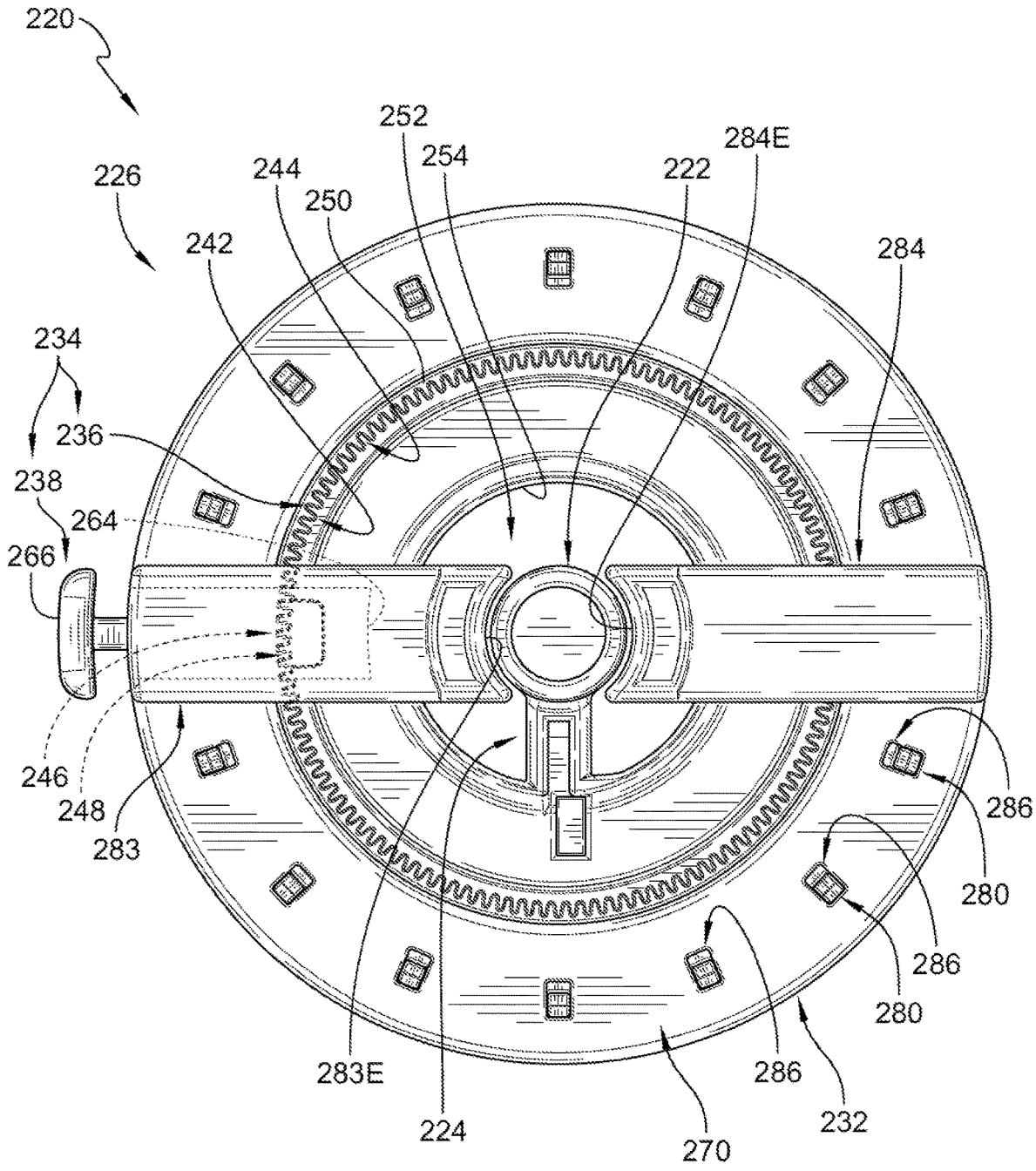
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FIG. 15

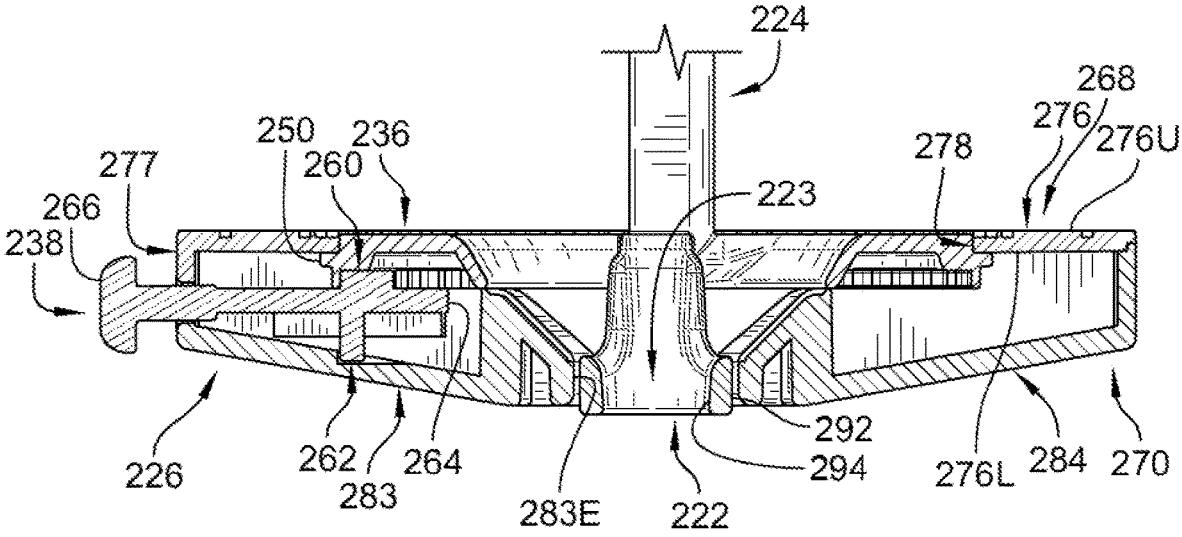
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FIG. 16

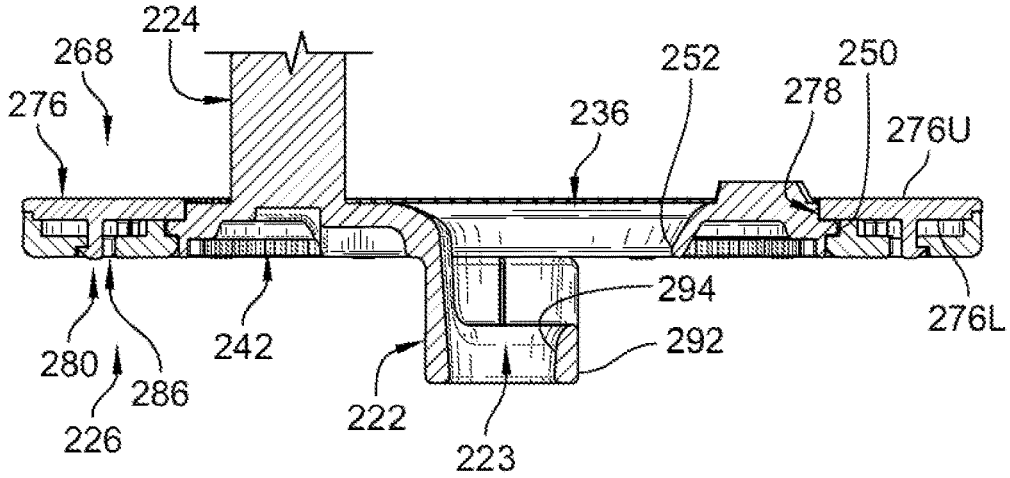
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FIG. 17

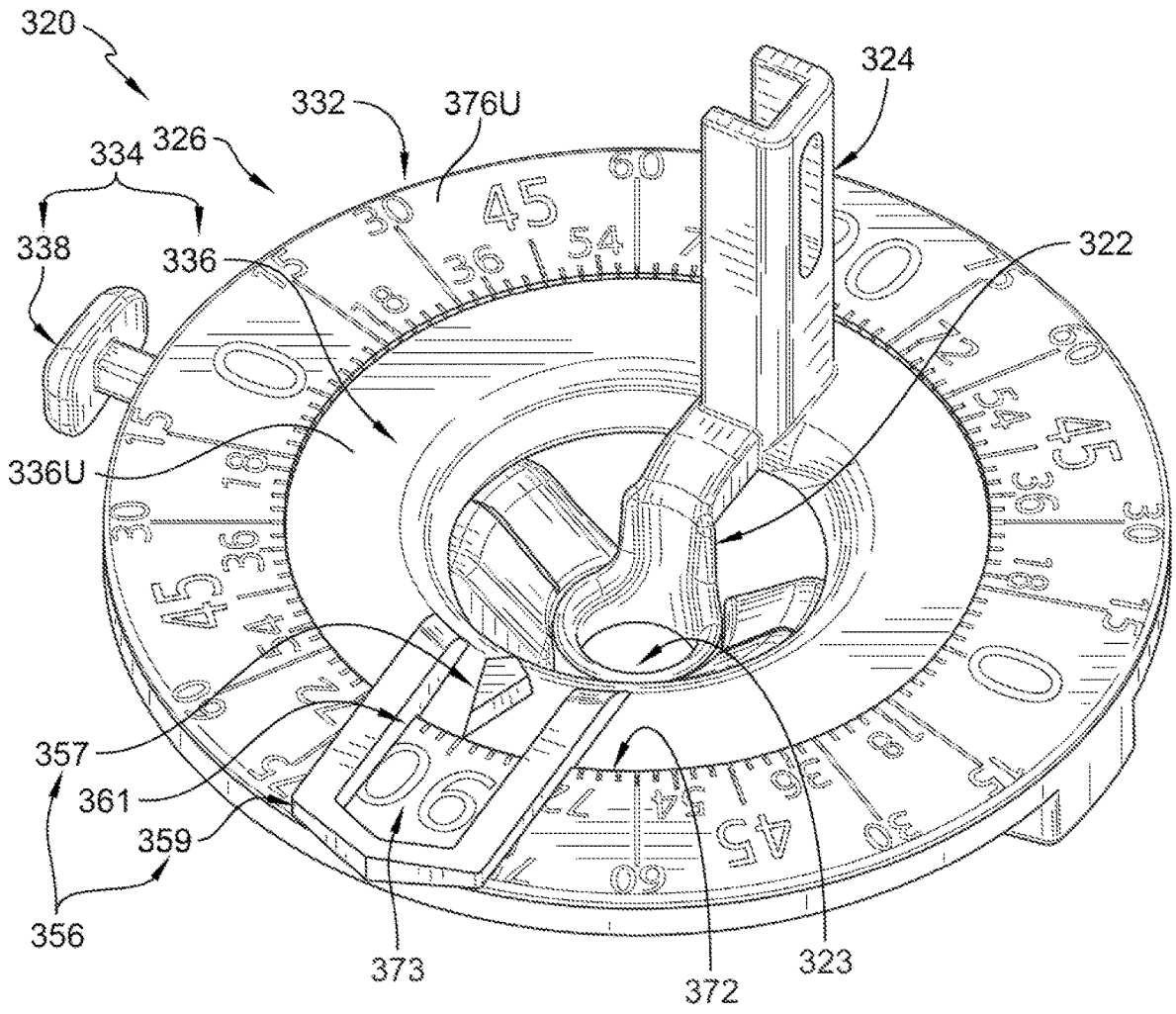
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FIG. 18

INDEXABLE, LOCKING HOPPING FOOT

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 63/269,279, filed Mar. 14, 2022, the entire contents of which are hereby incorporated by reference.

FIELD OF DISCLOSURE

The present disclosure relates generally to sewing or quilting machines, and more specifically to a hopping foot for sewing and quilting machines.

BACKGROUND

Sewing machines are used for stitching one or more pieces of fabric with thread. Some sewing machines are stationary such that fabric is fed under a needle of the sewing machine, while other sewing machines, like quilting machines, are maneuverable such that the needle may be moved across the fabric.

Maneuverable sewing machines allow a user to create intricate stitching patterns. Maneuverability in such sewing and quilting machines, however, makes it difficult to accurately follow a path on the fabric, such as a seam, a ditch line, or another desired pattern.

A hopping foot and ruler may be used with the sewing machine to help guide the needle along the path. It remains difficult, however, to maneuver the machine and the ruler simultaneously.

SUMMARY

The present disclosure may comprise one or more of the following features and combinations thereof.

A hopping foot assembly for a sewing machine having a needle may comprise a circular hopping foot base, a hopping foot arm that extends axially from the hopping foot base relative to an axis, and a ruler guide. The circular hopping foot base may be shaped to include an outer surface and an inner surface that defines a needle opening that extends axially therethrough relative to the axis to allow the needle to extend into and out of fabric during use of the sewing machine. The hopping foot arm may be configured to be coupled to the sewing machine to fix the hopping foot base relative to the sewing machine. The ruler guide may be coupled to the outer surface of the hopping foot base.

In some embodiments, the ruler guide may be configured to change between an unlocked configuration and a locked configuration. In the unlocked configuration, the ruler guide may be free to rotate about the axis relative to the hopping foot base. In the locked configuration, the ruler guide may be blocked from rotating relative to the hopping foot base so that an orientation of the ruler guide is maintained when the ruler guide is engaged with an edge of a ruler to allow a user to follow a path with the needle of the sewing machine during use of the sewing machine.

In some embodiments, the rotating ruler guide may comprise a bearing coupled to the outer surface of the hopping foot base, a rotating guide attachment coupled to the bearing, and a locking assembly. The bearing may be configured to rotate about the axis. The rotating guide attachment may be configured to engage the edge of the ruler so as to align the needle with the path.

In some embodiments, locking assembly may comprise a lock disk coupled to the hopping foot base, and a locking latch coupled to the guide attachment. The locking latch may be configured to change between a locked position and an unlocked position. In the locked position, the locking latch may mate with the lock disk to block rotation of the guide attachment relative to the hopping foot base. In the unlocked position, the locking latch may be spaced apart from the lock disk to allow rotation of the guide attachment relative to the hopping foot base.

In some embodiments, the lock disk may be shaped to include a plurality of locking teeth. The plurality of locking teeth may define a plurality of disk grooves. The plurality of disk grooves may open radially inward toward the axis.

In some embodiments, the locking latch may be shaped to include a plurality of locking teeth. The plurality of locking teeth may define a plurality of latch grooves. The plurality of latch grooves may open radially outward away from the axis.

In some embodiments, the plurality of locking teeth on lock disk may extend into the plurality of latch grooves and the plurality of locking teeth on the locking latch may extend into the plurality of disk grooves when the locking latch is in the locked position to block rotation of the guide attachment relative to the hopping foot base. In some embodiments, the plurality of locking teeth on the lock disk may be spaced apart circumferentially around the axis.

In some embodiments, the locking assembly may further comprise a bias spring. The bias spring may be arranged between the guide attachment and the locking latch to bias the locking latch toward the locked position.

In some embodiments, the locking latch may comprise a planar body that extends radially relative to the axis a first tab that extends axially from a first side of the planar body, and a second tab that extends axially from a second side of the planar body opposite the first side. The first tab may be shaped to include the plurality of locking teeth. The second tab may be engaged with the bias spring.

In some embodiments, the lock disk may be shaped to include a pointer and the rotating guide attachment may be shaped to include a plurality of angular indicators. The plurality of angular indicators may be configured to be aligned with the pointer of the rotating guide to select a path that extends at a predetermined angle.

In some embodiments, the locking assembly may further comprise a bias spring. The bias spring may be arranged between the guide attachment and the locking latch to bias the locking latch toward the locked position.

In some embodiments, the lock disk may be shaped to include a pointer. The rotating guide attachment may be shaped to include a plurality of angular indicators. The plurality of angular indicators may be configured to be aligned with the pointer of the rotating guide to select a path that extends at a predetermined angle.

In some embodiments, the rotating ruler guide may comprise a lock disk coupled to the hopping foot base, a rotating guide attachment coupled to the lock disk to rotate about the axis, and a locking latch arranged to extend between the guide attachment and the lock disk. The rotating guide attachment may be configured to engage the edge of the ruler so as to align the needle with the path. The locking latch may be configured to change between a locked position and an unlocked position. In the locked position, the locking latch may mate with the lock disk to block rotation of the guide attachment relative to the hopping foot base. In the unlocked

position, the locking latch may be spaced apart from the lock disk to allow rotation of the guide attachment relative to the hopping foot base.

In some embodiments, the lock disk may be shaped to include a pointer and the rotating guide attachment may be shaped to include a plurality of angular indicators. The plurality of angular indicators may be configured to be aligned with the pointer of the rotating guide to select a path that extends at a predetermined angle.

In some embodiments, the locking assembly may further comprise a bias spring. The bias spring may be arranged between the guide attachment and the locking latch to bias the locking latch toward the locked position.

According to another aspect of the present disclosure, a hopping foot assembly for a sewing machine having a needle may comprise a hopping foot base, a hopping foot arm that extends axially form the hopping foot base, and a ruler guide coupled to the hopping foot base. The hopping foot base may be shaped to include a needle opening that extends axially therethrough relative to an axis. The hopping foot may be configured to be coupled to the sewing machine to fix the hopping foot base relative to the sewing machine. The ruler guide may be configured to change between an unlocked configuration and a locked configuration. In the unlocked configuration, the ruler guide may be free to rotate about the axis relative to the hopping foot base. In the locked configuration, the ruler guide may be blocked from rotating relative to the hopping foot base.

In some embodiments, the rotating ruler guide may comprise a bearing coupled to the outer surface of the hopping foot base, a rotating guide attachment coupled to the bearing, and a locking assembly. The bearing may be configured to rotate about the axis. The rotating guide attachment may be configured to engage the edge of the ruler so as to align the needle with the path.

In some embodiments, the locking assembly may comprise a lock disk coupled to the hopping foot base and a locking latch coupled to the guide attachment. The locking latch may be configured to change between a locked position and an unlocked position. In the locked position, the locking latch may mate with the lock disk to block rotation of the guide attachment relative to the hopping foot base. In the unlocked position, the locking latch may be spaced apart from the lock disk to allow rotation of the guide attachment relative to the hopping foot base.

In some embodiments, the lock disk may be shaped to include a plurality of locking teeth and the locking latch may be shaped to include a plurality of locking teeth. The plurality of locking teeth on lock disk may engage the plurality of locking teeth on the locking latch when the locking latch is in the locked position to block rotation of the guide attachment relative to the hopping foot base.

In some embodiments, the plurality of locking teeth on lock disk may define a plurality of disk grooves that open radially inward toward the axis. In some embodiments, the plurality of locking teeth on the locking latch may define a plurality of latch grooves that open radially outward away from the axis. The plurality of locking teeth on lock disk may extend into the plurality of latch grooves and the plurality of locking teeth on the locking latch may extend into the plurality of disk grooves when the locking latch is in the locked position. In some embodiments, the plurality of locking teeth on the lock disk may be spaced apart circumferentially around the axis.

In some embodiments, the locking assembly may further comprises a bias spring. The bias spring may be arranged between the guide attachment and the locking latch to bias the locking latch toward the locked position.

In some embodiments, the lock disk may be shaped to include a pointer and the rotating guide attachment may be shaped to include a plurality of angular indicators. The plurality of angular indicators may be configured to be aligned with the pointer of the rotating guide to select a path that extends at a predetermined angle.

In some embodiments, the rotating ruler guide may comprise a lock disk coupled to the hopping foot base, a rotating guide attachment coupled to the lock disk to rotate about the axis, and a locking latch arranged to extend between the guide attachment and the lock disk. The rotating guide attachment may be configured to engage the edge of the ruler so as to align the needle with the path. The locking latch may be configured to change between a locked position and an unlocked position. In the locked position, the locking latch may mate with the lock disk to block rotation of the guide attachment relative to the hopping foot base. In the unlocked position, the locking latch may be spaced apart from the lock disk to allow rotation of the guide attachment relative to the hopping foot base.

These and other features of the present disclosure will become more apparent from the following description of the illustrative embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a sewing machine with a hopping foot assembly coupled to a presser bar of the sewing machine;

FIG. **2** is a detail view of the sewing machine of FIG. **1** showing the hopping foot assembly that includes a hopping foot base shaped to include an opening that extends axially therethrough relative to an axis of the hopping foot assembly, a hopping foot arm that extends from the hopping foot base and couples to the sewing machine to fix the hopping foot base relative to the sewing machine, and a ruler guide coupled to the hopping foot base that aids a user in aligning a needle of the sewing machine in a path;

FIG. **3** is a perspective view of the hopping foot assembly of FIG. **2** showing the ruler guide which comprises a pointer and a plurality of angular indicators configured to be aligned with the pointer of the rotating guide to select a path that extends at a predetermined angle;

FIG. **4** is an exploded view of the hopping foot assembly of FIG. **3** showing the ruler guide which comprises a bearing configured to be coupled to the hopping foot base and to rotate about the axis, the rotating guide attachment configured to be coupled to the bearing, and a locking assembly that includes a lock disk, a locking latch configured to change between a locked position as shown in FIG. **7** and an unlocked position as shown in FIG. **8**, and a bias spring configured to bias the locking latch to the locked position;

FIG. **5** is a top view of the hopping foot assembly of FIG. **3** showing the rotating ruler guide engaged with the edge of the ruler with the rotating ruler guide in a first orientation;

FIG. **6** is a view similar to FIG. **5** showing that the rotating ruler guide has moved to a second orientation such that the rotating ruler guide is at a predetermined angle in the second position compared to the first position;

FIG. **7** is a cross-section view of the hopping foot assembly of FIG. **3** showing the ruler guide in the locked configuration such that the locking latch is in a locked position in which the locking latch mates with the locking disk to block rotation of the guide attachment relative to the hopping foot base;

FIG. **8** is a view similar to FIG. **7** showing the ruler guide in the unlocked configuration such that the locking latch is in the unlocked position in which the locking latch is spaced apart from the locking disk to allow rotation of the guide attachment relative to the hopping foot base;

FIG. **7**A is cross-section view of the hopping foot assembly of FIG. **7** showing the locking disk is shaped to include a plurality of locking teeth that engage with a plurality of locking teeth included in the locking latch when the locking latch is in the locked position to block rotation of the guide attachment relative to the hopping foot base.

FIG. **8**A is a view similar to FIG. **8** showing the locking latch has moved to an unlocked position such that the plurality of locking teeth of the locking latch are spaced apart from the plurality of locking teeth of the lock disk to allow rotation of the guide attachment relative to the hopping foot base;

FIG. **9** is cross-section view of the hopping foot assembly of FIG. **3** showing the plurality of locking teeth of the lock disk are spaced apart circumferentially around an axis;

FIG. **10** is a perspective view of the locking latch included in the hopping foot assembly of FIG. **3** showing the locking latch comprises a planar body that extends radially relative to the axis, a first tab that extends axially from a first side of the planar body, and a second tab that extends axially from a second side of the planar body opposite the first side that is configured to be engaged with the bias spring, and further showing the first tab shaped to include the plurality of locking teeth;

FIG. **11** is view of another embodiment of a hopping foot assembly showing the hopping foot assembly that includes a hopping foot base shaped to include a needle opening that extends axially therethrough relative to an axis of the hopping foot assembly, a hopping foot arm that extends from the hopping foot base and fixes the hopping foot base relative to the sewing machine, and a ruler guide coupled to the hopping foot base that extends circumferentially all the way around the hopping foot base to aid the user in aligning a needle of the sewing machine in a path;

FIG. **12** is an exploded view of the hopping foot assembly of FIG. **11** showing the ruler guide comprises a rotating guide attachment comprising a plurality of angle indicators and a locking assembly that includes a lock disk integrally formed with the hopping foot base, a locking latch configured to change between the locked position as shown in FIG. **15** and the unlocked position, and a bias spring configured to bias the locking latch to the locked position;

FIG. **13** is a top view of the hopping foot assembly of FIG. **11** showing the rotating ruler guide engaged with the edge of the ruler with the rotating ruler guide in a first orientation;

FIG. **14** is a view similar to FIG. **13** showing the rotating ruler guide has moved to a second orientation such that the rotating ruler guide is at a predetermined angle in the second position compared to the first position;

FIG. **15** is a bottom view of the hopping foot assembly of FIG. **11** showing the locking disk is shaped to include a plurality of locking teeth that engage with a plurality of locking teeth included in the locking latch when the locking latch is in the locked position to block rotation of the guide attachment relative to the hopping foot base;

FIG. **16** is a cross-section view of the hopping foot assembly of FIG. **13** taken along line **16-16** showing the ruler guide in the locked configuration such that the locking latch is in locked position in which the locking latch mates with the locking disk to block rotation of the guide attachment relative to the hopping foot base;

FIG. **17** is a cross-section view of the hopping foot assembly of FIG. **13** taken along line **17-17** showing the guide attachment of the includes an upper portion and a lower portion as that couple together over the lock disk; and

FIG. **18** is a view of another embodiment of a hopping foot assembly showing the hopping foot assembly that includes a hopping foot base shaped to include a needle opening that extends axially therethrough relative to an axis of the hopping foot assembly, a hopping foot arm that extends from the hopping foot base and fixes the hopping foot base relative to the sewing machine, and a ruler guide coupled to the hopping foot base that extends circumferentially all the way around the hopping foot base to aid the user in aligning a needle of the sewing machine in a path;

DETAILED DESCRIPTION OF THE DRAWINGS

For the purpose of promoting an understanding of the principles of the disclosure, reference will now be made to a number of illustrative embodiments illustrated in the drawings and specific language will be used to describe the same.

A hopping foot assembly **20** adapted for use with a sewing machine **10** is shown in FIGS. **1-10**. The sewing machine **10** has a sewing machine body **12**, sewing machine bed **14**, a presser bar **16**, and a needle **18** as shown in FIGS. **1** and **2**. The hopping foot assembly **20** is coupled to the presser bar **16** of the sewing machine **10** and configured to be lowered into contact with fabric **19** to be sewn.

The hopping foot assembly **20** includes a hopping foot base **22**, a hopping foot arm **24**, and a ruler guide **26** as shown in FIGS. **2-7**. The hopping foot base **22** is shaped to define a needle opening **23** that extends through the base **22** relative to an axis **28**. The needle opening **23** is configured to allow the needle **18** to extend into and out of the fabric **19**. The hopping foot arm **24** extends axially from the hopping foot base **22** and couples to the presser bar **16** of the sewing machine **10** to fix the hopping foot base **22** relative to the sewing machine **10**. The ruler guide **26** is coupled to the hopping foot base **22** and is configured rotate about the axis **28** relative to the hopping foot base **22**.

When sewing or quilting pieces of fabric together, it may be difficult for a user to guide the needle **18** of the machine **10** along a path without straying from the path. The path may be a seam, a ditch line, or another desired stitch pattern to be sewn in the fabric **19**. Following the path with the needle **18** is especially difficult for free moving or maneuverable machines, which allow the user to freely move the machine **10** along the path.

Therefore, the user may use a ruler **15** to define the path to be followed by the needle **18** and help guide the hopping foot, and thus the needle **18**, along the path. However, it may be difficult to maneuver the machine **10** and maintain the orientation of the ruler **15** simultaneously.

As such, the hopping foot assembly **20** includes the ruler guide **26** to help the user easily guide the hopping foot assembly **20** along the ruler **15**. The ruler guide **26** is configured to change between an unlocked configuration as shown in FIGS. **8** and **8**A and a locked configuration as shown in FIGS. **7** and **7**A to maintain an orientation of the ruler **15** when the ruler guide **26** is engaged with an edge **17** of the ruler **15** that defines a path.

In the unlocked configuration, the ruler guide **26** is free to rotate about the axis **28** relative to the hopping foot base. This allows the ruler **15** to be moved around the hopping foot assembly **20** to create different paths **21** as suggested in FIGS. **5** and **6**. When the ruler guide **26** is in the unlocked

configuration, the ruler guide **26** may be rotated to achieve the desired orientation of the ruler **15**. As shown in FIG. **5**, the dotted arrow suggests the ruler guide **26** is free to rotate in two directions about the axis **28** when in the unlocked configuration.

In locked configuration, the ruler guide **26** is blocked from rotating relative to the hopping foot base **22** to maintain the orientation of the ruler guide **26** and, therefore, the ruler **15**. Maintaining engagement of the hopping foot assembly **20** with the edge **17** of the ruler **15** is important for following the path with the needle **18** during use of the sewing machine **10**.

The ruler guide **26** comprises a bearing **30**, a rotating guide attachment **32**, and a locking assembly **34** as shown in FIGS. **3-6**. The bearing **30** is coupled to an outer surface of the hopping foot base **22** and configured to rotate about the axis **28**. The rotating guide attachment **32** is coupled to the bearing **30** and configured to engage the edge **17** of the ruler **15** so as to align the needle **18** with the path. The locking assembly **34** is configured to change the ruler guide **26** between the unlocked and locked configurations.

The locking assembly **34** comprises a lock disk **36** and a locking latch **38** as shown in FIGS. **3-10**. The lock disk **36** is coupled to the hopping foot base **22**. The locking latch **38** is coupled to the guide attachment **32**. The locking latch **38** is configured to change between a locked position as shown in FIGS. **7** and **7**A and an unlocked position as shown in FIGS. **8** and **8**A. In the locked position, the locking latch **38** mates with the lock disk **36** to block rotation of the guide attachment **32** relative to the hopping foot base **22**. In the unlocked position, the locking latch **38** is spaced apart from the lock disk **36** to allow rotation of the guide attachment **32** relative to the hopping foot base **22**.

In the illustrative embodiment, the locking assembly **34** further comprises a bias spring **40** as shown in FIGS. **4** and **7-8**A. The bias spring **40** is arranged between the guide attachment **32** and the locking latch **38** to bias the locking latch **38** toward the locked position.

The lock disk **36** is shaped to include a plurality of locking teeth **42**, and the locking latch **38** is shaped to include a plurality of locking teeth **46** as shown in FIGS. **7-10**. The plurality of locking teeth **42** define a plurality of disk grooves **44** that open radially inward toward the axis **28**. The plurality of locking teeth **46** also define a plurality of latch grooves **48** that open radially outward away from the axis **28**.

The plurality of locking teeth **42** on lock disk **36** extend into the plurality of latch grooves **48** and the plurality of locking teeth **46** on the locking latch **38** extend into the plurality of disk grooves **44** when the locking latch **38** is in the locked position as shown in FIGS. **7** and **7**A. The plurality of locking teeth **42** of the lock disk **36** and the plurality of locking teeth **46** of the locking latch **38** engage to block rotation of the guide attachment **32** relative to the hopping foot base **22**.

In the illustrative embodiment, the plurality of locking teeth **42** on the lock disk **36** are spaced apart circumferentially around the axis **28**.

The lock disk **36** is shaped to include an upper surface **36**U, a lower surface **36**L opposite the upper surface **36**U, an outer perimeter edge **50** that forms the plurality of locking teeth **42**, and a center hole **52** as shown in FIGS. **4**, **7**, and **8**. The outer perimeter edge **50** extends between and interconnects the upper and lower surfaces **36**U, **36**L. The center hole **52** extends through the upper and lower surfaces **36**U, **36**L at the axis **28** and the hopping foot base **22** extends into the center hole **52** to couple the lock disk **36** to the hopping foot base **22**.

In the illustrative embodiment, the upper surface **36**U of the lock disk **36** is shaped to include a pointer **56** as shown in FIGS. **3** and **4**. The pointer **56** is configured to align with one of a plurality of angular indicators **72** formed on the rotating guide attachment **32**. The pointer **56** is configured to be aligned with one of the plurality of angular indicators **72** to select the path that extends at a predetermined angle.

To select the predetermined angle, the locking latch **38** is moved to the unlocked position to cause the plurality of locking teeth **46** of the locking latch **38** to be spaced apart from the plurality of locking teeth **42** of the lock disk **36**. This allows the rotating guide attachment **32** to rotate about the axis **28**. The rotating guide attachment **32** is rotated until the pointer **56** on the lock disk **36** aligns with the desired angular indicator on the guide attachment **32**. Then, the locking latch **38** is moved to the locked position to cause the plurality of locking teeth **42** on lock disk **36** to extend into the plurality of latch grooves **48** and the plurality of locking teeth **46** on the locking latch **38** to extend into the plurality of disk grooves **44**, thereby blocking rotation of the guide attachment **32**.

In the illustrative embodiment, to move the locking latch **38** to the unlocked position, a user engages the locking latch **38** with a force as suggested in FIGS. **7** and **7**A. The force overcomes a bias force applied by the bias spring **40** to move the locking latch **38** to the unlocked position. Once the rotating guide attachment **32** is at the predetermined angle, the user releases the locking latch **28**, which causes the bias spring **40** to urge the locking latch **38** back to the locked position.

The locking latch **38** is shaped to include a planar body **58**, a first tab **60**, and a second tab **62** as shown in FIGS. **7-8**A and **10**. The planar body **58** extends radially relative to the axis. The first tab **60** extends axially from a first side **58**U of the planar body **58**. The second tab **62** extends axially from a second side **58**L of the planar body **58** opposite the first side **58**U. In the illustrative embodiment, the first tab **60** of the locking latch **38** is shaped to include the plurality of locking teeth **46** as shown in FIGS. **7**, **8** and **10**.

The planar body **58** is shaped to define a locking end **64** and an engagement end **66** as shown in FIGS. **7-8**A and **10**. The first and second tabs **60**, **62** extend from the planar body **58** adjacent the locking end **64**. The engagement end **66** is spaced apart radially from the locking end **64**. The user engages the engagement end **66** of the planar body **58** to move the locking latch **38** between the unlocked and locked positions.

Turning again to the guide attachment **32**, the guide attachment **32** includes an upper portion **68** and a lower portion **70** as shown in FIGS. **4**, **7**, and **8**. The lower portion **70** is configured to be coupled to the upper portion **68**. In the illustrative embodiment, the upper portion **68** defines the plurality of angular indicators **72**.

In the illustrative embodiment, an interior space **74** is defined between the upper and lower portions **68**, **70** as shown in FIG. **4**. The locking end **64** of the locking latch **38** is located axially between the upper and lower portions **68**, **70** of the guide attachment **32** in the interior space **74**. The engagement end **66** is located outside of the interior space **74** so that the user may engage the locking latch **38** to move it between the unlocked and locked positions.

The upper portion **68** is shaped to define an upper panel **76**, a lip **78**, and a plurality of attachment hooks **80** as show in FIGS. **3** and **4**. The upper panel **76** extends circumferen-

tially at least partway about the axis **28**. The lip **78** extends axially from a first side **76**U of the upper panel **76** over the lock disk **36** and circumferentially at least partway about the axis **28**. The attachment hooks **80** extend axially from a second side **76**L of the upper panel **76** opposite the first side **76**U. The attachment hooks **80** are configured to engage the lower portion **70** to couple the upper portion **68** to the lower portion **70**. In the illustrative embodiment, the first side **76**U of the upper panel **76** and the lip **78** define the plurality of angular indicators **72**.

The lower portion **70** is shaped to define a lower panel **76**, a flange **84**, and attachment notches **86** as shown in FIGS. **3** and **4**. The lower panel **76** extends circumferentially at least partway about the axis **28**. The flange **84** extends axially from the lower panel **76** toward the lock disk **36** and circumferentially at least partway about the axis **28**. The attachment notches **86** extend through the lower panel **76**. The notches **86** are configured to receive the attachment hooks **80** to couple the upper portion **68** to the lower portion **70**.

The flange **84** defines a center hole **88** as shown in FIGS. **3** and **4**. The center hole **88** is concentric with the center hole **52** of the lock disk **36**. The flange **84** is coupled to the bearing **30** so that the guide attachment **32** is allowed to rotate about the axis **28** when in the unlocked configuration. The bearing **30** is located in the center hole **88** to rotatably couple the guide attachment **32** to the hopping foot base **22**.

In the illustrative embodiment, the bias spring **40** extends between the second tab **62** and the flange **84** as shown in FIGS. **7** and **8**. A first end **40**A of the bias spring **40** engages the second tab **62** of the locking latch **38**, while a second end **40**B of the bias spring **40** engages the flange **84**.

When the user applies a force to the locking latch **38**, the force compresses the bias spring **40** radially between the second tab **62** and the flange **84** relative to the axis **28**. The force applied to the locking latch **38** is greater than the bias force applied by the spring to cause the locking latch **38** to translate from the locked position to the unlocked position. When the force is removed, the bias spring **40** urges the locking latch **38** back to the locked position.

In the illustrative embodiment, the lower portion **70** further includes a guide channel **90** as shown in FIG. **4**. The bias spring **40** is located in the guide channel **90**. The guide channel **90** is configured to maintain the position of the bias spring **40**.

Turning again to the hopping foot base **22**, the hopping foot base **22** includes outer surface **92**, an inner surface **94**, and the needle opening **23** as shown in FIGS. **3**, **4**, **7**, **8**, and **9**. The inner surface **92** is opposite the outer surface **94**. The inner surface **92** defines the needle opening **23** that extends axially through the base **22**. The bearing **30** is coupled to the outer surface **92** of the hopping foot base **22**, and the lock disk **36** is coupled to the outer surface **92** of the hopping foot base **22** in the center hole **52**.

In the illustrative embodiment, the hopping foot base **22** is circular as shown in FIGS. **3** and **4**. In other embodiments, the hopping foot **22** may have a different shape.

To use the hopping foot assembly **20**, the user first selects the orientation of the ruler **15** to get the desired path. If the orientation of the ruler guide **26** does not match the desired orientation of the ruler **15**, the user may change the orientation of the ruler guide **26** by applying the force to the locking latch **38** to change the locking latch **38** to the unlocked position and rotating the ruler guide **26** to the desired orientation. The user then stops applying the force to cause the locking latch **38** to change to the locked position blocking rotation of the ruler guide **26** thereby maintaining the desired orientation.

The ruler guide **26** is shown in a first orientation as shown in FIG. **5**. The ruler guide **26** is then engaged with the edge **17** of the ruler **15** with the ruler guide **26** in the first orientation. The user then moves the sewing machine **10** along the path while keeping the edge **17** of the ruler **15** engaged with the ruler guide **26**. In this way, the needle **18** follows the path and stitches the desired stich line as suggested in FIG. **5**.

If the desired path changes direction, the user may change the orientation of the ruler guide **26**. To change the orientation of the ruler guide **26** from the first orientation to the second orientation, the user applies force to the locking latch **38** to move the locking latch **38** to the unlocked position so that the ruler guide **26** is in the unlocked configuration.

With the ruler guide **26** in the unlocked configuration, the user may select the new orientation such as a second orientation as shown in FIG. **6**. The guide attachment **32** is then rotated about the axis **28** until the pointer **56** on the lock disk **36** aligns with the desired angular indicator on the guide attachment **32** corresponding with the second orientation as shown in FIG. **6**. Then, the locking latch **38** is moved to the locked position to cause the plurality of locking teeth **42** on lock disk **36** to extend into the plurality of latch grooves **48** and the plurality of locking teeth **46** on the locking latch **38** to extend into the plurality of disk grooves **44**, thereby blocking rotation of the guide attachment **32**.

In the illustrative embodiment, to move the locking latch **38** to the unlocked position, a user engages the locking latch **38** with a force as suggested in FIGS. **7** and **7**A. The force overcomes a bias force applied by the bias spring **40** to move the locking latch **38** to the unlocked position. Once the rotating guide attachment **32** is at the predetermined angle, the user releases the locking latch **28**, which causes the bias spring **40** to urge the locking latch **38** back to the locked position.

Another embodiment of a hopping foot assembly **220** in accordance with the present disclosure is shown in FIGS. **11-17**. The hopping foot assembly **220** is substantially similar to the hopping foot assembly **20** shown in FIGS. **1-10** and described herein. Accordingly, similar reference numbers in the **200** series indicate features that are common between the hopping foot assembly **20** and the hopping foot assembly **220**. The description of the hopping foot assembly **20** is incorporated by reference to apply to the hopping foot assembly **220**, except in instances when it conflicts with the specific description and the drawings of the hopping foot assembly **220**.

The hopping foot assembly **220** includes a hopping foot base **222**, a hopping foot arm **224**, and a ruler guide **226** as shown in FIGS. **11-17**. The hopping foot base **222** is shaped to define a needle opening **223** that extends through the base **222** relative to the axis **228**. The needle opening **223** is configured to allow the needle **18** to extend into and out of the fabric **19**. The hopping foot arm **224** extends axially from the hopping foot base **222** and couples to the presser bar **16** of the sewing machine **10** to fix the hopping foot base **222** relative to the sewing machine **10**. The ruler guide **226** is coupled to the hopping foot base **222** and is configured to change between the unlocked configuration and the locked configuration like in the embodiment of FIGS. **7-8**A.

The ruler guide **226** includes a rotating guide attachment **232** and a locking assembly **234** comprising a lock disk **236** and a locking latch **238** as shown in FIGS. **11-17**. The rotating guide attachment **232** is configured to rotate about

the axis **228**. The locking assembly **234** is configured to change the ruler guide **236** between the unlocked and locked configurations.

In the illustrative embodiment, lock disk **236** is coupled to the hopping foot base **222**, and the rotating guide attachment **232** is rotatably coupled to the lock disk **236** such that the ruler guide **226** does not include a bearing. The locking latch **238** is coupled to the guide attachment **232** and is arranged to extend between the guide attachment **232** and the lock disk **236**.

The lock disk **236** is integrally formed with the hopping foot base **222** and hopping foot arm **224** in the illustrative embodiment. The lock disk **236** extends circumferentially about the axis **228**. The lock disk **236** is integrally formed with the hopping foot base **222** and the hopping foot arm **224** such that the lock disk **236** is concentric with the hopping foot base **222**.

Similar to the embodiment of FIGS. **1-10**, the lock disk **236** is shaped to include a plurality of locking teeth **242** and the locking latch **238** is shaped to include a plurality of locking teeth **246** as shown in FIGS. **12** and **15**. The plurality of locking teeth **242** define a plurality of disk grooves **244** that open radially inward toward the axis **228**. The plurality of locking teeth **246** that define a plurality of latch grooves **248** that open radially outward away from the axis **228**.

The plurality of locking teeth **242** on lock disk **236** extend into the plurality of latch grooves **248** and the plurality of locking teeth **246** on the locking latch **238** extend into the plurality of disk grooves **244** when the locking latch **238** is in the locked position as shown in FIG. **15**. The plurality of locking teeth **242** of the lock disk **236** and the plurality of locking teeth **246** of the locking latch **238** engage to block rotation of the guide attachment **232** relative to the hopping foot base **222**.

In the illustrative embodiment, the locking assembly **234** further comprises a bias spring **240** as shown in FIG. **12**. The bias spring **240** is arranged between the guide attachment **232** and the locking latch **238** to bias the locking latch **238** toward the locked position.

The lock disk **236** is shaped to include an upper surface **236**U, a lower surface **236**L opposite the upper surface **236**U, an outer perimeter edge **250** that forms a plurality of locking teeth **242**, and a center hole **252** as shown in FIGS. **12** and **15**. The outer perimeter edge **250** extends between and interconnects the upper and lower surfaces **236**U, **236**L. The center hole **252** extends through the upper and lower surfaces **236**U, **236**L at the axis **228** and defines an inner edge **254** of the lock disk **236**.

In the illustrative embodiment, the lock disk **236** is coupled with the hopping foot arm **224** inward of the outer perimeter edge **250**. The hopping foot base **222** extends from the inner edge **254** into the center hole **252** such that the inner edge **254** is spaced apart from the hopping foot base **222**.

The locking latch **238** is shaped to include a planar body **258**, a first tab **260**, and a second tab **262** as shown in FIGS. **12** and **16**. The planar body **258** extends radially relative to the axis **228**. The first tab **260** extends axially from a first side **258**U of the planar body **258**. The second tab **62** extends axially from a second side **258**L of the planar body **258** opposite the first side **258**U. In the illustrative embodiment, the first tab **260** of the locking latch **238** is shaped to include the plurality of locking teeth **246** as shown in FIGS. **11-17**.

The planar body **258** is shaped to define a locking end **264** and an engagement end **266** as shown in FIGS. **12** and **15**. The first and second tabs **260**, **262** extend from the planar body **258** adjacent the locking end **264**. The engagement end **266** is spaced apart radially from the locking end **264**. The user engages the engagement end **266** of the planar body **258** to move the locking latch **238** between the unlocked and locked positions.

Turning again to the guide attachment **232**, the guide attachment **232** includes an upper portion **268** and a lower portion **270** as shown in FIGS. **12** and **15-17**. The lower portion **270** is configured to be coupled to the upper portion **268**. In the illustrative embodiment, the upper portion **268** extends circumferentially all the way around the axis **228** and defines the plurality of angular indicators **272**.

The upper portion **268** is shaped to define an upper panel **276**, a flange **277**, a lip **278**, and a plurality of attachment hooks **280** as show in FIGS. **12**, **16**, and **17**. The upper panel **276** extends circumferentially all the way around the axis **228**. The flange **277** extends axially from a lower side **276**L of the upper panel **276** at an outer perimeter edge **279** of the upper panel **276**, while the lip **278** extends axially from an upper side **276**U of the upper panel **276** over the lock disk **236** at an inner edge **281** of the upper panel **276**. The attachment hooks **280** extend axially from the lower side **276**L of the upper panel **276**. The attachment hooks **280** are configured to engage the lower portion **270** to couple the upper portion **268** to the lower portion **270**. In the illustrative embodiment, the upper side **276**U of the upper panel **276** defines the plurality of angular indicators **272**.

In the illustrative embodiment, the upper surface **236**U of the lock disk **236** is shaped to include a pointer **256** as shown in FIGS. **11-14**. The pointer **256** is configured to align with one of a plurality of angular indicators **272** formed on the rotating guide attachment **232**. The pointer **256** is configured to be aligned with one of the plurality of angular indicators **272** to select the path that extends at a predetermined angle.

The lower portion **270** is shaped to define a lower panel **282**, guide flanges **283**, **284**, and attachment notches **286** as shown in FIGS. **12** and **15-17**. The lower panel **282** extends circumferentially all the way around the axis **228**. The guide flanges **283**, **284** each extend radially inward from the lower panel **282** toward the hopping foot base **222** on opposite sides of the hopping foot base **222**. The terminal ends **283**E and **284**E of the guide flanges **283**, **284** are contoured to match the hopping foot base **222**. In the illustrative embodiment, the hopping foot base **222** is circular and the terminal ends **283**E and **284**E of the guide flanges **283**, **284** are contoured to match the circular shape of the hopping foot base **222**. The attachment notches **286** extend through the lower panel **282**. The notches **286** are configured to receive the attachment hooks **280** to couple the upper portion **268** to the lower portion **270**.

In the illustrative embodiment, the lower portion **270** further includes a guide channel **290** as shown in FIG. **12**. The bias spring **240** is configured to be located in the guide channel **290**. The guide channel **290** is configured to maintain the position of the bias spring **240**.

Turning again to the hopping foot base **222**, the hopping foot base **222** includes outer surface **292**, an inner surface **294**, and the needle opening **223** as shown in FIGS. **16** and **17**. The inner surface **292** is opposite the outer surface **294**. The inner surface **292** defines the needle opening **223** that extends axially through the base **222**.

The terminal ends **283**E and **284**E of the guide flanges **283**, **284** are contoured to match the outer surface **292** of the hopping foot base **222** in the illustrative embodiment. The terminal ends **283**E and **284**E of the guide flanges **283**, **284** do not engage the outer surface **292** of the hopping foot base **222** as shown in FIG. **16**.

Another embodiment of a hopping foot assembly **320** in accordance with the present disclosure is shown in FIG. **18**. The hopping foot assembly **320** is substantially similar to the hopping foot assembly **20** shown in FIGS. **1-10** and the hopping foot assembly **220** as shown in FIGS. **11-17** and described herein. Accordingly, similar reference numbers in the **300** series indicate features that are common between the hopping foot assemblies **20**, **220** and the hopping foot assembly **320**. The description of the hopping foot assembly **20** and the hopping foot assembly **220** is incorporated by reference to apply to the hopping foot assembly **320**, except in instances when it conflicts with the specific description and the drawings of the hopping foot assembly **320**.

The hopping foot assembly **320** includes a hopping foot base **322** is shaped to define a needle opening **323**, a hopping foot arm **324** the extends axially from the hopping foot base **322** and couples to the presser bar **16** of the sewing machine **10**, and a ruler guide **326** as shown in FIG. **18**. The ruler guide **326** is coupled to the hopping foot base **322** and is configured to change between the unlocked configuration and the locked configuration like in the embodiment of FIGS. **7-8**A.

The ruler guide **326** includes a rotating guide attachment **332** configured to rotate about the axis and a locking assembly **334** configured to change the ruler guide **326** between the unlocked and locked configurations as shown in FIG. **18**. The locking assembly **334** comprises a lock disk **336** and a locking latch **338**. The lock disk **336** is shaped to include a pointer **356** configured to align with one of a plurality of angular indicators **372** formed on the rotating guide attachment **332** as shown in FIG. **18**.

The pointer **356** includes an arrow **357** and a viewfinder **359** as shown in FIG. **18**. The arrow **357** is formed on an upper surface **336**U of the lock disk **336**. The viewfinder **359** extends radially outwardly from the lock disk **336** over the guide attachment **332**.

The arrow **357** is configured to be aligned with one of the plurality of angular indicators **372** on an upper side **376**U of the guide attachment **332** to select the path that extends at a predetermined angle. The viewfinder **359** is configured to frame the angle numbers **373** formed on the upper side **376**U of the guide attachment **332**. The arrow **357** is arranged so as to point within a viewfinder aperture **361** formed by the viewfinder **359** as shown in FIG. **18**.

The viewfinder aperture **361** formed by the by the viewfinder **359** is sized to the angle number **373** corresponding to the angular indicator **372** aligned with the arrow **357** as shown in FIG. **18**. The user can thereby easily see the desired angle to be selected while rotating the guide attachment **332**.

While the disclosure has been illustrated and described in detail in the foregoing drawings and description, the same is to be considered as exemplary and not restrictive in character, it being understood that only illustrative embodiments thereof have been shown and described and that all changes and modifications that come within the spirit of the disclosure are desired to be protected.

What is claimed is:

1. A hopping foot assembly for a sewing machine having a needle, the hopping foot assembly comprising:

a circular hopping foot base shaped to include an outer surface and an inner surface that defines a needle opening that extends axially therethrough relative to an axis to allow the needle to extend into and out of fabric during use of the sewing machine,

a hopping foot arm that extends axially from the hopping foot base relative to the axis and configured to be coupled to the sewing machine to fix the hopping foot base relative to the sewing machine, and

a ruler guide coupled to the hopping foot base and configured to change between an unlocked configuration in which the ruler guide is free to rotate in two directions about the axis relative to the hopping foot base and a locked configuration in which the ruler guide is blocked from rotating relative to the hopping foot base so that an orientation of the ruler guide is maintained when the ruler guide is engaged with an edge of a ruler to allow a user to follow a path with the needle of the sewing machine during use of the sewing machine.

2. The hopping foot assembly of claim **1**, wherein the rotating ruler guide comprises:

a bearing coupled to the outer surface of the hopping foot base and configured to rotate about the axis,

a rotating guide attachment coupled to the bearing and configured to engage the edge of the ruler so as to align the needle with the path, and

a locking assembly comprising:

a lock disk coupled to the hopping foot base, and

a locking latch coupled to the guide attachment and configured to change between a locked position in which the locking latch mates with the lock disk to block rotation of the guide attachment relative to the hopping foot base and an unlocked position in which the locking latch is spaced apart from the lock disk to allow rotation of the guide attachment relative to the hopping foot base.

3. The hopping foot assembly of claim **2**, wherein the locking assembly further comprises a bias spring arranged between the guide attachment and the locking latch to bias the locking latch toward the locked position.

4. The hopping foot assembly of claim **2**, wherein the lock disk is shaped to include a pointer, and the rotating guide attachment is shaped to include a plurality of angular indicators configured to be aligned with the pointer of the rotating guide to select a path that extends at a predetermined angle.

5. A hopping foot assembly for a sewing machine having a needle, the hopping foot assembly comprising:

a circular hopping foot base shaped to include an outer surface and an inner surface that defines a needle opening that extends axially therethrough relative to an axis to allow the needle to extend into and out of fabric during use of the sewing machine,

a hopping foot arm that extends axially from the hopping foot base relative to the axis and configured to be coupled to the sewing machine to fix the hopping foot base relative to the sewing machine, and

a ruler guide coupled to the hopping foot base and configured to change between an unlocked configuration in which the ruler guide is free to rotate about the axis relative to the hopping foot base and a locked configuration in which the ruler guide is blocked from rotating relative to the hopping foot base so that an orientation of the ruler guide is maintained when the ruler guide is engaged with an edge of a ruler to allow a user to follow a path with the needle of the sewing machine during use of the sewing machine,

wherein the rotating ruler guide comprises:

a bearing coupled to the outer surface of the hopping foot base and configured to rotate about the axis,

a rotating guide attachment coupled to the bearing and configured to engage the edge of the ruler so as to align the needle with the path, and

a locking assembly comprising:

a lock disk coupled to the hopping foot base, and

a locking latch coupled to the guide attachment and configured to change between a locked position in which the locking latch mates with the lock disk to block rotation of the guide attachment relative to the hopping foot base and an unlocked position in which the locking latch is spaced apart from the lock disk to allow rotation of the guide attachment relative to the hopping foot base,

wherein the lock disk is shaped to include a plurality of locking teeth that define a plurality of disk grooves that open radially inward toward the axis,

wherein the locking latch is shaped to include a plurality of locking teeth that define a plurality of latch grooves that open radially outward away from the axis, and

wherein the plurality of locking teeth on lock disk extend into the plurality of latch grooves, and the plurality of locking teeth on the locking latch extend into the plurality of disk grooves when the locking latch is in the locked position to block rotation of the guide attachment relative to the hopping foot base.

6. The hopping foot assembly of claim **5**, wherein the plurality of locking teeth on the lock disk are spaced apart circumferentially around the axis.

7. The hopping foot assembly of claim **6**, wherein the locking assembly further comprises a bias spring arranged between the guide attachment and the locking latch to bias the locking latch toward the locked position.

8. The hopping foot assembly of claim **7**, wherein the locking latch comprises:

a planar body that extends radially relative to the axis,

a first tab that extends axially from a first side of the planar body, the first tab shaped to include the plurality of locking teeth, and

a second tab that extends axially from a second side of the planar body opposite the first side and the second tab engaged with the bias spring.

9. The hopping foot assembly of claim **5**, wherein the lock disk is shaped to include a pointer and the rotating guide attachment is shaped to include a plurality of angular indicators configured to be aligned with the pointer of the rotating guide to select a path that extends at a predetermined angle.

10. The hopping foot assembly of claim **1**, wherein the rotating ruler guide comprises:

a lock disk coupled to the hopping foot base,

a rotating guide attachment coupled to the lock disk to rotate about the axis and configured to engage the edge of the ruler so as to align the needle with the path, and

a locking latch arranged to extend between the guide attachment and the lock disk and configured to change between a locked position in which the locking latch mates with the lock disk to block rotation of the guide attachment relative to the hopping foot base and an unlocked position in which the locking latch is spaced apart from the lock disk to allow rotation of the guide attachment relative to the hopping foot base.

11. The hopping foot assembly of claim **10**, wherein the lock disk is shaped to include a pointer and the rotating guide attachment is shaped to include a plurality of angular indicators configured to be aligned with the pointer of the rotating guide to select a path that extends at a predetermined angle.

12. The hopping foot assembly of claim **11**, wherein the locking assembly further comprises a bias spring arranged between the guide attachment and the locking latch to bias the locking latch toward the locked position.

13. A hopping foot assembly for a sewing machine having a needle, the hopping foot assembly comprising:

a hopping foot base shaped to include a needle opening that extends axially therethrough relative to an axis,

a hopping foot arm that extends axially from the hopping foot base and configured to be coupled to the sewing machine to fix the hopping foot base relative to the sewing machine, and

a ruler guide coupled to the hopping foot base and configured to change between an unlocked configuration in which the ruler guide is free to rotate in two directions about the axis relative to the hopping foot base and a locked configuration in which the ruler guide is blocked from rotating relative to the hopping foot base.

14. The hopping foot assembly of claim **13**, wherein the rotating ruler guide comprises:

a bearing coupled to the outer surface of the hopping foot base and configured to rotate about the axis,

a rotating guide attachment coupled to the bearing and configured to engage the edge of the ruler so as to align the needle with the path, and

a locking assembly comprising:

a lock disk coupled to the hopping foot base, and

a locking latch coupled to the guide attachment and configured to change between a locked position in which the locking latch mates with the lock disk to block rotation of the guide attachment relative to the hopping foot base and an unlocked position in which the locking latch is spaced apart from the lock disk to allow rotation of the guide attachment relative to the hopping foot base.

15. The hopping foot assembly of claim **14**, wherein the lock disk is shaped to include a plurality of locking teeth, the locking latch is shaped to include a plurality of locking teeth, and the plurality of locking teeth on lock disk engage the plurality of locking teeth on the locking latch when the locking latch is in the locked position to block rotation of the guide attachment relative to the hopping foot base.

16. The hopping foot assembly of claim **15**, wherein the plurality of locking teeth on lock disk define a plurality of disk grooves that open radially inward toward the axis, the plurality of locking teeth on the locking latch define a plurality of latch grooves that open radially outward away from the axis, and the plurality of locking teeth on lock disk extend into the plurality of latch grooves and the plurality of locking teeth on the locking latch extend into the plurality of disk grooves when the locking latch is in the locked position.

17. The hopping foot assembly of claim **15**, wherein the plurality of locking teeth on the lock disk are spaced apart circumferentially around the axis.

18. The hopping foot assembly of claim **13**, wherein the locking assembly further comprises a bias spring arranged between the guide attachment and the locking latch to bias the locking latch toward the locked position.

19. The hopping foot assembly of claim **13**, wherein the lock disk is shaped to include a pointer and the rotating guide attachment is shaped to include a plurality of angular indicators configured to be aligned with the pointer of the rotating guide to select a path that extends at a predetermined angle.

20. The hopping foot assembly of claim **13**, wherein the rotating ruler guide comprises:

a lock disk coupled to the hopping foot base,

a rotating guide attachment coupled to the lock disk to rotate about the axis and configured to engage the edge of the ruler so as to align the needle with the path, and

a locking latch arranged to extend between the guide attachment and the lock disk and configured to change between a locked position in which the locking latch mates with the lock disk to block rotation of the guide attachment relative to the hopping foot base and an unlocked position in which the locking latch is spaced apart from the lock disk to allow rotation of the guide attachment relative to the hopping foot base.

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