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SOLE STRUCTURE FOR ARTICLE OF FOOTWEAR WITH SENSORY FEEDBACK SYSTEM

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to, and the benefit of, U.S. Patent Application No. 15/165,617, filed on May 26, 2016.

TECHNICAL FIELD

[0002] The present disclosure relates to a sole structure for an article of footwear. In particular, the present disclosure relates to a sole structure including a sensory feedback system.

BACKGROUND

[0003] Footwear typically includes a sole configured to be located under a wearer's foot to space the foot away from the ground or floor surface. Soles can be designed to provide a desired level of cushioning. The ground contact surface of the article of footwear can be configured for durability.

SUMMARY

[0004] It is desirable to maintain the center of pressure (COP) at a predetermined, ideal location on a shoe sole during a golf swing. To this end, the present disclosure describes a sole structure including a sensory feedback system capable of providing the golfer with a tactile indication that the COP has shifted from its ideal location during the golf swing. In certain embodiments, the sole structure includes an insole with a sensory feedback system. The insole includes a first insole layer and a second insole layer coupled to the second insole layer, and the sensory feedback system includes a plurality of protrusions extending from the second insole layer and through the first insole layer. The protrusions are made from a material that is harder than the material forming the first insole layer. In other words, the hardness of the material forming the protrusions is greater than the hardness of the material forming the first insole layer. In the present disclosure, the term "hardness" means the resistance of a material to permanent deformation (e.g., permanent indentation). Further, the protrusions are placed along a predetermined portion of the insole based on the user's needs. As such, the protrusions can provide a tactile sensory feedback to

the user during golf swing. Specifically, a user may shift its COP away from the predetermined, ideal COP location during a golf swing. As part of his training, however, the user senses the protrusions when he is shifting the COP away from the predetermined, ideal COP location during a golf swing, allowing the user to correct its golf swing.

[0005] “A,” “an,” “the,” “at least one,” and “one or more” are used interchangeably to indicate that at least one of the item is present; a plurality of such items may be present unless the context clearly indicates otherwise. All numerical values of parameters (e.g., of quantities or conditions) in this specification, including the appended claims, are to be understood as being modified in all instances by the term “about” whether or not “about” actually appears before the numerical value. “About” indicates that the stated numerical value allows some slight imprecision (with some approach to exactness in the value; approximately or reasonably close to the value; nearly). If the imprecision provided by “about” is not otherwise understood in the art with this ordinary meaning, then “about” as used herein indicates at least variations that may arise from ordinary methods of measuring and using such parameters. In addition, a disclosure of a range is to be understood as specifically disclosing all values and further divided ranges within the range.

[0006] The terms “comprising,” “including,” and “having” are inclusive and therefore specify the presence of stated features, steps, operations, elements, or components, but do not preclude the presence or addition of one or more other features, steps, operations, elements, or components. Orders of steps, processes, and operations may be altered when possible, and additional or alternative steps may be employed. As used in this specification, the term “or” includes any one and all combinations of the associated listed items.

[0007] Those having ordinary skill in the art will recognize that terms such as “above,” “below,” “upward,” “downward,” “top,” “bottom,” etc., are used descriptively for the figures, and do not represent limitations on the scope of the present teachings, as defined by the claims.

[0008] The above features and advantages and other features and advantages of the present teachings are readily apparent from the following detailed description of the best modes for carrying out the teachings when taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Figure 1 is a schematic, top view of a sole structure including tactile sensory feedback protrusions along its lateral side.

[0010] Figure 2 is a schematic, cross-sectional side view of the sole structure shown in Figure 1, taken along section line 2-2.

[0011] Figure 3 is a schematic, fragmentary, enlarged cross-sectional side view of an insole of the sole structure shown in Figure 1 when a wearer's COP on the insole coincides with a predetermined, ideal COP location.

[0012] Figure 4 is a schematic, fragmentary, enlarged cross-sectional side view of the insole of the sole structure shown in Figure 1 when the wearer's COP on the insole does not coincide with the predetermined, ideal COP location.

[0013] Figure 5 is a schematic, top view of a sole structure including tactile sensory feedback protrusions at a forefoot region of the insole.

[0014] Figure 6 is a schematic, top view of a sole structure including tactile sensory feedback protrusions at a heel region of the insole.

DETAILED DESCRIPTION

[0015] Referring to the drawings, wherein like reference numbers correspond to like or similar components throughout the several figures, and beginning with FIGS. 1 and 2 schematically illustrate a sole structure 12 for an article of footwear 10 (FIG. 2). The article of footwear 10 further includes a footwear upper 14 (FIG. 2) secured to the sole structure 12. As a non-limiting example, the article of footwear 10 may be a golf shoe 11. The sole structure 12 includes an outsole 16 and a midsole 18 secured to the outsole 16. The outsole 16 includes an outsole body 20 and a plurality of tread elements 22 for providing traction to the wearer of the article of footwear 10. The tread elements 22 extend from the outsole body 20.

[0016] The outsole 16 can be a single-piece or unitary structure and can be manufactured using an insert molding process. The material for the outsole 16 may be selected to provide a desirable combination of durability and flexibility. For instance, the outsole 16 may be wholly or partly made of a thermoplastic or other suitably durable material. As a non-limiting example, the outsole 16 is wholly or partly made of thermoplastic polyurethane (TPU).

[0017] As discussed above, the sole structure 12 also includes a midsole 18 that overlays at least part of the outsole 16. Specifically, in the depicted embodiment, the midsole 18 is directly secured to the outsole 16 and extends over most or all the outsole 16. The midsole 18 defines an upper midsole surface 19 and a lower midsole surface 21 opposite to the upper midsole surface 19. The upper midsole surface 19 faces away from the outsole 16, and the lower midsole surface 21 faces toward the outsole 16. The midsole 18 is wholly or partly made of a material that combines a desired level of resiliency and support, such as an ethylene vinyl acetate (EVA) foam and polyurethane foam.

[0018] The sole structure 12 further includes an insole 24 that overlays the midsole 18. The insole 24 may be alternatively referred to as sock liner and is directly secured to the midsole 18 and extends over most of the upper midsole surface 19. The insole 24 may be made of a cushioning foam material, such as a lighter weight and less rigid foam than the midsole 18. For instance, the insole 24 may be formed of a deformable (for example, compressible) material, such as polyurethane foams, EVA foams, or other polymer foam materials. As a non-limiting example, the insole 24 may be wholly or partly made of a blend of the EVA and Nitrile rubber. Accordingly, the insole 24 may, by virtue of its compressibility, provide cushioning, and may also conform to the foot in order to provide comfort, support, and stability. For purposes of reference, the insole 24 extends along a longitudinal insole axis X and has an insole heel region 26, an insole midfoot region 28, and an insole forefoot region 30. The insole midfoot region 28 is between the insole heel region 26 and the insole forefoot region 30. For purposes of discussion, the insole heel region 26, the insole midfoot region 28, and the insole forefoot region 30 are defined as the rearmost third, the middle third, and the foremost third of the insole 24, respectively. The insole heel region 26 generally includes portions of the insole 24 corresponding with rear portions of a human foot including the calcaneus bone and of a size corresponding with the insole 24 and article of footwear 10. The insole forefoot region 30 generally includes portions of the insole 24 corresponding with the toes and the joints connecting the metatarsals with the phalanges of the human foot of the size corresponding with the insole 24 and article of footwear 10. The insole midfoot region 28 generally includes portions of the insole 24 corresponding with an arch area of the human foot of the size corresponding with the outsole and article of footwear 10. Accordingly, the insole midfoot region 28 is also referred to as the insole arch region.

[0019] As used herein, a lateral side of a component for the article of footwear 10, such as an insole lateral side 32, is a side that corresponds with the side of the foot of the wearer of the article of footwear 10 that is generally further from the other foot of the wearer (i.e., it is the side closer to the fifth toe of the wearer). The fifth toe is commonly referred to as the little toe. A medial side of a component for the article of footwear 10, such as an insole medial side 34 of the outsole 16, is the side that corresponds with an inside area of the foot of the wearer and is generally closer to the other foot of the wearer (i.e., it is the side closer to the hallux of the foot of the wearer). The hallux is commonly referred to as the big toe. The insole lateral side 32 and the insole medial side 34 both extend around the periphery of the insole 24 from the foremost extent 37 to the rearmost extent 38.

[0020] The midsole 18 is at least partly disposed between the outsole 16 and the insole 24. The outsole 16 and the midsole 18 can be secured to one another by thermoforming during a molding process, by thermoplastic layers that melt to bond the components, by adhesives, or by any other suitable manner. The footwear upper 14 is secured in any suitable manner to the sole structure 12. More specifically, the footwear upper 14 is secured to an inner outsole peripheral surface 50 of the outsole 16, and to an inner midsole peripheral surface 52 of the midsole 18. The footwear upper 14 may include one or more materials (for example, textiles, foam, leather, and synthetic leather), which may be stitched, adhesively bonded, molded, or otherwise formed to define an interior void configured to receive a foot. The material for the upper 14 may be selected and arranged to selectively impart properties such as durability, air-permeability, wear-resistance, flexibility, and comfort.

[0021] The insole 24 has a foot-receiving surface 36 and a midsole-facing surface 40 opposite the foot-receiving surface 36. In the depicted embodiment, the insole 24 includes a first or upper insole layer 42 and a second or lower insole layer 44 coupled to the first insole layer 42. The first insole layer 42 defines the foot-receiving surface 36 of the insole 24, and the second insole layer 44 defines the midsole-facing surface 40 of the insole 24. The second insole layer 44 is disposed below the first insole layer 42. Accordingly, the second insole layer 44 is disposed between the midsole 18 and the first insole layer 42.

[0022] The insole 24 further includes a tactile sensory feedback system 45 for providing the wearer with a tactile indication that his center of pressure (COP) has shifted from a predetermined, ideal location **C** during, for example, a golf swing. In

the present disclosure, the term “center of pressure” means the point of application of the ground reaction force vector. The “ground reaction force vector” represents the sum of all forces acting between the foot of a wearer of the article of footwear 10 and the insole 24. The predetermined, ideal COP location **C** is at the insole midfoot region 28, and it is desirable to maintain the COP at the predetermined, ideal location **C** at different stages of a golf swing in order to optimize the club swing. By providing the tactile indication that the COP has moved from the predetermined, ideal COP **C**, the tactile sensory feedback system 45 can help make the user aware of poor balance and irregular weight shifts during a golf swing. In other words, the tactile sensory feedback system 45 serves a training tool to improve a golfer’s swing.

[0023] The tactile sensory feedback system 45 includes at least one protrusion 46 extending from the second insole layer 44 through the first insole layer 42. In the depicted embodiment, multiple protrusions 46 extend from the second insole layer 44 and at least partially through the first insole layer 42. The protrusions 46 have a greater hardness than the first insole layer 42. For instance, the indentation hardness of the material (measured, for example, in the Shore C Hardness Scale) forming the protrusions 46 may be greater than the indentation hardness of the material forming the first insole layer 42. For example, the hardness of the material forming the protrusions 46 may be between ten percent (10%) and twenty-five percent (25%) greater than the hardness of the material forming the first insole layer 42. As a result, when the wearer’s actual COP **A** moves from the predetermined, ideal COP location **C** during a golf swing, the wearer can tactilely sense protrusions 46 on his foot, thereby indicating that his COP **A** has shifted from the predetermined, ideal location **C**. The material forming the first insole layer 42 may be referred to as the first material, and the material forming the protrusions 46 and the second insole layer 44 may be referred to as the second material. Similarly, the hardness of the material forming the first insole layer 42 may be referred to as the first hardness, and the hardness of the material forming the protrusions 46 may be referred to as the second hardness. Accordingly, for purposes of the present application, the second hardness is greater than the first hardness.

[0024] As discussed above, the hardness of the material forming the protrusions 46 is greater than the hardness of the material forming the first insole layer 42. To achieve this difference in hardness, the protrusions 46 and the first insole layer 42 may be made of different materials having different harnesses. As a non-

limiting example, the protrusions 46 may be made of polyurethane foam, whereas the first insole layer 42 may be made of EVA foam. In this particular example, the hardness of the polyurethane foam is greater than the hardness of the EVA foam. Alternatively, the protrusions 46 and the first insole layer 42 may be made of the same material having different densities. For instance, the protrusions 46 may be made of an EVA foam, which has a greater density than the EVA foam forming the first insole layer 42. As such, the hardness of the EVA foam forming the protrusions 46 is greater than the hardness of the EVA foam forming the first insole layer 42. It is envisioned, that the protrusions 46 may be integrally formed with the second insole layer 44 so as to form a one-piece structure in order to facilitate manufacturing of the sole structure 12. Accordingly, the protrusions 46 and the second insole layer 44 may be made of the same material.

[0025] Referring to FIGS. 3 and 4, regardless of the specific material employed, each protrusion 46 is received in a hole 48 of the first insole layer 42. The first insole layer 42 may therefore have the same number holes 48 as the number of protrusions 46. Each hole 48 extends through the entire maximum thickness T of the first insole layer 42. The maximum height H of the protrusion 46 is less than or equal to the maximum thickness of the first insole layer 42 when the user's COP A on the insole 24 coincides with the predetermined, ideal COP location C. Further, each hole 48 is configured, shaped, and sized to receive at least one protrusion 46. Each protrusion 46 may have a cylindrical shape in order to facilitate manufacturing of the insole 24, and each hole 48 may also have a corresponding cylindrical shape in order to receive one protrusion 46. It is contemplated, however, that the protrusions 46 and holes 48 may have other suitable shapes.

[0026] Referring now to FIGS. 1-4, irrespective of its shape, the protrusions 46 do not extend through the entire maximum thickness T of the first insole layer 42 when the user's COP A on the insole 24 coincides with the predetermined, ideal COP location C. In other words, the protrusions 46 are not flushed with the foot-receiving surface 36 of the insole 24 when the user's COP A on the insole 24 coincides with the predetermined, ideal COP location C as shown in FIG. 3. As a result, the user does not feel the protrusions 46 when his COP A coincides with the predetermined, ideal COP location C. Therefore, a gap 54 is defined between a top terminal surface 56 of the protrusion 46 and the foot-receiving surface 36 of the insole 24 when the user's COP A on the insole 24 coincides with the predetermined, ideal COP location C.

However, when the wearer's COP does not coincide with predetermined, ideal COP location C during a golf swing, the weight of the wearer shifts at least part of the foot-receiving surface 36 of the insole 24 shifts toward the second insole layer 44, thereby closing the gap 54 as shown in FIG. 4. Consequently, the user can feel the protrusion 46, because the softer first insole layer 44 deforms to a greater extent than the harder protrusion 46, which causes the protrusion 46 to extend beyond the foot-receiving surface 36 and impinge into the user's foot/skin. Further, because the protrusions 46 are made of a harder material than the material forming the first insole layer 44, the wearer can easily sense the protrusion 46 on his foot. In other words, the difference in hardness between the protrusions 46 and the first insole layer 44 assist in providing the user with a tactile indication that the user's COP A has shifted from the predetermined, ideal COP location C. Such tactile indication helps the wearer correct its balance and weight pattern during a golf swing.

[0027] The protrusions 46 are only disposed along the feedback region F of the insole 24 in order to provide tactile training feedback to a user during a golf swing. Depending on the wearer's golf swing patterns, the protrusions 46 can be located on different parts of the insole 24. The particular location of the feedback region F depends on the particular user's needs. For instance, in the embodiment depicted in FIG. 1, the feedback region F does not encompass the entire surface area of the insole 24. Rather, the feedback region F only extends along insole lateral side 32 of the insole 24 in order to provide tactile feedback about the user's balance in the medial-lateral direction L (FIG. 1). To provide tactile feedback about the user's balance in the medial-lateral direction L, no protrusion 46 should be located along the insole medial side 34 of the insole 24 at least in the embodiment shown in FIG. 1. Thus, in the embodiment depicted in FIG. 1, all the protrusions 46 are located closer to the insole lateral side 32 than to the insole medial side 34 of the insole 24. In this embodiment, the feedback region F extends along the insole heel region 26, the insole midfoot region 28, and the insole forefoot region 30 in order to maximize the tactile feedback in the medial lateral direction L.

[0028] Because of the location of the feedback region F, the tactile training feedback to the user increases as a function of a distance D between the location of the actual COP A during a golf swing and the predetermined, ideal COP location C. Accordingly, the tactile training feedback is indicative of the actual COP of the user on the insole 24. The intensity of the tactile training feedback is a function of the

maximum height H (FIG. 3) of the protrusions 46. The maximum height H of the protrusion 46 is defined as the distance from the lower protrusion edge 58 to the top terminal surface 56 of the protrusion 46. The lower protrusion edge 58 is located at the intersection between the second insole layer 44 and the protrusion 46. The spacing and density of the protrusions 46 within the feedback region F can be tuned according to the user's needs. The spacing between the protrusions 46 within the feedback region affects the intensity and location of the tactile training feedback. Likewise, the protrusion density within the feedback region F also affects the intensity and location of the tactile training feedback. Accordingly, the intensity and location of the tactile training feedback are a function of the protrusion density/spacing within the feedback region F.

[0029] Referring to FIG. 5, it is contemplated that the feedback region F may be disposed only at insole forefoot region 30 of the insole 24 in order to provide tactile training feedback about the user's balance in an anterior-posterior direction P. The term "anterior" is used to refer to a front or forward component or portion of a component. The term "posterior" is used to refer to a rear or rearward component of portion of a component. The term "forward" is used to refer to the general direction from the heel region 26 toward the forefoot region 30, and the term "rearward" is used to refer to the opposite direction, i.e., the direction from the forefoot region 30 toward the heel region 26. In this embodiment, no protrusion 46 is disposed at the insole heel region 26 and the insole midfoot region 28 in order to provide tactile training feedback mostly in the anterior-posterior direction P. The anterior-posterior direction P may be perpendicular to the medial-lateral direction L.

[0030] Referring to FIG. 6, the feedback region F can only be disposed at the insole heel region 26 in order to provide tactile training feedback about the user's balance in an anterior-posterior direction P. In this embodiment, no protrusion 46 is disposed at the insole forefoot region 30 and the insole midfoot region 28 in order to provide tactile training feedback mostly in the anterior-posterior direction P.

[0031] While the best modes for carrying out the teachings have been described in detail, those familiar with the art to which this disclosure relates will recognize various alternative designs and embodiments for practicing the teachings within the scope of the appended claims.

CLAIMS

1. An insole, comprising:
 - a first insole layer defining a foot-receiving surface and made of a first material, wherein the first material has a first hardness;
 - a second insole layer coupled to the first insole layer; and
 - a plurality of protrusions each extending from the second insole layer, wherein each of the protrusions extends through the first insole layer, each of the protrusions is made of a second material, the second material has a second hardness, and the second hardness is greater than the first hardness.
2. The insole of claim 1, wherein the protrusions are only located at a feedback region of the insole in order to provide tactile training feedback to a user during a golf swing.
3. The insole of claim 2, wherein the insole includes an insole forefoot region, an insole heel region, and an insole midfoot region between the insole forefoot region and the insole heel region, and the feedback region is at least partially disposed in at least one of the insole heel region or the insole forefoot region to provide tactile feedback about a user's balance in an anterior-posterior direction.
4. The insole of any of claims 2 and 3, wherein the insole includes an insole lateral side and an insole medial side opposite the insole lateral side, and the feedback region is at least partially disposed along the insole lateral side to provide tactile feedback about a user's balance in a medial-lateral direction.
5. The insole of any of claims 2-4, wherein the tactile training feedback is indicative of a location of a center of pressure (COP) of the user on the insole.
6. The insole of claim 5, wherein the tactile training feedback increases as a function of a distance between the location of the COP and a predetermined, ideal COP location.

7. The insole of claim 6, wherein the predetermined, ideal COP location is at the insole midfoot region.
8. The insole of any of claims 2-7, wherein the tactile training feedback is a function of at least one of a density/spacing and a height of the protrusions.
9. The insole of any of claims 1-8, wherein the second insole layer is made of the second material.
10. The insole of any of claims 1-9, wherein the protrusions are integrally formed with the second insole layer.
11. The insole of any of claims 1-10, wherein the first insole layer has a maximum thickness, the first insole layer defines a plurality of holes, each of the holes extends through an entirety of the maximum thickness, and each of the holes receives one of the protrusions.
12. A sole structure, comprising:
 - an outsole;
 - an insole;
 - a midsole disposed between the outsole and the insole;
 - wherein the insole includes:
 - a first insole layer made of a first material, the first material having a first hardness;
 - a second insole layer coupled to the first insole layer; and
 - a plurality of protrusions each extending from the second insole layer, each of the protrusions extending through the first insole layer, each of the protrusions being made of a second material, the second material having a second hardness, and the second hardness being greater than the first hardness.
13. The sole structure of claim 12, wherein the protrusions are only located at a feedback region of the insole in order to provide tactile training feedback to a user during a golf swing.

14. The sole structure of claim 13, wherein the insole includes an insole forefoot region, an insole heel region, and an insole midfoot region between the insole forefoot region and the insole heel region, and the feedback region is at least partially disposed in at least one of the insole heel region or the insole forefoot region to provide tactile feedback about a user's balance in an anterior-posterior direction.

15. The sole structure of any of claims 13 and 14, wherein the insole includes an insole lateral side and an insole medial side opposite the insole lateral side, and the feedback region is at least partially disposed along the insole lateral side to provide tactile feedback about a user's balance in a medial-lateral direction.

16. The sole structure of any of claims 13-15, wherein the tactile training feedback is indicative of a location of a center of pressure (COP) of the user on the insole.

17. The sole structure of claim 16, wherein the tactile training feedback increases as a function of a distance between the location of the COP and a predetermined, ideal COP.

18. The sole structure of claim 17, wherein the predetermined, ideal COP location is at the insole midfoot region.

19. The sole structure of any of claims 13-18, wherein the tactile training feedback is a function of at least one of a density/spacing and a height of the protrusions.

20. The sole structure of any of claims 12-19, wherein the second insole layer is made of the second material.

21. The sole structure of any of claims 12-20, wherein the protrusions are integrally formed with the second insole layer.

22. The sole structure of any of claims 13-21, wherein the first insole layer has a maximum thickness, the first insole layer defines a plurality of holes, each of the holes extends through an entirety of the maximum thickness, and each of the holes receives one of the protrusions.

23. The sole structure of claim 22, wherein the tactile training feedback is indicative of a location of a center of pressure (COP) of the user on the insole, the insole has a foot-receiving surface and a midsole-facing surface opposite the foot-receiving surface, the first insole layer defines the foot-receiving surface, the second insole layer defines the midsole-facing surface, each of the protrusions has a maximum height, and the maximum height of the protrusion is less than the maximum thickness of the first insole layer when the location of the COP of the user on the insole coincides with the predetermined, ideal COP location.

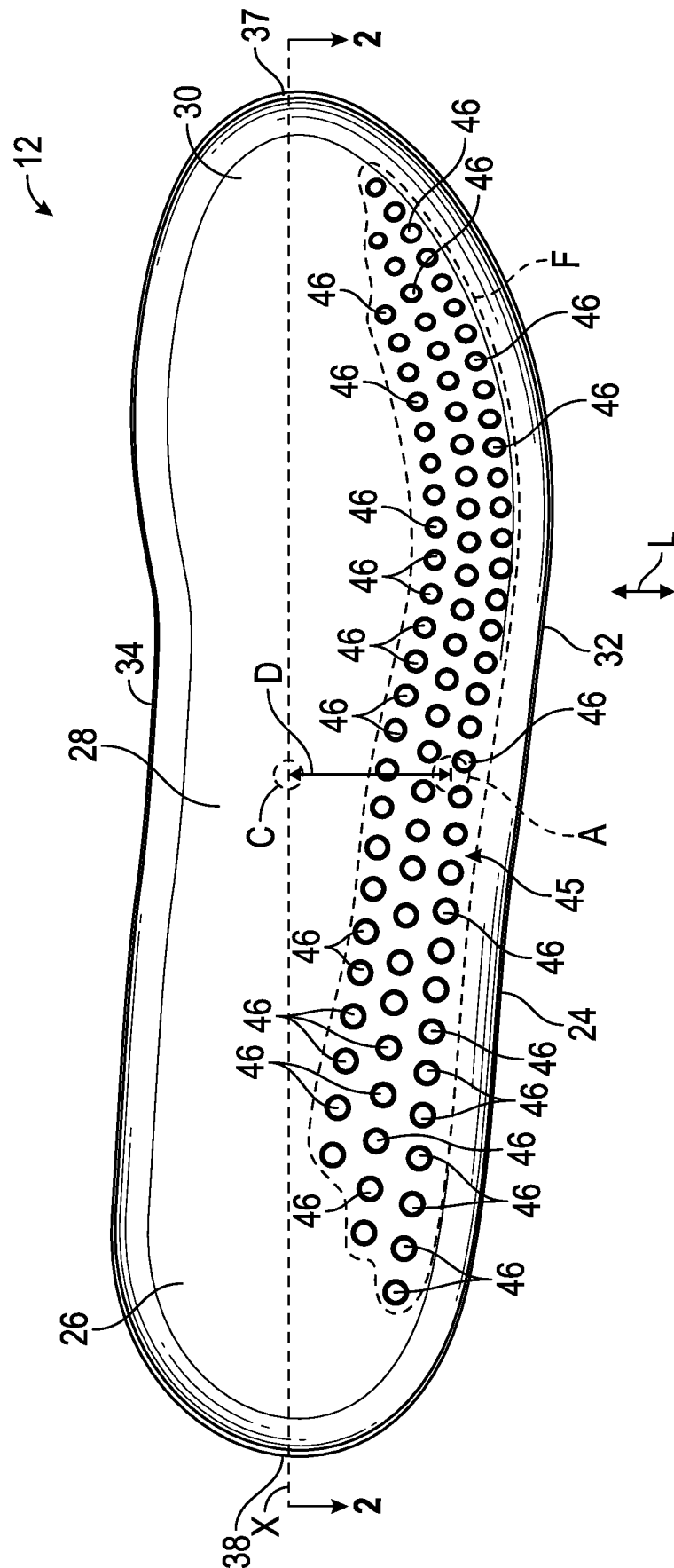


FIG. 1

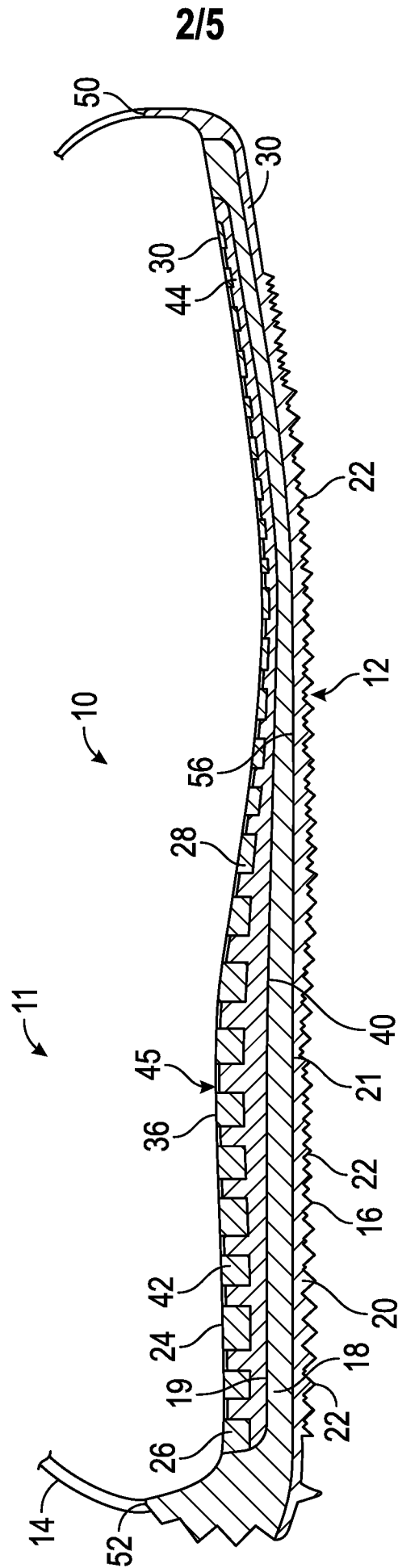


FIG. 2

3/5

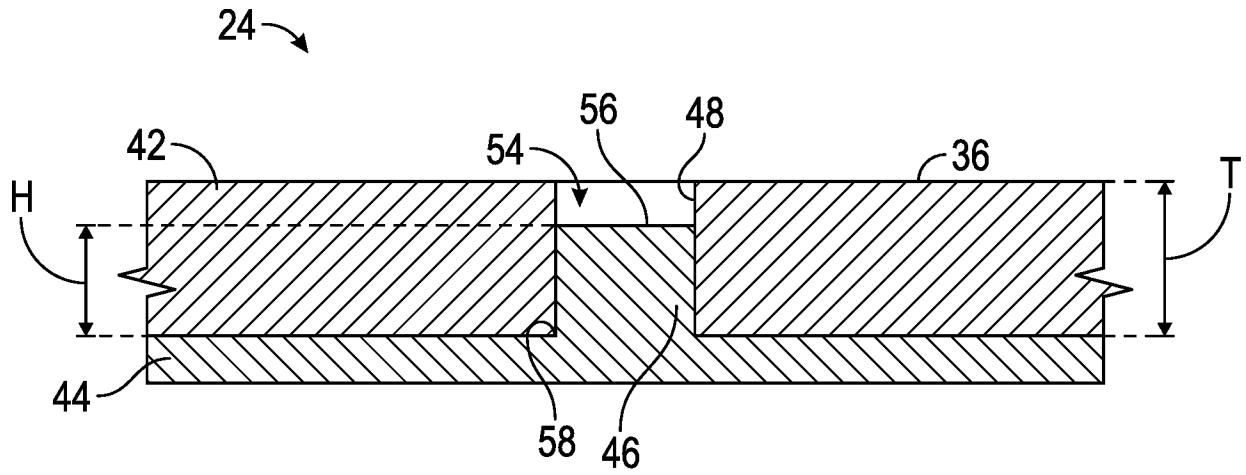


FIG. 3

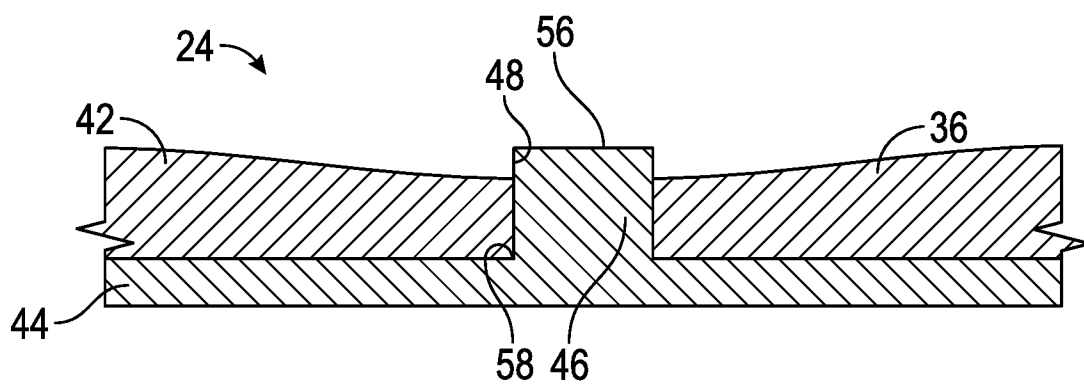
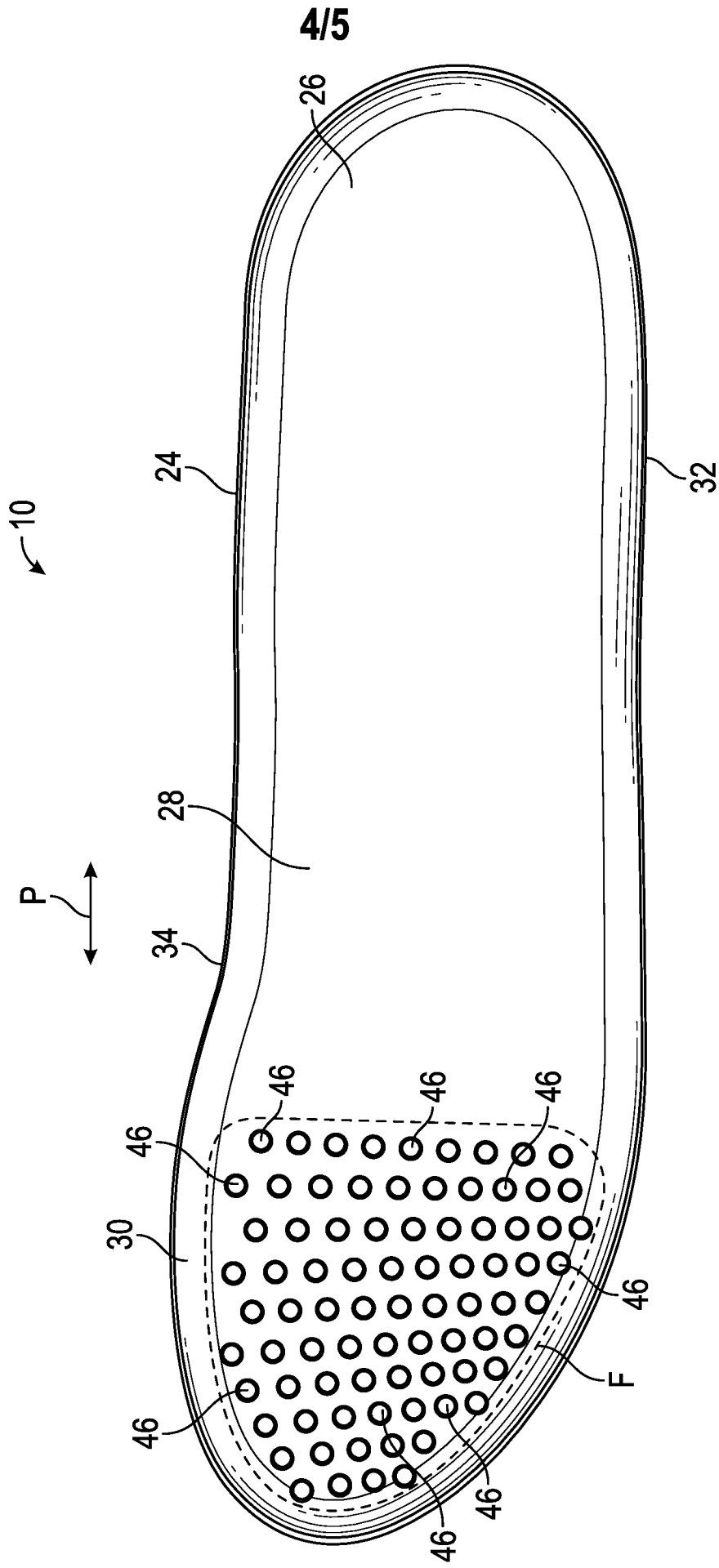


FIG. 4



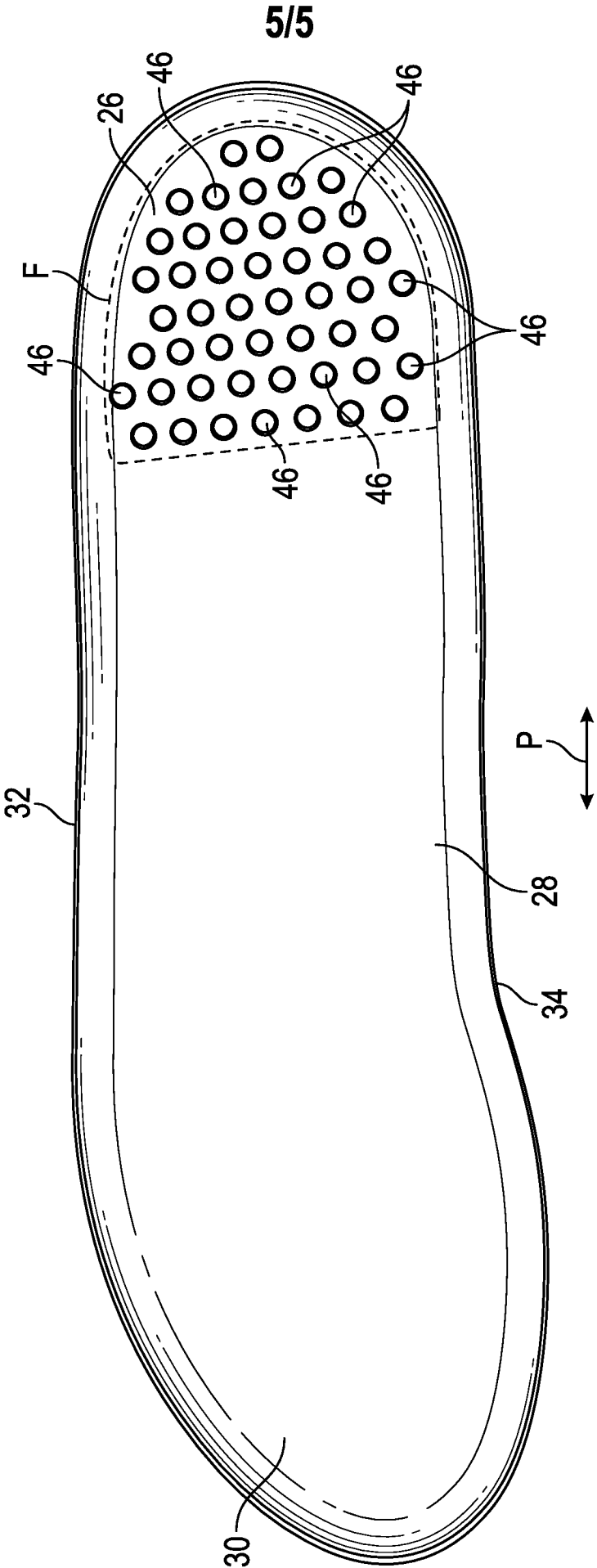


FIG. 6

INTERNATIONAL SEARCH REPORTInternational application No.
PCT/US2017/029839**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 6-7,17-18,23
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
Claims 6-7, 17-18 and 23 refer to multiple dependent claims which do not comply with PCT Rule 6.4(a).
3. ☒ Claims Nos.: 5,8-11,16,19-22
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of any additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

A. CLASSIFICATION OF SUBJECT MATTER**A43B 7/14(2006.01)i, A43B 17/00(2006.01)i, A43B 17/14(2006.01)i, A43B 5/00(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHEDMinimum documentation searched (classification system followed by classification symbols)
A43B 7/14; A43B 17/00; A43B 17/02; A43B 17/14; A43B 13/18; A43B 13/20; A43B 5/00Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility modelsElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: insole, layer, hardness, sensor, feedback, protrusion, pressure**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 9161591 B2 (LANDAU, ALEXANDER et al.) 20 October 2015 See column 3, lines 35-41, 61-62, claim 1 and figures 1, 2.	1-4, 12-15
A	EP 0224613 B1 (NITEX GMBH) 27 September 1989 See claim 1.	1-4, 12-15
A	CN 202135794 U (CAMEL (FUJIAN) OUTDOOR GOODS CO., LTD.) 08 February 2012 See paragraphs [0015]-[0019] and figures 1, 2.	1-4, 12-15
A	JP 11-253205 A (IMAMURA, NOBORU) 21 September 1999 See paragraphs [0048]-[0050], claims 1, 2 and figure 4.	1-4, 12-15
A	US 5564202 A (HOPPENSTEIN, REUBEN) 15 October 1996 See claim 1.	1-4, 12-15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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Name and mailing address of the ISA/KR

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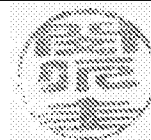


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INTERNATIONAL SEARCH REPORT

Information on patent family members

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