US012344978B2

(12) **United States Patent**
Bagley

(10) **Patent No.: US 12,344,978 B2**
(45) **Date of Patent: Jul. 1, 2025**

(54) **SEWING HOPPING FOOT WITH RULER GUIDE**

(71) Applicant: **GRACEWOOD MANAGEMENT, INC.**, West Jordan, UT (US)

(72) Inventor: **Jim Matthews Bagley**, West Valley City, UT (US)

(73) Assignee: **GRACEWOOD MANAGEMENT, INC.**, West Jordan, UT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **18/550,782**

(22) PCT Filed: **Mar. 17, 2022**

(86) PCT No.: **PCT/US2022/071203**
§ 371 (c)(1),
(2) Date: **Sep. 15, 2023**

(87) PCT Pub. No.: **WO2022/198227**
PCT Pub. Date: **Sep. 22, 2022**

(65) **Prior Publication Data**

US 2024/0158972 A1 May 16, 2024

Related U.S. Application Data

(60) Provisional application No. 63/162,064, filed on Mar. 17, 2021.

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

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

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

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,934,190 A 11/1933 Harker
2,790,404 A 4/1957 Somers et al.
(Continued)

FOREIGN PATENT DOCUMENTS

CH 686681 A5 5/1996
DE 9405056 U1 5/1994
GB 2505152 A 2/2014
WO 2022198227 A1 9/2022

OTHER PUBLICATIONS

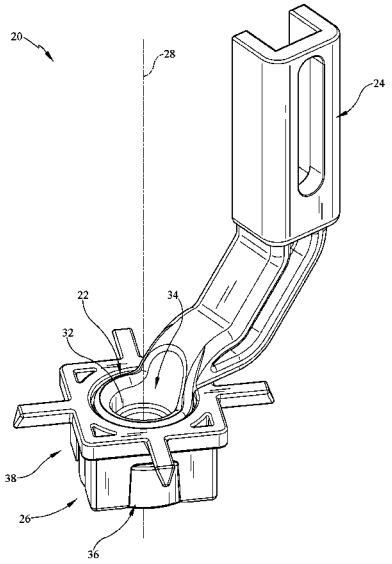
International Search Report and Written Opinion for International Application No. PCT/US2022/071203, dated Jun. 9, 2022, 13 pages.
(Continued)

Primary Examiner — Nathan E Durham
(74) *Attorney, Agent, or Firm* — Ryan L. Marshall; Jessica Kiser; Barnes & Thornburg LLP

(57) **ABSTRACT**

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

17 Claims, 8 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

4,665,845	A *	5/1987	Card	D05C 15/20 112/80.4
5,513,586	A *	5/1996	Neely	D05C 15/22 112/80.01
5,515,797	A	5/1996	Janouschek et al.	
8,234,989	B2	8/2012	Thomas et al.	
8,453,587	B2	6/2013	Bagley	
10,407,812	B2	9/2019	Labes et al.	
10,612,173	B2	4/2020	Groelz et al.	
2011/0100276	A1	5/2011	Thomas et al.	
2019/0352824	A1	11/2019	Groelz et al.	
2020/0109502	A1 *	4/2020	Zieman	D05B 29/06
2020/0181820	A1	6/2020	Mitchell	

OTHER PUBLICATIONS

International Preliminary Report on Patentability for International Application No. PCT/US2022/071203, dated Sep. 12, 2023, 8 pages.

Stormshopping; "Multifunctional Daisy Flower Stitch Circles Embroidery Presser Foot for Singer Brother Janome and Other Low Shank Sewing Machine by Stormshopping"; Retrieved from: https://www.amazon.com/Multifunctional-Circles-Embroidery-Presser-Stormshopping/dp/B072LW3W38 ; Available at least as early as Oct. 8, 2020; 9 pages.

Handi Quilter, Inc; "Handi Quilter Echo Feet Kit"; Retrieved from: https://www.amazon.com/Handi-Quilter-Echo-Feet-Kit/dp/B075R9MW5K ; Available at least as early as Oct. 8, 2020; 7 pages.

Brother; "Free Motion Echo Quilting Foot, Brother #XE0766001"; Retrieved from: https://www.sewingpartsonline.com/free-motion-echo-quilting-foot-brother-xe0766001.aspx?gclid=EAIaIQobChMI26WQze-g7AIVjf7jBx1eBwSvEAQYBiABEgLGzvD_BwE on Oct. 6, 2020; 6 pages.

Johnson, Liz; "Janome Clear View Quilting Foot and Guide Set"; Retrieved from: https://sew4home.com/accessories-we-love-clear-view-quilting-foot-and-guide-set-from-janome/ ; Aug. 21, 2018; 15 pages.

Martelli Enterprises , "Bella Sedere—Presser Feet Demo", Retrieved from: https://www.youtube.com/watch?v=he-LlnlAoJQ, Uploaded Feb. 17, 2016.

* cited by examiner

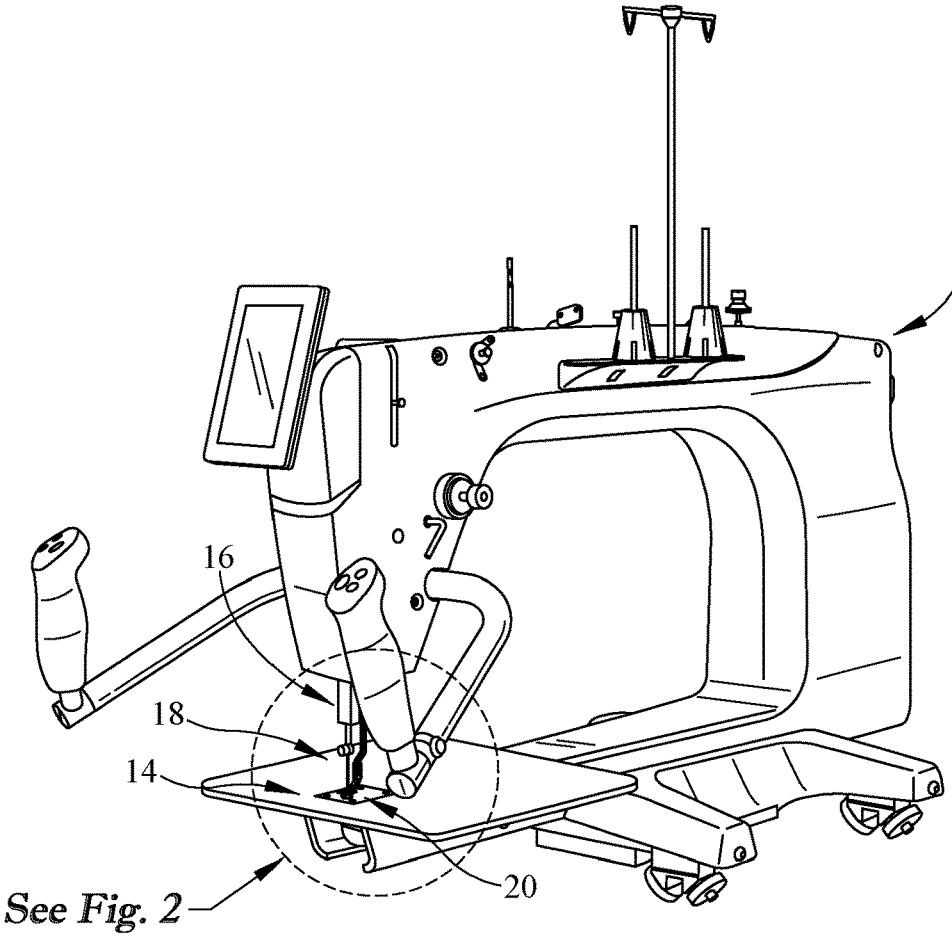


FIG. 1

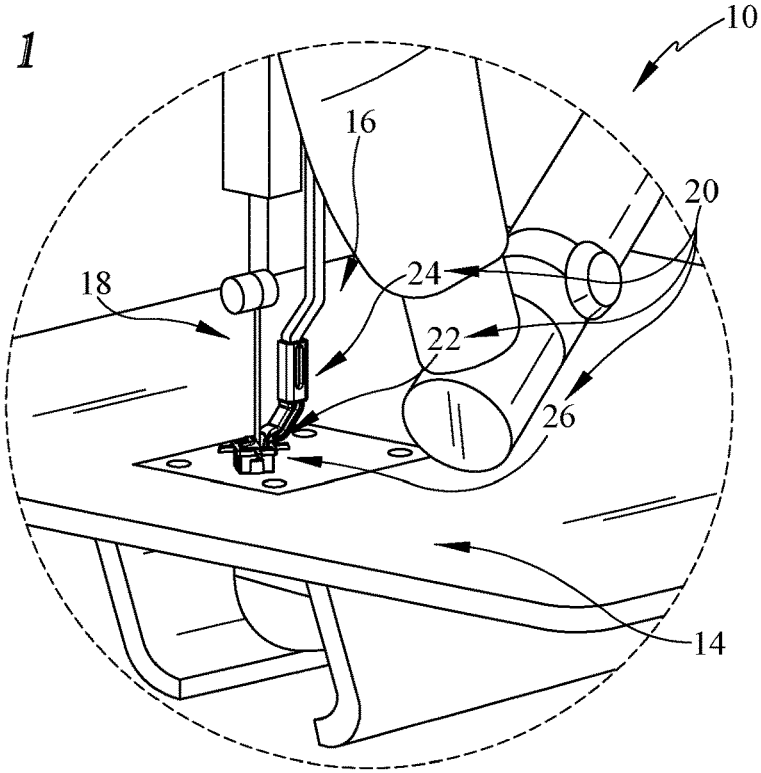


FIG. 2

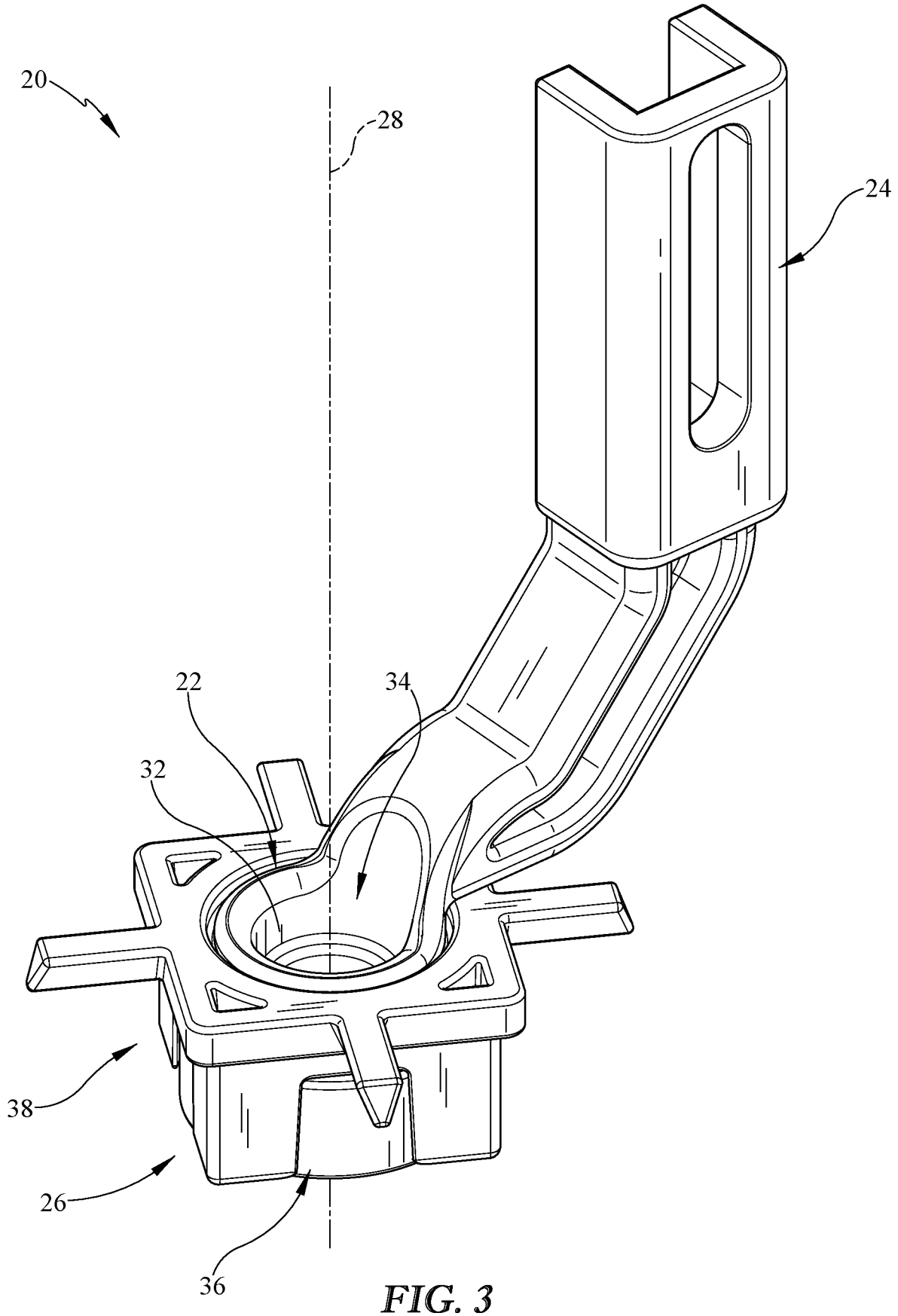


FIG. 3

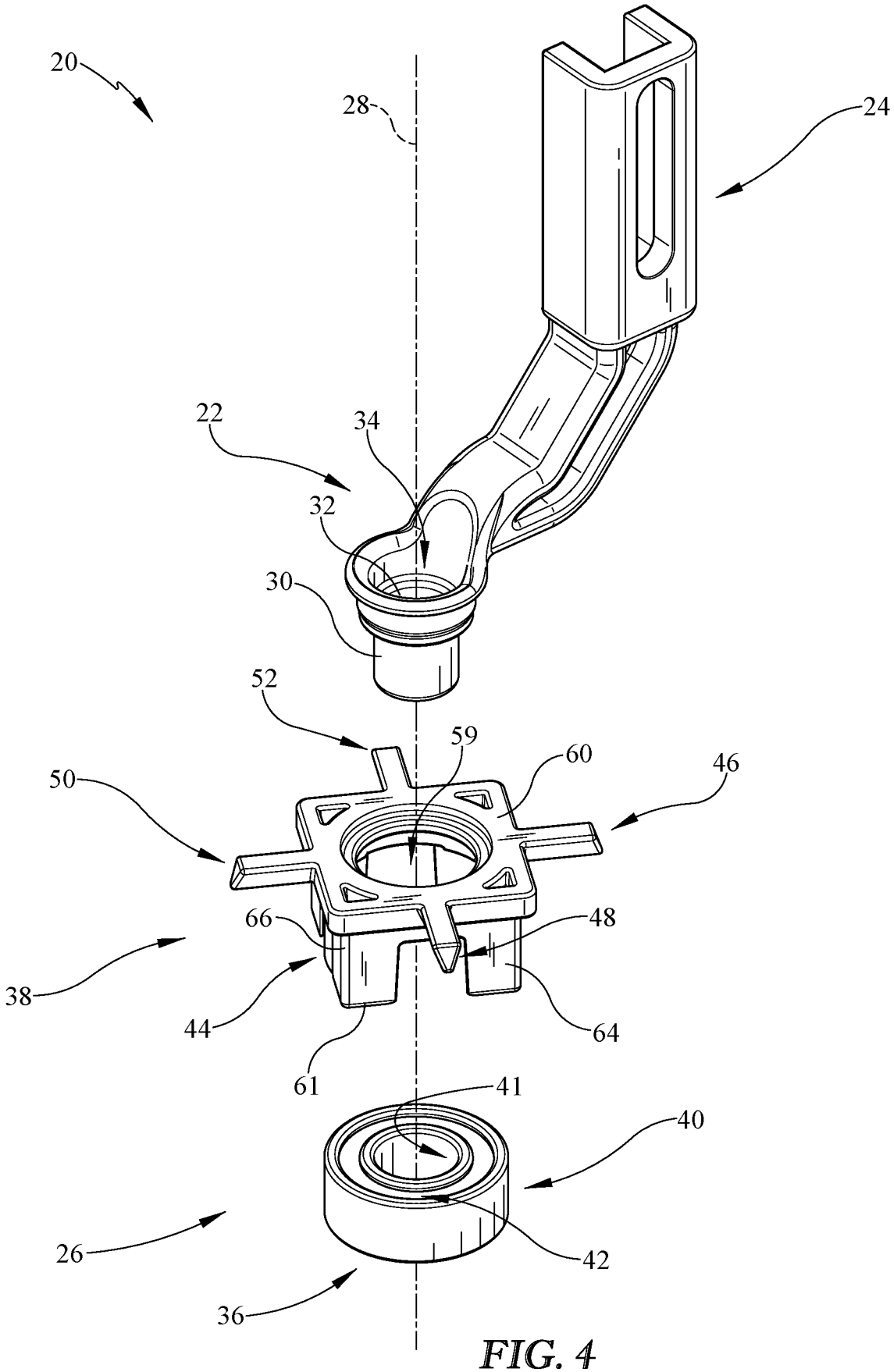


FIG. 4

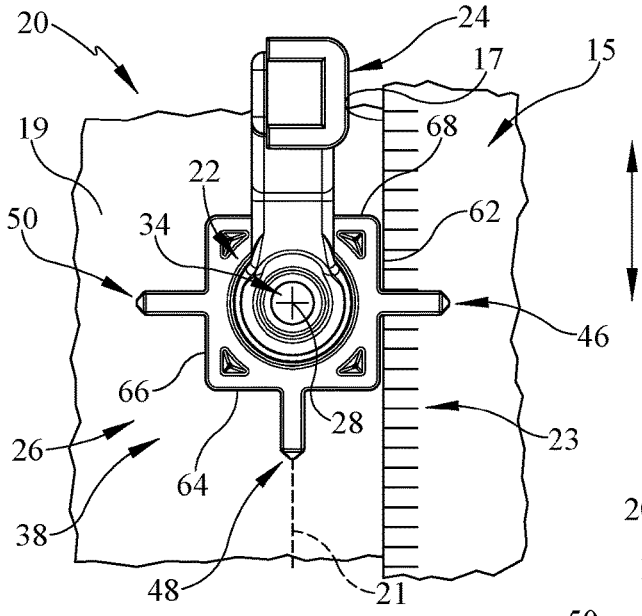


FIG. 5

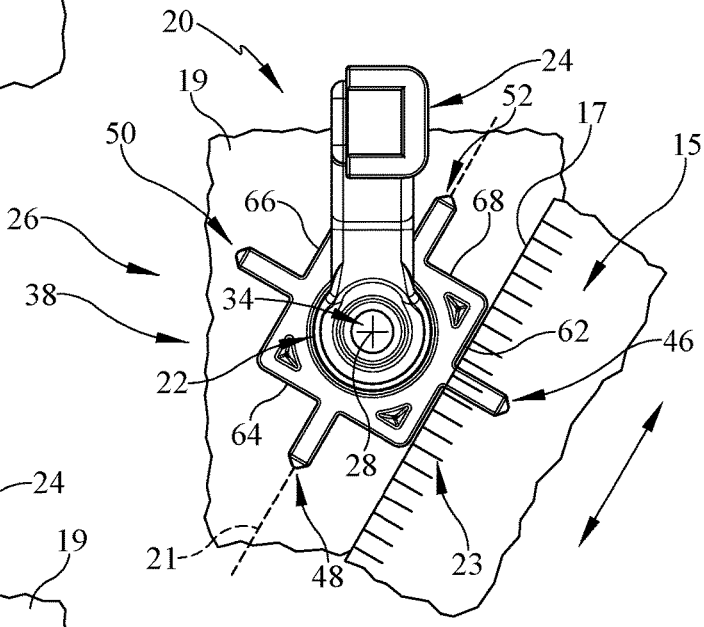


FIG. 6

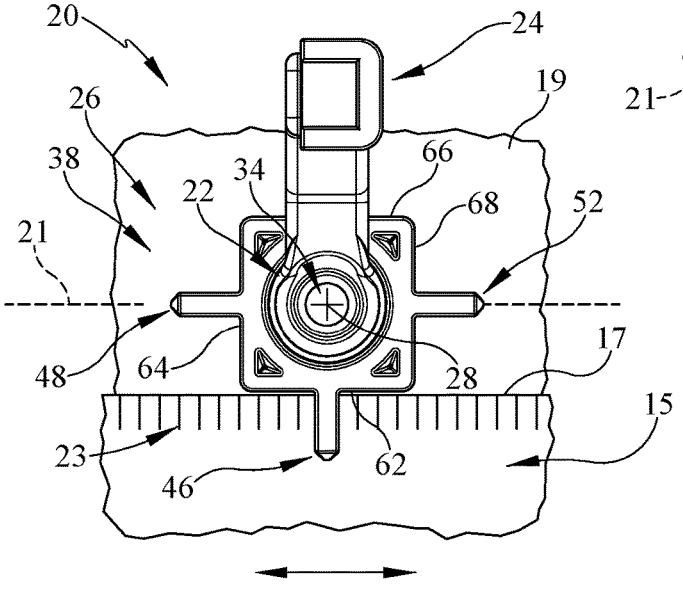


FIG. 7

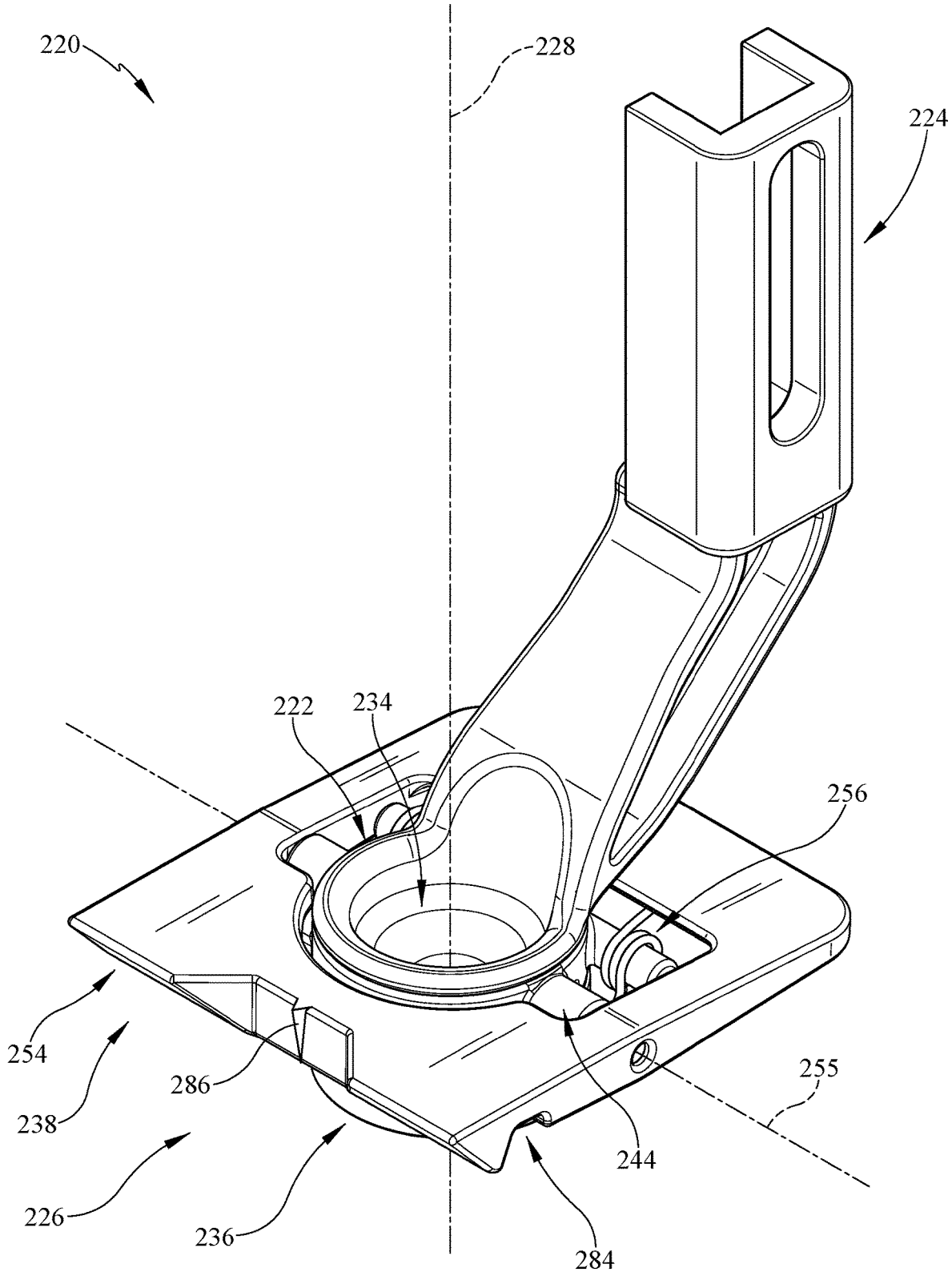


FIG. 8

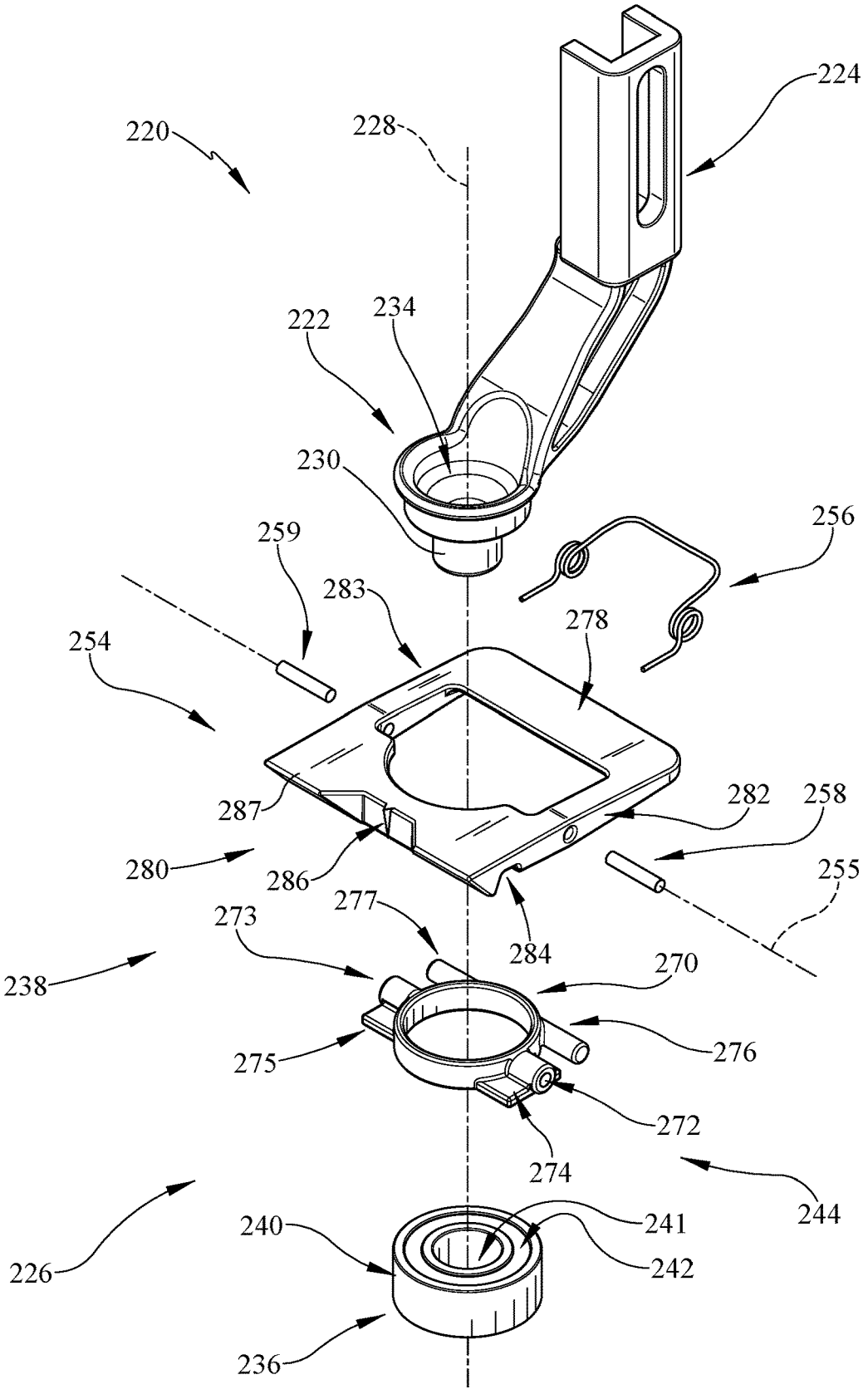

220
228
224
222
234
230
259
256
283
278
254
287
282
258
280
286
255
277
273
284
270
238
275
276
272
274
244
240
241
242
226
236

FIG. 9

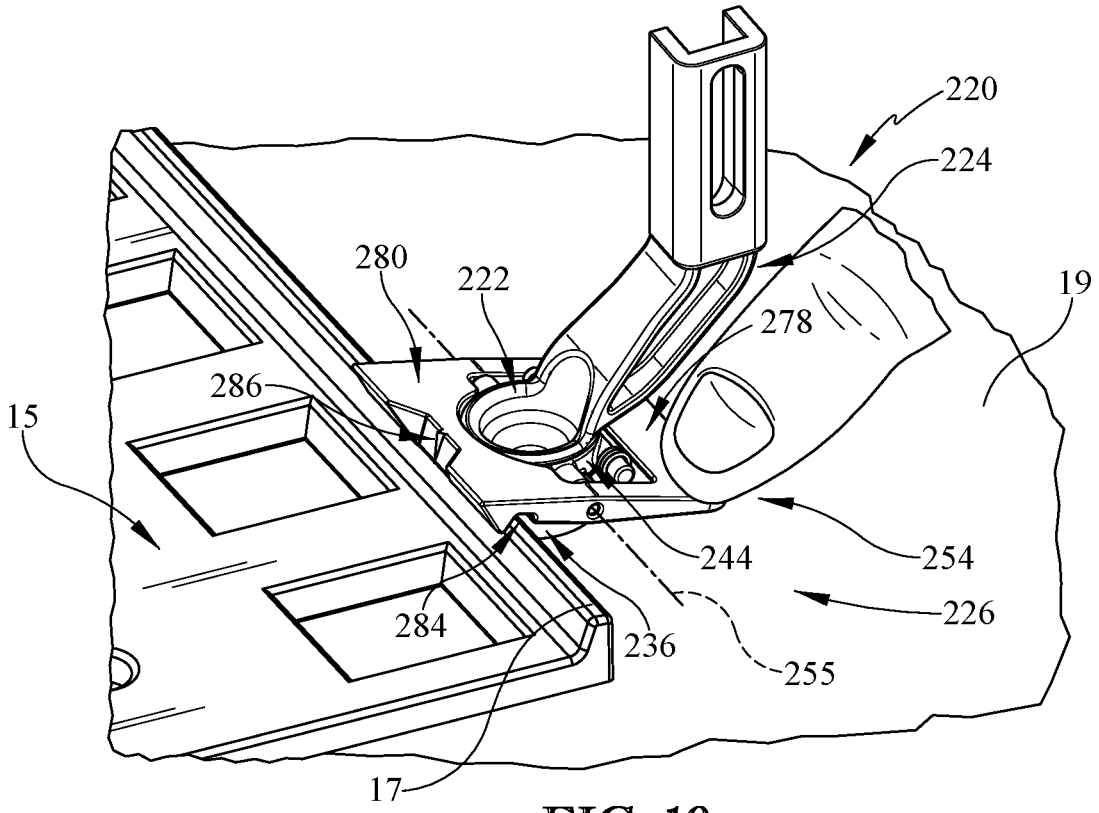

220
224
280
222
19
278
286
15
244
254
226
284
236
255
17

FIG. 10

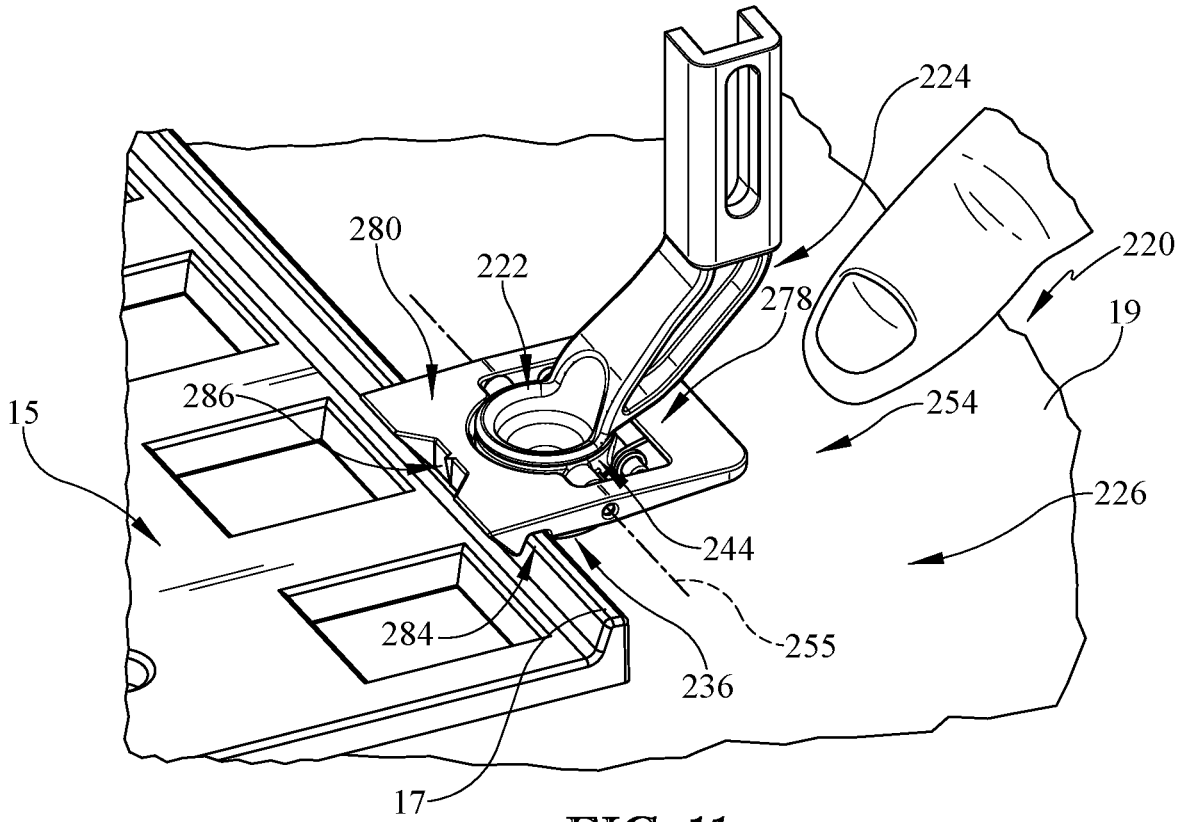

224
280
220
222
278
19
286
254
15
226
244
284
255
236
17

FIG. 11

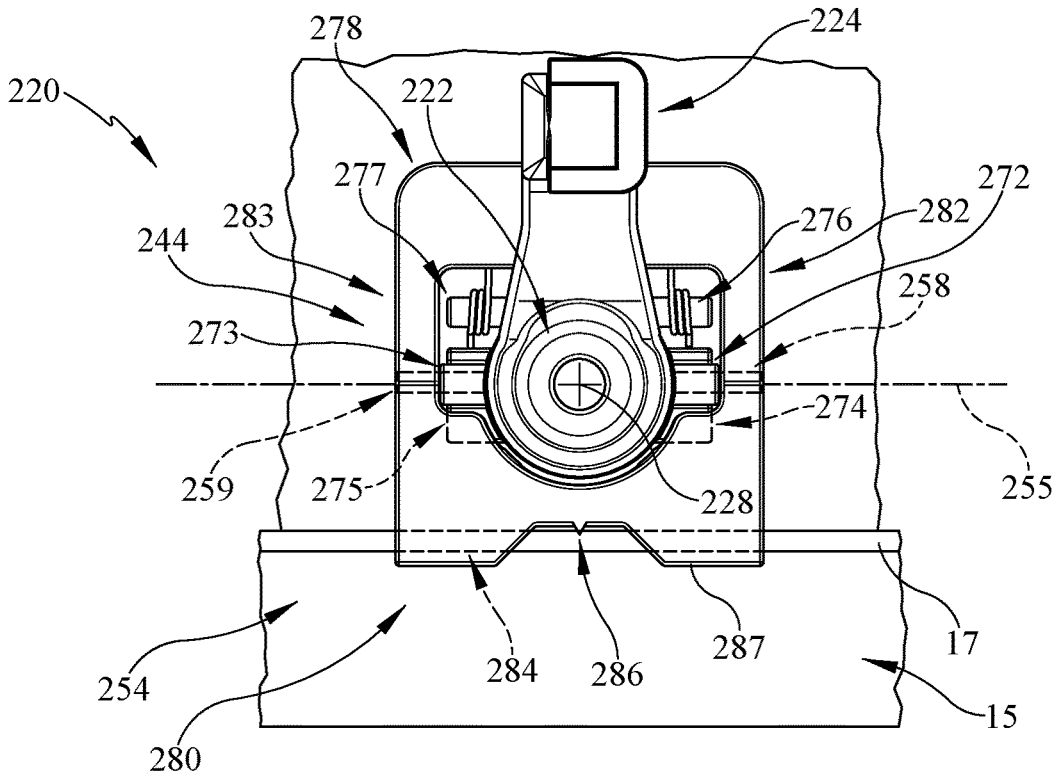

278
224
220
222
277
272
283
276
282
244
258
273
274
259
275
228
255
254
284
286
287
17
280
15

FIG. 12

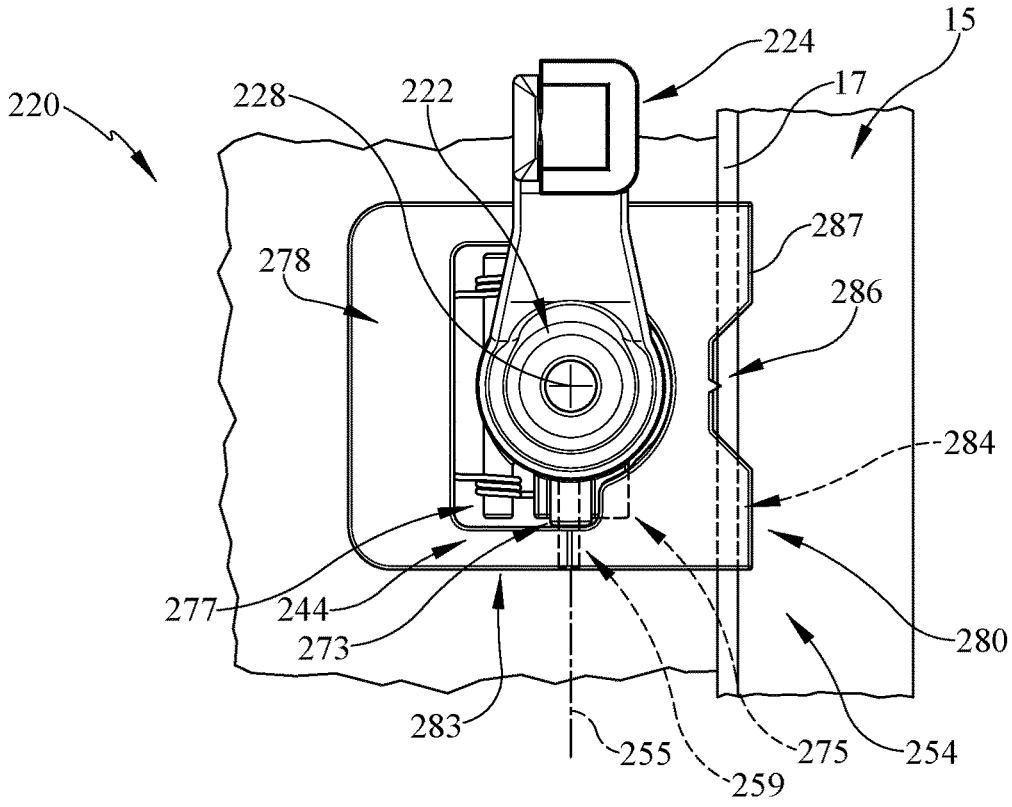

15
224
220
228
222
17
278
287
286
284
277
244
273
280
283
255
275
254
259

FIG. 13

SEWING HOPPING FOOT WITH RULER GUIDE

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a National Stage application of International Application No. PCT/US2022/071203 filed 17 Mar. 2022, which claims priority to and the benefit of U.S. Provisional Patent Application No. 63/162,064, filed 17 Mar. 2021, the disclosure of which is now expressly incorporated herein by reference.

FIELD OF DISCLOSURE

The present disclosure relates generally to sewing or quilting machines, and more specifically to a hopping foot for sewing or 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 feed 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 patterns with the stitching. Such sewing or quilting machines, however, may also make 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, and a rotating 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 an axis to allow the needle to extend into and out of fabric during use of the sewing machine. The hopping foot arm may extend axially from the hopping foot base relative to the axis. 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 rotating ruler guide may be coupled to the outer surface of the hopping foot base. The rotating ruler guide may be configured rotate about the axis relative to the hopping foot base.

In some embodiments, the rotating ruler guide may be configured to engage an edge of a ruler and rotate to maintain engagement with the edge of the ruler. The edge of the ruler may define a path. The rotating ruler guide may rotate to allow a user to follow the 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 and a guide attachment. The bearing may be coupled to the outer surface of the hopping foot base and may be configured to rotate about the axis. The guide attachment may be coupled to the bearing and may be configured to engage the edge of the ruler so as to align the needle with the path.

In some embodiments, the guide attachment may comprise a guide-attachment body and a plurality of guide-attachment tabs. The plurality of guide-attachment tabs may each extend from the guide-attachment body.

In some embodiments, the guide-attachment body may be shaped to include a top side surface, a bottom side surface, and a plurality of lateral edge surfaces. The bottom surface may be opposite the top side surface. The plurality of lateral edge surfaces may extend between and interconnect the top and bottom side surfaces. In some embodiments, the plurality of guide-attachment tabs may each extend from one of the plurality of lateral edge surfaces of the guide-attachment body.

In some embodiments, the bearing may include an outer race, an inner race, and a roller. The roller may be located between the outer race and the inner race.

In some embodiments, the hopping foot base may be coupled to the inner race of the bearing. The guide attachment may be coupled to the outer race of the bearing. In some embodiments, the guide attachment may be configured to couple to the edge of the ruler to fix the guide attachment relative to the ruler.

In some embodiments, the guide attachment may comprise a guide-attachment body, a guide-attachment clip, and a spring. The guide-attachment body may be coupled to the bearing. The guide-attachment clip may be coupled to the guide-attachment body and may be configured to pivot relative to the guide-attachment body about a pivot axis that is perpendicular to the axis. The spring may be located between the guide-attachment body and the guide-attachment clip and may be configured to bias the guide-attachment clip into engagement with the edge of the ruler.

In some embodiments, the guide-attachment clip may be shaped to define a groove. The groove may mate with the edge of the ruler to couple the rotating ruler guide to the ruler.

In some embodiments, the guide-attachment clip may include a pointer. The pointed may be configured to be aligned with measurement indicators formed in the ruler so that the user may sew a stitch in the fabric with a predetermined length.

In some embodiments, the rotating ruler guide may comprise a guide-attachment body. The guide-attachment body may be configured to engage the ruler so as to align the needle with the path. The plurality of guide-attachment tabs may each extend from the guide-attachment body.

In some embodiments, the guide-attachment body may be shaped to include a top side surface, a bottom side surface, and a plurality of lateral edge surfaces. The bottom side surface may be opposite the top side surface. The plurality of lateral edge surfaces may extend between and interconnect the top and bottom side surfaces. In some embodiments, the plurality of guide-attachment tabs may each extend from one of the plurality of lateral edge surfaces of the guide-attachment body.

In some embodiments, the rotating ruler guide may comprise a guide-attachment body, a guide-attachment clip, and a spring. The guide-attachment clip may be coupled to the guide-attachment body and may be configured to pivot relative to the guide-attachment body about a pivot axis that is perpendicular to the axis. The spring may be located between the guide-attachment body and the guide-attachment clip and may be configured to bias the guide-attachment clip into engagement with the edge of the ruler.

In some embodiments, the guide-attachment clip may be shaped to define a groove. The groove may mate with the edge of the ruler to couple the rotating ruler guide to the ruler.

In some embodiments, the rotating ruler guide may be configured to couple to the edge of the ruler. The rotating ruler guide may couple to the edge of the ruler to fix the rotating ruler guide relative to the ruler.

According to another aspect of the present disclosure, a hopping foot assembly for a sewing machine having a needle may comprise a hooping foot base, a hopping foot arm, and a rotating ruler guide. The hopping foot base may be shaped to include a needle opening that extends axially therethrough relative to an axis. The hopping foot arm may extend from the hopping foot base. 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 rotating ruler guide may be coupled to the hopping foot base. The rotating ruler guide may be configured rotate about the axis relative to the hopping foot base.

In some embodiments, the rotating ruler guide may be configured to engage an edge of a ruler that defines a path. The rotating ruler guide may rotate to maintain engagement with the edge of the ruler during use of the sewing machine.

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

In some embodiments, the guide attachment may comprise a guide-attachment body and a plurality of guide-attachment tabs. The guide-attachment body may be coupled to the bearing. The guide-attachment body may be shaped to include a plurality of lateral edge surfaces. The plurality of guide-attachment tabs may each extend from one of the plurality of lateral edge surfaces of the guide-attachment body.

In some embodiments, the bearing may include an outer race, an inner race, and a roller. The roller may be located between the outer race and the inner race.

In some embodiments, the hopping foot base may be coupled to the inner race of the bearing. The guide attachment may be coupled to the outer race of the bearing.

In some embodiments, the guide attachment may comprise a guide-attachment body, a guide-attachment clip, and a spring. The guide-attachment body may be coupled to the bearing. The guide-attachment clip may be coupled to the guide-attachment body and may be configured to pivot relative to the guide-attachment body about a pivot axis that is perpendicular to the axis. The spring may be located between the guide-attachment body and the guide-attachment clip. The spring may be configured to bias the guide-attachment clip into engagement with the edge of the ruler.

In some embodiments, the guide-attachment clip may be shaped to define a groove. The groove may mate with the edge of the ruler to couple the rotating ruler guide to the ruler.

In some embodiments, the guide-attachment clip may include a pointer. The pointer may be configured to be aligned with measurement indicators formed in the ruler so that a user may sew a stitch in the fabric with a predetermined length.

In some embodiments, the guide attachment may be configured to couple to the edge of the ruler. The guide attachment may couple to the edge of the ruler to fix the guide attachment relative to the ruler.

In some embodiments, the rotating ruler guide may comprise a guide-attachment body and a plurality of guide-attachment tabs. The guide-attachment body may be configured to engage the ruler so as to align the needle with the path. The plurality of guide-attachment tabs may each extend from the guide-attachment body.

In some embodiments, the guide-attachment body may be shaped to include a top side surface, a bottom side surface, and a plurality of lateral edge surfaces. The bottom side surface may be opposite the top side surface. The plurality of lateral edge surfaces may extend between and interconnect the top and bottom side surfaces. In some embodiments, the plurality of guide-attachment tabs may each extend from one of the plurality of lateral edge surfaces of the guide-attachment body.

In some embodiments, the rotating ruler guide may comprise a guide-attachment body, a guide-attachment clip, and a spring. The guide-attachment clip may be coupled to the guide-attachment body. The guide attachment clip may be configured to pivot relative to the guide-attachment body about a pivot axis that is perpendicular to the axis. The spring may be located between the guide-attachment body and the guide-attachment clip. The spring may be configured to bias the guide-attachment clip into engagement with the edge of the ruler.

In some embodiments, the guide-attachment clip may be shaped to define a groove. The groove may mate with the edge of the ruler to couple the rotating ruler guide to the ruler. In some embodiments, the rotating ruler guide may be configured to couple to the edge of the ruler.

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 including a sewing machine body, a pressure bar, and a needle and showing a hopping foot assembly coupled to the presser bar of the sewing machine;

FIG. **2** is a detail view of the sewing machine of FIG. **1** showing the hopping foot assembly includes a hopping foot base shaped to include an needle opening that extends therethrough, a hopping foot arm that extends from the hooping foot base and fixes the hopping foot base relative to the sewing machine, and a rotating 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 rotating ruler guide includes a bearing coupled to the hopping foot base that rotates about the axis of the hooping foot assembly and a guide attachment coupled to the bearing and configured to engage an edge of a ruler that defines the path so as to align the needle with the path;

FIG. **4** is an exploded view of the hopping foot assembly of FIG. **3** showing the guide attachment includes a guide-attachment body that fits over the bearing and a plurality of guide-attachment tabs that each extend from different lateral edge surfaces of the guide-attachment body to help the user align the needle with the path;

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

FIG. **6** is a view similar to FIG. **5** showing the rotating ruler guide engaged with the edge of the ruler in a second position which has caused the rotating ruler guide to rotate;

FIG. **7** is a view similar to FIG. **6** showing the rotating ruler guide engaged with the edge of the ruler in a third position which has caused the rotating ruler guide to rotate;

FIG. **8** 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 therethrough, a hopping foot arm that extends from the hooping foot base and fixes the hopping foot base relative to the sewing machine, and a rotating ruler guide coupled to the hopping foot base that selectively couples to the ruler to aid the user in aligning the needle of the sewing machine in the path;

FIG. **9** is an exploded view of the hopping foot assembly of FIG. **8** showing the rotating ruler guide includes a bearing and a guide attachment configured to engage the ruler so as to align the needle with the path, the guide attachment having a guide-attachment body coupled to the bearing, a guide-attachment clip coupled to the guide-attachment body that that mates with the edge of the ruler to couple the rotating ruler guide to the ruler, and a spring located between the guide-attachment body and the guide-attachment clip that biases the guide-attachment clip into engagement with the edge of the ruler;

FIG. **10** is a perspective view of the hopping foot assembly of FIG. **8** showing the guide-attachment clip is configured to pivot relative to the guide-attachment body about a pivot axis between a disengaged position and an engaged position as shown in FIG. **11**;

FIG. **11** is view similar to FIG. **10** showing the guide-attachment clip has changed to the engaged position in which the guide-attachment clip mates with the edge of the ruler to couple the rotating ruler guide to the ruler;

FIG. **12** is a top view of the hooping foot assembly of FIG. **8** showing the rotating ruler guide coupled to the edge of the ruler in a first position; and

FIG. **13** is a view similar to FIG. **12** showing the rotating ruler guide coupled to the edge of the ruler in a second position, which has caused the rotating ruler guide to rotate from the first position.

DETAILED DESCRIPTION OF THE DRAWINGS

For the purposes 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 first embodiment of a hopping foot assembly **20** adapted for use with a sewing machine **10** is shown in FIGS. **1-7**. 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. A second embodiment of a hopping foot assembly **220** is shown in FIGS. **8-15**.

The hopping foot assembly **20** includes a hopping foot base **22**, a hopping foot arm **24**, and a rotating ruler guide **26** as shown in FIGS. **2-7**. The hopping foot base **22** is circular and shaped to define a needle opening **34** that extends through the base **22** relative to an axis **28**. The needle opening **34** 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 rotating 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 the ruler **15** simultaneously.

As such, the hopping foot assembly **20** includes the rotating ruler guide **26** to help the user easily guide the hopping foot assembly **20** along the ruler **15**. The rotating ruler guide **26** is configured to engage an edge **17** of a ruler **15** that defines a path **21** and rotate to maintain engagement with the edge **17** of 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 **21** with the needle **18** during use of the sewing machine **10**.

The rotating ruler guide **26** rotates to maintain engagement with the edge **17** of the ruler **15** to allow the user to easily maneuver the ruler **15** while operating the sewing machine **10**. The ruler **15** may be moved around the hopping foot assembly **20** to create different paths **21** as suggested in FIGS. **5-7**. The rotating ruler guide **26** may rotate as the ruler **15** is moved to maintain engagement with the ruler **15** so that the user does not need to reposition the hopping foot assembly **20** or the ruler **15**.

In an illustrative embodiment, the rotating ruler guide **26** offsets the needle **18** from the edge **17** of the ruler **15** as shown in FIG. **5-7**. Therefore, the needle **18** follows the path **21** defined by the edge **17** of the ruler **15** at the offset distance from the edge **17** of the ruler **15**. The path **21** may be a seam, ditch line, or other pattern line. In the illustrative embodiment, the edge **17** of the ruler **15** is straight and the path **21** is parallel to the edge **17** of the ruler **15**. In other embodiments, the edge **17** may be curved or another non-linear path.

The rotating ruler guide **26** includes a bearing **36** and a guide attachment **38** as shown in FIGS. **3-7**. The bearing **36** is coupled to the hopping foot base **22** and configured to rotate relative to the hooping foot base **22** about the axis **28**. The guide attachment **38** is coupled to the bearing **36** and configured to engage the ruler **15** so as to align the needle **18** with the path.

The bearing **36** includes an outer race **40**, an inner race **41**, and a roller **42** as shown in FIG. **4**. The roller **42** is located between the outer race **40** and the inner race **41**. The hopping foot base **22** is coupled to the inner race **41** of the bearing **36**, while the guide attachment **38** is coupled to the outer race **40** of the bearing **36**.

The guide attachment **38** includes a guide-attachment body **44** and a plurality of guide-attachment tabs **46**, **48**, **50**, **52** as shown in FIGS. **4-7**. The guide-attachment body **44** is coupled and extends around the bearing **36**. The guide-attachment tabs **46**, **48**, **50**, **52** each extend from different lateral edge surfaces of the guide-attachment body **44**.

The guide-attachment body **44** is shaped to include a top side surface **60**, a bottom side surface **61**, and a plurality of lateral edge surfaces **62**, **64**, **66**, **68** as shown in FIGS. **4-7**. The bottom side surface **61** is opposite the top side surface

60 and faces the fabric 19. The plurality of lateral edge surfaces 62, 64, 66, 68 extend between and interconnect the top and bottom side surfaces 60, 61.

The plurality of lateral edge surfaces 62, 64, 66, 68 include a first edge surface 62, a second edge surface 64, a third edge surface 66, and a fourth edge surface 68 as shown in FIGS. 4-7. The third edge surface 66 is opposite the first edge surface 62 and parallel to the first edge surface 62. The fourth edge surface 68 is opposite the second edge surface 64 and parallel to the second edge surface 64. The second and fourth edge surfaces 64, 68 extend between and interconnect the first and third edge surfaces 62, 66.

The plurality of guide-attachment tabs 46, 48, 50, 52 include a first tab 46, a second tab 48, a third tab 50, and a fourth tab 52 as shown in FIGS. 4-7. The first tab 46 extends from the first edge surface 62, while the third tab 50 extends from the third edge surface 66 in an opposite direction as the first tab 46. The second tab 48 extends from the second edge surface 64, while the fourth tab 52 extends from the fourth edge surface 68 in an opposite direction as the second tab 48.

The guide-attachment body 44 also defines a through hole 59 as shown in FIG. 4. The through hole 59 extends through the top side and bottom side surfaces 60, 61. The hopping foot base 22 extends into the hole 59 from the top side surface 60. The bearing 36 is coupled to the hopping foot base 22 in the hole 59 such that the guide-attachment body 44 extends around the bearing 36.

Turning again to the hopping foot base 22, the hopping foot base 22 includes outer surface 30, an inner surface 32, and the needle opening 34 as shown in FIGS. 4-7. The inner surface 32 is opposite the outer surface 30. The inner surface 32 defines the needle opening 34 that extends axially through the base 22. The inner race 41 of the bearing 36 is coupled to the outer surface 30 of the hopping foot base 22.

To use the hopping foot assembly 20, the user places the ruler 15 on the fabric 19 arranged on the machine bed 14 and engages one of the edge surfaces 62, 64, 66, 68 of the guide attachment 38 with the edge 17 of the ruler 15. The user then moves the sewing machine 10 along the path 21 while keeping the edge surface 62, 64, 66, 68 of the hopping foot assembly 20 engaged with the edge 17 of the ruler 15. In this way, the needle 18 follows the path 21 and stitches the desired stich line as suggested in FIGS. 5-7.

In the illustrative embodiment, the first edge 62 is engaged with the edge 17 of the ruler 15 in a first position as shown in FIG. 5. In the first position, the ruler 15 is extends vertically. The ruler 15 may be arranged on either side of the rotating ruler guide 26 in the vertical first position.

For instance, the ruler 15 may be arranged so that the third edge 66 of the guide attachment 38 may be engaged with the edge 17 of the ruler 15 while the ruler 15 is in the first position. Additionally, either one of the second or fourth edge surfaces 64, 68 may also be may be engaged with the edge 17 of the ruler 15 while the ruler 15 is in the first position. The rotating ruler guide 26 may be rotated until one of the edges 62, 64, 66, 68 engages the edge 17 of the ruler 15 in the first position.

In the illustrative embodiment, the first tab 46 extends over the ruler 15 and is configured to act as a pointer 46 as shown in FIGS. 5-7. The first tab 46 may be aligned with measurement indicators 23 formed in the ruler 15. The user may align the first tab 46 with the measurement indicators 23 of the ruler 15 to sew a stitch in the fabric 19 with a predetermined length.

Simultaneously, the second and forth tabs 48, 52 align with the path 21 as shown in FIGS. 5-7. The second tab 48 or the fourth tab 52 indicates the hopping foot assembly 20 is following the path 21 as the first tab 46 indicates the length of the stitch.

If the path 21 changes direction, i.e. the user wants/needs to sew a different seam, ditch line, or pattern line, the user may adjust the position of the ruler 15 as suggested in FIGS. 6 and 7. To adjust the position of the ruler 15, the user moves the ruler 15 keeping the edge 17 engaged with the edge surface 62, 64, 66, 68. The first edge surface 62 is kept engaged with the edge 17 of the ruler 15 as the position of the ruler 15 is adjusted in the illustrative embodiment. The ruler 15 is moved until the edge 17 of the ruler 15 defines the desired path 21 to be followed.

In the illustrative embodiment, the ruler 15 is moved from the first position to a second position as shown in FIG. 6. In the second position, the ruler 15 extends at an angle relative to the first position. The angle may vary as the rotating ruler guide 26 is configured to rotate 360 degrees about the axis 28. The first edge surface 62 remains engaged with the edge 17 of the ruler 15 in the second position as shown in FIG. 6.

In the illustrative embodiment, the ruler 15 may also be moved from one of the first position and the second position to a third position as shown in FIG. 7. In the third position, the ruler 15 extends horizontally. The ruler 15 may be arranged on either side of the rotating ruler guide 26 in the horizontal third position.

Another embodiment of a hopping foot assembly 220 in accordance with the present disclosure is shown in FIGS. 8-13. The hopping foot assembly 220 is substantially similar to the hopping foot assembly 20 shown in FIGS. 1-6 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 rotating ruler guide 226 as shown in FIGS. 8-13. The hopping foot base 222 is circular and is shaped to define a needle opening 234 that extends through the base 222 relative to the axis 228. The needle opening 234 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 22 relative to the sewing machine 10. The rotating ruler guide 226 is coupled to the hopping foot base 222.

In the illustrative embodiment, the rotating ruler guide 226 is configured rotate about the axis 228 relative to the hopping foot base 222. The rotating ruler guide 226 may rotate 360 degrees about the axis 228. The rotating ruler guide 226 is also configured to couple to the edge 17 of the ruler 15 aligned with the path 21 and rotate to maintain engagement with the edge 17 of the ruler 15.

The rotating ruler guide 226 includes a bearing 236 and a guide attachment 238 as shown in FIGS. 8-11. The bearing 236 is coupled to the hopping foot base 222 and configured to rotate relative to the hooping foot base 222 about the axis 228. The guide attachment 238 is coupled to the bearing 236 and configured to couple to the ruler 15.

The bearing 236 includes an outer race 240, an inner race 241, and a roller 242 as shown in FIG. 9. The roller 242 is located between the outer race 240 and the inner race 241.

The hopping foot base **222** is coupled to the inner race **241** of the bearing **236**, while the guide attachment **238** is coupled to the outer race **240** of the bearing **236**.

The guide attachment **238** includes a guide-attachment body **244**, a guide-attachment clip **254**, and a spring **256** as shown in FIGS. **8-13**. The guide-attachment body **244** is coupled to the outer race **240** of the bearing **236**. The guide-attachment clip **254** is coupled to the guide-attachment body **244** and shaped to define a groove that mates with the edge **17** of the ruler **15** to couple the rotating ruler guide **226** to the ruler **15**. The spring **256** is located between the guide-attachment body **244** and the guide-attachment clip **254** and configured to bias the guide-attachment clip **254** into engagement with the edge **17** of the ruler **15**.

In the illustrative embodiment, the guide-attachment clip **254** is configured to pivot relative to the guide-attachment body **244** about a pivot axis **255** perpendicular to the axis **228** as shown in FIGS. **10** and **11**. The guide-attachment clip **254** is configured to pivot between a disengaged arrangement as shown in FIG. **10** and an engaged arrangement as shown in FIG. **11**.

To couple the rotating ruler guide **226** to the ruler **15**, the user engages the guide-attachment clip **254** as suggested in FIG. **10**. The user pushes down on a lever portion **278** of the guide-attachment clip **254** to cause the guide-attachment clip **254** to change to the disengaged arrangement. In the disengaged arrangement, the guide-attachment clip **254** is angled relative to the machine base **14** so that the groove **284** of the guide-attachment clip **254** is spaced apart from the ruler **15**.

The space created under the guide-attachment clip **254** by angling with guide-attachment clip **254** allows the edge **17** of the ruler **15** to be arranged under the groove **284** of the guide-attachment clip **254**. The user may then release the lever portion **278** of the guide-attachment clip **254** and the spring **256** biases the guide-attachment clip **254** into the engaged arrangement. In the engaged arrangement, the guide-attachment clip **254** is parallel with the machine base **14** so that the groove **284** engages with and couples to the edge **17** of the ruler **15**.

To uncouple the rotating ruler guide **226** from the ruler **15**, the user again engages the lever portion **278** to cause the guide-attachment clip **254** to change from the engaged arrangement to the disengaged arrangement. The space created under the guide-attachment clip **254** by angling with guide-attachment clip **254** allows the ruler **15** to be moved out from under the groove **284** of the guide-attachment clip **254**. The user may then release the lever portion **278** of the guide-attachment clip **254** and the spring **256** biases the guide-attachment clip **254** into the engaged arrangement.

The guide-attachment body **244** includes cylinder portion **270**, pin portions **272**, **273**, flanges **274**, **275**, and spring tabs **276**, **277** as shown in FIG. **9**. The cylinder portion **270** extends around the outer surface **230** of the hopping foot base **222** and couples to an outer race **240** of the bearing **236**. The pin portions **272**, **273** extend from the cylinder portion **270** opposite one another and couple to the guide-attachment clip **254**. The flanges **274**, **275** extend from the pin portions **272**, **273**. The flanges **274**, **275** are configured to engage the guide-attachment clip **254** to cause the guide-attachment clip **254** to change from the engaged arrangement to the disengaged arrangement. The spring tabs **274**, **275** extend from the cylinder portion **270** and form the attachment locations for the spring **256**.

In the illustrative embodiment, the guide attachment **238** includes pins **258**, **259** as shown in FIG. **9**. The pins **258**, **259** extend through the guide-attachment clip **254** and into the pin portions **272**, **273** of the guide-attachment body **244**. The pins **258**, **259** extend along the pivot axis **255** and allow the guide-attachment clip **254** to pivot relative to the guide-attachment body **244**.

The guide-attachment clip **254** includes the lever portion **278**, a clip portion **280**, and side portions **282**, **283** as shown in FIGS. **9-13**. The lever portion **278** is configured to be engaged by the user to cause the guide-attachment clip **254** to change between the engaged arrangement and the disengaged arrangement. The clip portion **280** is configured to engage with the edge **17** of the ruler **15** to couple the rotating ruler guide **226** to the ruler **15**. The side portions **282**, **283** extend between and interconnect the lever portion **278** and the clip portion **280**.

In the illustrative embodiment, the pins **258**, **259** extend through the side portions **282**, **283** of the guide-attachment clip **254** and into the pin portions **272**, **723** of the guide-attachment body **244**. The first pin **258** extends through the side portion **282** and into the pin portion **272** on one side of the guide attachment **238**. The second pin **259** extends through the side portion **283** and into the pin portion **273** on the opposite side of the guide attachment **238**.

In the illustrative embodiment, the clip portion **280** of the guide-attachment clip **254** includes the groove **284** and a pointer **286** as shown in FIGS. **9-13**. The groove **284** extends into a bottom surface of the clip portion **280** that faces the machine bed **14** and/or the fabric **19**. The groove **284** extends between the side portions **282**, **283**. The pointer **286** extends into an edge **287** of the clip portion **280** in the illustrative embodiment. In other embodiments, the pointer **286** may extends from the edge **287** toward the ruler **15**.

The pointer **286** is configured to be aligned with measurement indicators **23** formed in the ruler **15**. In this way, the user may sew a stitch in the fabric **19** with a predetermined length.

In the illustrative embodiment, the attachment clip **254** is coupled to the edge **17** of the ruler **15** so that the edge **17** of the ruler **15** is arranged in the groove **284**. The ruler **15** is arranged in a first position as shown in FIG. **12**, in which the ruler **15** extends horizontally.

If the path **21** changes direction, i.e. the user wants/needs to sew a different seam, ditch line, or pattern line, the user may adjust the position of the ruler **15** as suggested in FIG. **13**. To adjust the position of the ruler **15**, the user moves the ruler **15**, which causes the rotating ruler guide **226** to rotate. The ruler **15** is moved until the edge **17** of the ruler **15** defines the desired path **21** to be followed.

In the illustrative embodiment, the ruler **15** is moved from the first position to a second position as shown in FIG. **13**. In the second position, the ruler **15** extends vertically. In other embodiments, the ruler **15** may be arranged at an angle relative to the first position and/or the second position. The angle may vary as the rotating ruler guide **226** is configured to rotate 360 degrees about the axis **228**.

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 rotating ruler guide coupled to the outer surface of the hopping foot base and configured rotate about the axis relative to the hopping foot base,

wherein the rotating ruler guide is configured to engage an edge of a ruler that defines a path and rotate to maintain engagement with the edge of the ruler to allow a user to follow the path with the needle of the sewing machine during use of the sewing machine,

wherein the rotating ruler guide comprises:

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

a guide attachment separate from and coupled to the bearing and configured to engage the edge of the ruler so as to align the needle with the path.

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

a guide-attachment body shaped to include a top side surface, a bottom side surface opposite the top side surface, and a plurality of lateral edge surfaces that extend between and interconnect the top and bottom side surfaces, and

a plurality of guide-attachment tabs that each extend from one of the plurality of lateral edge surfaces of the guide-attachment body.

3. The hopping foot assembly of claim **1** or claim **2**, wherein the bearing includes an outer race, an inner race, and a roller located between the outer race and the inner race, the hopping foot base is coupled to the inner race of the bearing, and the guide attachment is coupled to the outer race of the bearing.

4. The hopping foot assembly of claim **1**, wherein the guide attachment is configured to couple to the edge of the ruler to fix the guide attachment relative to the ruler.

5. The hopping foot assembly of claim **1** or claim **4**, wherein the guide attachment comprises:

a guide-attachment body coupled to the bearing,

a guide-attachment clip coupled to the guide-attachment body and configured to pivot relative to the guide-attachment body about a pivot axis that is perpendicular to the axis, the guide-attachment clip shaped to define a groove that mates with the edge of the ruler to couple the rotating ruler guide to the ruler, and

a spring located between the guide-attachment body and the guide-attachment clip and configured to bias the guide-attachment clip into engagement with the edge of the ruler.

6. The hopping foot assembly of claim **5**, wherein the guide-attachment clip includes a pointer configured to be aligned with measurement indicators formed in the ruler so that the user may sew a stitch in the fabric with a predetermined length.

7. 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 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 rotating ruler guide coupled to the hopping foot base and configured rotate about the axis relative to the hopping foot base, wherein the rotating ruler guide is configured to engage an edge of a ruler that defines a path and rotate to maintain engagement with the edge of the ruler during use of the sewing machine,

wherein the rotating ruler guide comprises:

a guide-attachment body shaped to include a top side surface, a bottom side surface opposite the top side surface, and a plurality of lateral edge surfaces that extend between and interconnect the top and bottom side surfaces, the guide-attachment body configured to engage the ruler so as to align the needle with the path, and

a plurality of guide-attachment tabs that each extend from one of the plurality of lateral edge surfaces of the guide-attachment body, the plurality of guide-attachment tabs includes a first tab that extends from a first edge surface included in the plurality of lateral edge surfaces, a second tab that extends from a second edge surface included in the plurality of lateral edge surfaces, a third tab that extends from a third edge surface in an opposite direction as the first tab, and a fourth tab that extends from a fourth edge surface in an opposite direction as the second tab.

8. 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 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 rotating ruler guide coupled to the hopping foot base and configured rotate about the axis relative to the hopping foot base, wherein the rotating ruler guide is configured to engage an edge of a ruler that defines a path and rotate to maintain engagement with the edge of the ruler during use of the sewing machine, wherein rotating ruler guide comprises:

a guide-attachment body,

a guide-attachment clip coupled to the guide-attachment body and configured to pivot relative to the guide-attachment body about a pivot axis that is perpendicular to the axis, the guide-attachment clip shaped to define a groove that mates with the edge of the ruler to couple the rotating ruler guide to the ruler, and

a spring located between the guide-attachment body and the guide-attachment clip and configured to bias the guide-attachment clip into engagement with the edge of the ruler.

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

a ruler, and

a hopping foot base shaped to define 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 rotating ruler guide coupled to the hopping foot base and configured rotate about the axis relative to the hopping foot base,

wherein the rotating ruler guide is configured to engage an edge of the ruler that defines a path and rotate to

maintain engagement with the edge of the ruler to allow a user to follow the path with the needle of the sewing machine during use of the sewing machine.

10. The hopping foot assembly of claim **9**, wherein the rotating ruler guide comprises:

a guide-attachment body shaped to include a top side surface, a bottom side surface opposite the top side surface, and a plurality of lateral edge surfaces that extend between and interconnect the top and bottom side surfaces, the guide-attachment body configured to engage the ruler so as to align the needle with the path, and

a plurality of guide-attachment tabs that each extend from one of the plurality of lateral edge surfaces of the guide-attachment body.

11. The hopping foot assembly of claim **9**, wherein the rotating ruler guide comprises:

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

a guide attachment coupled to the bearing and configured to engage the ruler so as to align the needle with the path.

12. The hopping foot base of claim **11**, wherein the guide attachment comprises:

a guide-attachment body coupled to the bearing and shaped to include a plurality of lateral edge surfaces, and

a plurality of guide-attachment tabs that each extend from one of the plurality of lateral edge surfaces of the guide-attachment body.

13. The hopping foot assembly of claim **11**, wherein the guide attachment comprises:

a guide-attachment body coupled to the bearing,

a guide-attachment clip coupled to the guide-attachment body and configured to pivot relative to the guide-attachment body about a pivot axis that is perpendicular to the axis, the guide-attachment clip shaped to define a groove that mates with the edge of the ruler to couple the rotating ruler guide to the ruler, and

a spring located between the guide-attachment body and the guide-attachment clip and configured to bias the guide-attachment clip into engagement with the edge of the ruler.

14. The hopping foot assembly of claim **13**, wherein the guide-attachment clip includes a pointer configured to be aligned with measurement indicators formed in the ruler so that a user may sew a stitch in the fabric with a predetermined length.

15. The hopping foot assembly of any one of claims **11** to **14**, wherein the bearing includes an outer race, an inner race, and a roller located between the outer race and the inner race, the hopping foot base is coupled to the inner race of the bearing, and the guide attachment is coupled to the outer race of the bearing.

16. The hopping foot assembly of claim **11**, wherein the guide attachment is configured to couple to the edge of the ruler to fix the guide attachment relative to the ruler.

17. The hopping foot assembly of claim **9**, wherein rotating ruler guide comprises:

a guide-attachment body,

a guide-attachment clip coupled to the guide-attachment body and configured to pivot relative to the guide-attachment body about a pivot axis that is perpendicular to the axis, the guide-attachment clip shaped to define a groove that mates with the edge of the ruler to couple the rotating ruler guide to the ruler, and

a spring located between the guide-attachment body and the guide-attachment clip and configured to bias the guide-attachment clip into engagement with the edge of the ruler.

* * * * *