



(51) International Patent Classification:

A45D 7/02 (2006.01) A45D 1/08 (2006.01)

(21) International Application Number:

PCT/US2018/048620

(22) International Filing Date:

29 August 2018 (29.08.2018)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

62/551,705 29 August 2017 (29.08.2017) US

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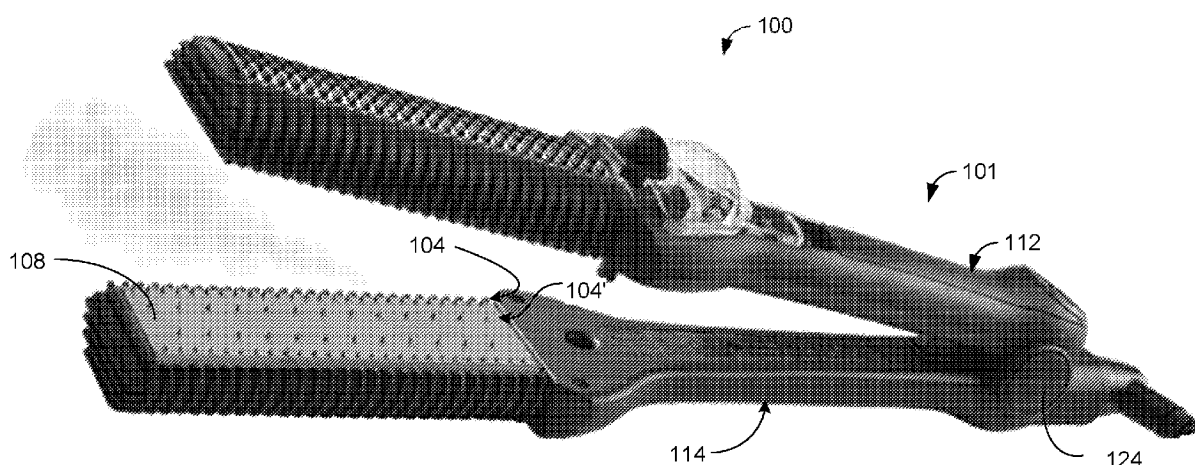
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(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

(54) Title: RETRACTABLE IRON

FIG. 1



(57) Abstract: An apparatus for styling hair includes a hinged frame with two arms and a hinge. A platen for engaging hair and having a plurality of through holes arranged in a pattern has a mounted surface against a first one of the arms and a free surface facing a second one of the two arms. A pin carrier is interposed between the first one of the arms and the flat plate, having a plurality of pins arranged in the pattern for inserting into the through holes. A mechanism is coupled to the pin carrier, movable between an extended state wherein the plurality of pins protrudes above the free surface and a retracted state wherein the plurality of pins are retracted below the free surface. The perforated platen and a mating platen can be heated for styling hair and a user can easily move the pins between the engaged and retracted states.



Published:

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

RETRACTABLE IRON

PRIORITY CLAIM

[001] The present application claims priority to U.S. provisional patent application Serial No. 62/551705 filed August 29, 2017, which is incorporated herein in its entirety by reference.

FIELD

[002] The present application relates to hair styling apparatus, and more particularly to electrical irons for shaping hair.

BACKGROUND

[003] Various electrical apparatus are known for styling hair by application of heat and/or steam. Hair curlers, for example, are used to impart curls into hair. They may be used on dry hair but work best on wet hair. Steam may assist in setting the hair to the curl of the curlers. Curling irons typically incorporate an electrical heating element to heat one or both sides of a smooth but curved pair of mating surfaces between which hair is placed to be curled. The hair may preferably be pulled through the interface of the mating surfaces of the curling iron to aid in curling the hair. Other apparatus include hair straighteners and smoothers that operate much like curling irons, but have flat or curved, smooth mating surfaces which act more like a clothes iron to straighten and/or smooth, or curve or curl the hair when compressed against and pulled along the hair.

[004] Prior apparatus by the inventor described in U.S. Patent Nos. RE38713E and 7,341,064, both incorporated herein by reference, improved upon these prior devices by fixing a plurality of pins for brushing or detangling to one a pair of the mating surfaces that engage holes in the other of the surfaces. One or both surfaces may incorporate a source of dry heat, or a source of steam is provided with a trigger for discharging the steam through holes in at least one of the surfaces as an aid to hair styling. This apparatus overcame a limitation of prior irons and straighteners that used untextured surfaces for engaging the

hair, sometimes tangling the hair or requiring much additional brushing with another apparatus such as a brush to achieve the desired style. The apparatus with pins reduced the time required to style the hair and the heat applied. However, the prior apparatus could not conveniently be adapted for use without the detangling pins when desired. Users that wanted to use both flat untextured surfaces and surfaces with detangling pins had to either use two separate irons or change one or more plates making up the mating surface of the textured iron during use. Some of the convenience provided by the new iron was lost for some users.

[005] Accordingly, it would be desirable to provide hair styling devices capable of use in curling, straightening, smoothing, curving and/or waving hair, that overcomes these and other limitations of the prior art.

SUMMARY

[006] This summary and the following detailed description should be interpreted as complementary parts of an integrated disclosure, which parts may include redundant subject matter and/or supplemental subject matter. An omission in either section does not indicate priority or relative importance of any element described in the integrated application. Differences between the sections may include supplemental disclosures of alternative embodiments, additional details, or alternative descriptions of identical embodiments using different terminology, as should be apparent from the respective disclosures.

[007] In an aspect of the disclosure, an apparatus for styling air includes a hinged frame comprising two opposing arms and a hinge. The apparatus includes a platen for engaging hair with a plurality of through holes arranged in a pattern, having a mounted surface against a first one of the arms and a free surface facing a second one of the two arms. The platen should be thermally conductive and capable of engaging hair without snagging or undue friction, e.g., smooth. The platen may be thermally coupled to an electrical heating element controlled by a thermal controller. A pin carrier is interposed between the first one of the arms and the flat plate, comprising a plurality of pins coupled to a substrate and arranged in the pattern for inserting into the through holes.

A facing platen coupled to the second one of the arms may likewise be heated and may include a pattern of holes or recesses for receiving the detangling pins when the pins are extended and the two opposing arms are held together closely by a user. The apparatus may further include a mechanism coupled to the pin carrier, movable between an extended state wherein the plurality of pins protrudes above the free surface and a retracted state wherein the plurality of pins are retracted below the free surface. A user-operable actuator on one arm may activate the mechanism, allowing the user to extend and retract the pins as often as desired during hair styling. Thus, the user is provided with a versatile apparatus useful as a detangling iron and as a flat iron, without needed to change out any components.

[008] To the accomplishment of the foregoing and related ends, one or more examples comprise the features described and particularly pointed out in the claims. The following description and the annexed drawings set forth in detail certain illustrative aspects and indicate but a few of the ways in which the principles of the examples may be employed. Other advantages and novel features will become apparent from the following detailed description when considered with the drawings and the disclosed examples, which encompass all such aspects and their equivalents.

BRIEF DESCRIPTION OF THE DRAWINGS

[009] The features, nature, and advantages of the present disclosure will become more apparent from the detailed description set forth below when taken with the drawings in which like reference characters identify like elements correspondingly throughout the specification and drawings.

[010] Fig. 1 is a perspective view illustrating an apparatus for styling hair with retractable detangling pins.

[011] Fig. 2 is a cross-sectional view illustrating interior components of the apparatus shown in Fig. 1.

[012] Fig. 3 is an exploded perspective assembly view further illustrating interior components of the apparatus of Fig. 1.

[013] Fig. 4 is a schematic diagram illustrating an electrical circuit for an apparatus as shown in Fig. 1.

[014] Figs. 5A-B are simplified cross-sectional diagrams illustrating aspects of the retractable detangling pins and associated components, for a flat platen embodiment.

[015] Fig. 6 is a simplified cross-sectional diagram illustrating aspects of the retractable detangling pins and associated components, for a contoured platen embodiment.

DETAILED DESCRIPTION

[016] Various aspects are now described referring to the drawings. In this description, for explanation, numerous specific details provide a thorough understanding of one or more aspects. It may be evident, however, that the aspects of the disclosure may be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form to facilitate describing these aspects.

[017] Referring to Figs. 1-3, an apparatus 100 for styling hair includes a hinged frame 10 having two opposing arms 112, 114 joined by a hinge 124 that permits opening closing the two arms 112, 114 for capturing and releasing hair under treatment. While a pivoting hinge 124 is shown, other mechanisms for guiding movement of the arms 112, 114 may also be suitable. The apparatus includes a perforated platen 108 (Figs. 1, 3) having a plurality of through holes 110 (Fig. 3) arranged in a pattern. While the perforated platen is shown smooth on its upper surface to allow hair to pass over the perforated platen 108 without snagging or undue friction, non-smooth contours such as ridges that do not snag hair may also be useful. The bottom of the perforated platen 108, its "mounted surface" need not be smooth and may include various non-smooth mounting features, partially visible in Fig. 3. The mounted surface (bottom) of the perforated platen 108 is mounted against a first one of the arms, with its free surface facing a second one of the two arms as shown in Figs. 1, 3. The perforated platen may be coated with a non-stick high-temperature coating, for example, a ceramic, fluoropolymer (e.g., polytetrafluoroethylene), or chloro-

fluoropolymer for greater smoothness and protection from oxidation. While the perforated platen as shown in Figs. 1 and 3 includes a pattern of cylindrical holes (i.e., holes with cylindrical walls), the perforations may be of any configuration that accommodates the detangling pins inserted through the perforations without entangling or snaring the hair under treatment.

[018] The apparatus 100 may further include a pin carrier 106, 106' interposed between the first one of the arms 114 and the perforated plate. The pin carrier may be made of any suitable structural material in any useful shape. While dual pin carriers 106, 106' are illustrated in Fig. 3, any useful number of pin carriers may be used, for example, one, two, or three. In an aspect, the dual pin carriers 106, 106' may be joined by clips 132 at or near ends thereof, forming an integrated pin carrier 107. In another aspect, inner rows of the pins 104' may be spaced apart further than the outer rows of pins 104; for example, about 1.5 to 3 times further apart, such as about twice as far apart. Each of the two separate pieces 106, 106' may be positioned relative to the perforated platen 108 so the first 104 of the two rows is along and closer to an edge of the perforated platen than the second 104' of the two rows of pins. Correspondingly, wherein the pattern of through holes in the perforated plate 108 may include a row of more closely-spaced holes along each long edge of the smooth plate, and two or more rows of more widely-spaced holes there between, as shown in Fig. 3.

[019] Each pin carrier 106, 106' includes a plurality of pins 104, 104' coupled to a substrate and arranged in the pattern of perforations for inserting into the through holes. The pins 104, 104' should be smooth enough for detangling hair, for example a surface roughness of about 3 micrometers or smoother and made of a ductile and/or tough structural material capable of operating in the expected high-temperature environment. Suitable materials may include, for example, stainless steel, uncoated or coated with a high-temperature friction-reducing coating as described for the perforated platen 108, structural ceramics, or similarly tough materials. The detangling pins illustrated in Figs. 1, 3 are cylinders with rounded, tapered, blunt or pointed ends, about 0.5 to 1.5

mm in diameter and about 4 to 8 mm long; however, other sizes and shapes of pins may also be useful.

[020] The apparatus 100 may further include a mechanism 149 coupled to the pin carrier 106, 106'. The mechanism 149 may be an assembly of multiple components, for example, a slider 138, a link 148, a sliding actuator 144, and a frame 142. The slider 138 includes sliding bearings 136 of low-friction material at or near its four corners. The bearings 136 facilitate smooth sliding of the slider 138 relative to the integrated pin carrier 107, under a pushing or pulling force exerted by the user against the manual actuator 144 in a receiver of the first arm 114. The pushing or pulling force is transmitted to the slider 138 by the link 148.

[021] The frame 142 may include linear cams 140, also called ramps, that a lower surface or additional bearings of the slider traverses as it slides back and forth. The cams or ramps convert linear motion parallel to perforated plate 108 into linear motion perpendicular to the perforated plate 108, pushing the pin carrier 107 towards the perforated plate 108 and compressing resilient spring members 102 (for example, coil springs). The resilient members 102 impart a return force when the slider moves in the opposite direction and back down the ramps 140. Thus, the mechanism 149 and pin carrier 107 are movable between an extended state wherein the plurality of pins protrudes above the free surface and a retracted state wherein the plurality of pins is retracted below the free surface of the perforated plate 108. The resilient springs 102 bias the pin carrier towards one of the extended state and the retracted state (bias towards the retracted state is illustrated). In the assembled mechanism 149 fixed to the first arm 114, the ramps 140 are disposed against the pin carrier 107 by the slider 138 and springs 102, positioned for transforming motion of the pin carrier 107 parallel to the perforated platen 108 into motion perpendicular to the perforated platen. Other reciprocating mechanisms may also be used, instead of the illustrated sliding linear-cam mechanism.

[022] The apparatus may further include a water reservoir 117 for producing steam (Fig. 2) and a steam control button 118 (Fig. 3). Other components may

include, for example, the second arm 112, a keypad 120 for power and temperature control, and hinge pin bearings 122, 156 in the second and first arms 112, 114. A hinge pin 124 mounted through a wire guide 126 completes the hinge assembly. AC power may be supplied via a power bushing 130 and coupling 128. Wire guide channels in the guide 126 may be covered by one or more cover plates 146. A lower screen 152 ventilates an interior of the first arm 114. A fuse assembly 154 may provide overload protection. Upper and lower radiative housings 116, 115 help radiate excess heat and prevent skin contact with hot surfaces. These and other features may vary as known in the art to provide apparatus of different visual and functional styles, without departing from the inventive aspects described herein.

[023] In other aspects, the perforated platen 108 and/or a second platen are in thermal conductive communication with a resistive heating wire or element under the control of a heating circuit. While various circuits are known in the art and any suitable heating circuit may be used, Fig. 4 shows an example of a circuit 400 illustrative certain electrical aspects, without showing every detail within reach of an electrical designer of ordinary skill. The thermal circuit 400 includes a platen 412 thermally coupled to a resistive (or inductive) heating element 414. One or more temperature sensors 416, for example a thermistor or thermocouple, are likewise coupled to the platen 412. An AC power source 410 (e.g., via a connector to a wall socket) is coupled to a power controller 408, that supplies DC power to digital components of the circuit 400 and modulates power to the heater 414 under control of the microprocessor (or microcontroller) 402. The microprocessor 402 runs a control and user interface program that accepts inputs from the temperature sensor (or sensors) 416 and keypad 404 and provides a digital or analog output signal to the power controller 408 that controls energy supplied to the heater 414. Optionally, the microprocessor 402 controls a digital readout 406 that informs the user of the platen temperature as measured by the sensor 412.

[024] The apparatus 100 may include a second platen 103 mounted to the second arm opposite to the smooth plate (Fig. 2). Referring to Figs. 5A-5B, a

platen-pin assembly 500 may include a second platen 502 mounted as shown for platen 103 in Fig. 2 may include a pattern of recesses 510 matching the pattern of pins 504 fixed normal to the pin carrier 506 and the pattern of through holes in the perforated platen 508. A channel or gap 512 between the second platen 502 and the perforated platen 502 admits hair for treatment. The recesses 510 may help stabilize and secure the pins 504 while detangling hair. Fig. 5A shows the pin carrier 506 and pins 504 in an extended state for detangling under operation of a mechanism as described herein above. Fig. 5B shows the same elements with the pins 504 and carrier 506 in a retracted state for using the apparatus as a flat iron without detangling. The relative size of the pins and recesses is exaggerated for illustrative clarity.

[025] Fig. 6 shows another platen-pin assembly 600 including a contoured perforated platen 608, a contoured second platen 602, recesses 610, pins 604 and a contoured pin carrier 606. The user styles hair in the contoured gap 612. Other than the contours of the various elements, the principle of operation of the retracting pins is the same as for the flat platens illustrated.

[026] Just as the shape and configuration of the platens may be varied, so may the shape of the pins and matching perforations. Besides pins with circular or elliptical cross-sections, pins and holes of other cross sections may also be useful. For example, rectangular, polygonal or elongated elliptical detanglers may be useful; slots may be useful as perforations instead of, or besides cylindrical pins and holes. Many other mechanisms for retraction or extension may also be useful, instead of the illustrated sliding mechanism. For example, useful retraction-extension mechanisms (also known as reciprocating mechanisms) may include rack-and-pinion mechanisms, hydraulic or pneumatic pistons, electric linear motors, slider-crank mechanisms, rotating camshafts, or other mechanisms.

[027] The previous description of the disclosed aspects is provided to enable any person skilled in the art to make or use the present disclosure. Various modifications to these aspects will be clear to those skilled in the art, and the generic principles defined may be applied to other embodiments without

departing from the spirit or scope of the disclosure. The present disclosure and the appended claims are not limited to the embodiments shown herein and encompass a wider scope consistent with the principles and novel features disclosed.

CLAIMS

1. An apparatus for styling hair, comprising:
a hinged frame comprising two opposing arms and a hinge;
a perforated platen for engaging hair comprising a plurality of through holes arranged in a pattern, having a mounted surface against a first one of the arms and a free surface facing a second one of the two arms;
a pin carrier interposed between the first one of the arms and the perforated plate, comprising a plurality of pins coupled to a substrate and arranged in the pattern for inserting into the through holes; and
a mechanism coupled to the pin carrier, movable between an extended state wherein the plurality of pins protrude above the free surface and a retracted state wherein the plurality of pins are retracted below the free surface.
2. The apparatus of claim 1, further comprising a sliding actuator coupled to the mechanism for moving the mechanism between the extended state and the retracted state.
3. The apparatus of claim 2, further comprising a resilient spring biasing the pin carrier towards one of the extended state and the retracted state.
4. The apparatus of claim 2, further comprising a ramp disposed against the pin carrier, positioned for transforming motion of the pin carrier parallel to the perforated platen into motion perpendicular to the perforated platen.
5. The apparatus of claim 4, wherein the ramp is formed in a frame of the mechanism fixed to the first one of the two arms.
6. The apparatus of claim 2, wherein the sliding actuator comprises a manual actuator mounted in a receiver of the hinged frame.
7. The apparatus of claim 1, wherein the mechanism comprises an assembly of components.

8. The apparatus of claim 1, wherein each of the plurality of pins comprises a stainless steel material.

9. The apparatus of claim 8, wherein each of the plurality of pins has a diameter in a range of 0.5 to 1.5 mm.

10. The apparatus of claim 8, wherein each of the plurality of pins has length in a range of 1 to 4 mm.

11. The apparatus of claim 8, wherein the stainless steel material is coated with one of a ceramic or fluoropolymer.

12. The apparatus of claim 1, wherein the pin carrier comprises two separate pieces, each holding two rows of the plurality of pins.

13. The apparatus of claim 12, wherein pins in a first of the two rows are spaced apart a uniform amount that is less than spacing between pins in a second of the two rows.

14. The apparatus of claim 13, wherein each of the two separate pieces is positioned relative to the perforated platen so the first of the two rows is along and closer to an edge of the perforated platen than the second of the two rows.

15. The apparatus of claim 1, wherein the perforated platen is flat and smooth on its free surface.

16. The apparatus of claim 1, wherein the perforated platen is in conductive communication with a resistive heating element.

17. The apparatus of claim 1, further comprising a water reservoir for producing steam.

18. The apparatus of claim 1, further comprising a second platen mounted to the second arm opposite to the perforated platen.

19. The apparatus of claim 1, wherein the through holes have cylindrical walls.

20. The apparatus of claim 1, wherein the pattern of through holes include a row of more closely-spaced holes along each long edge of the smooth plate, and two or more rows of more widely-spaced holes there between.

FIG. 1

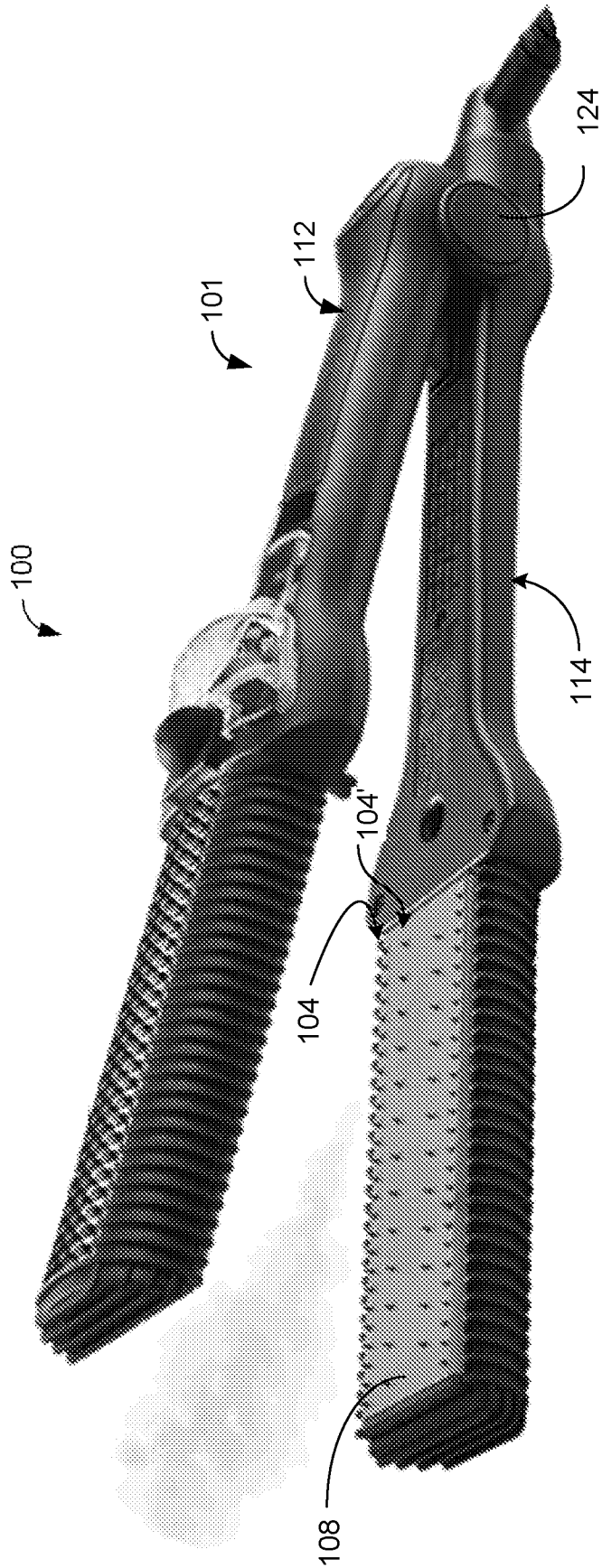


FIG. 2

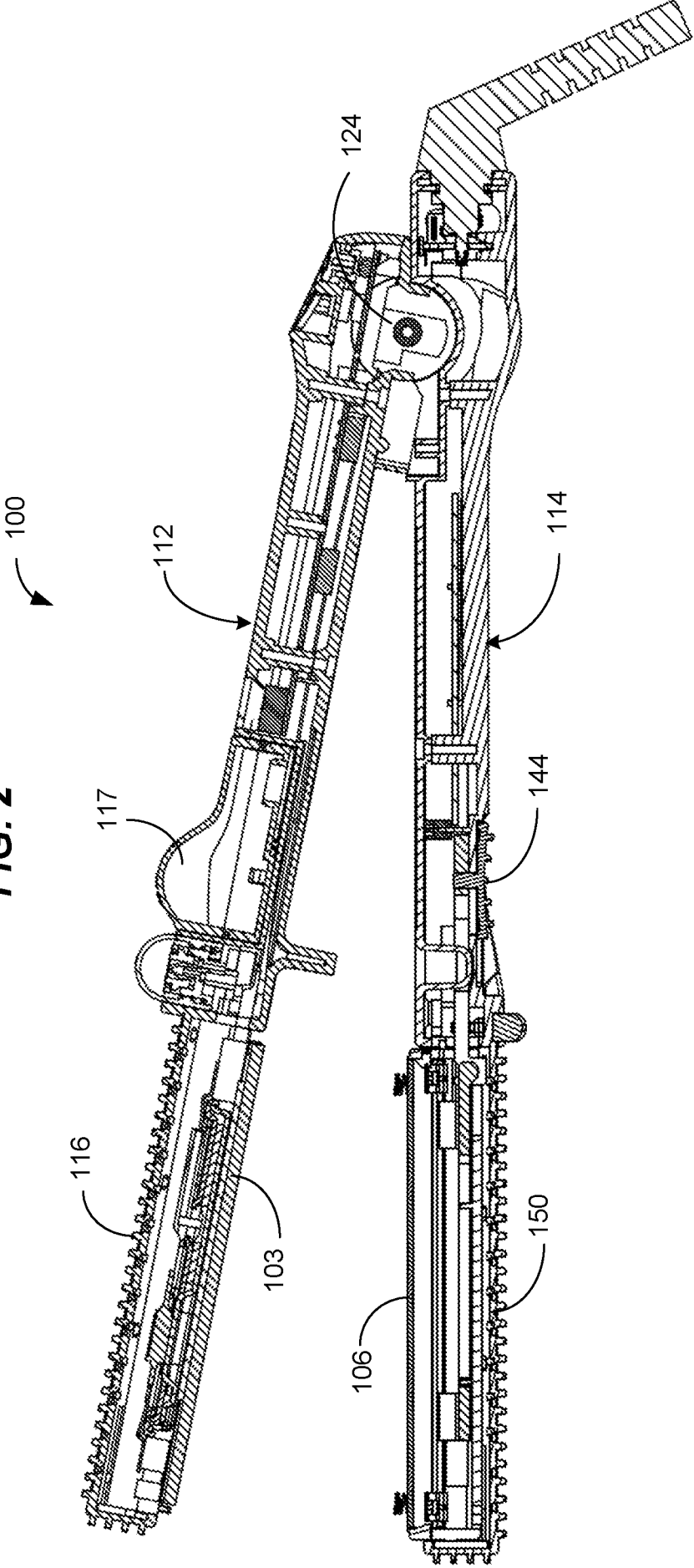


FIG. 3

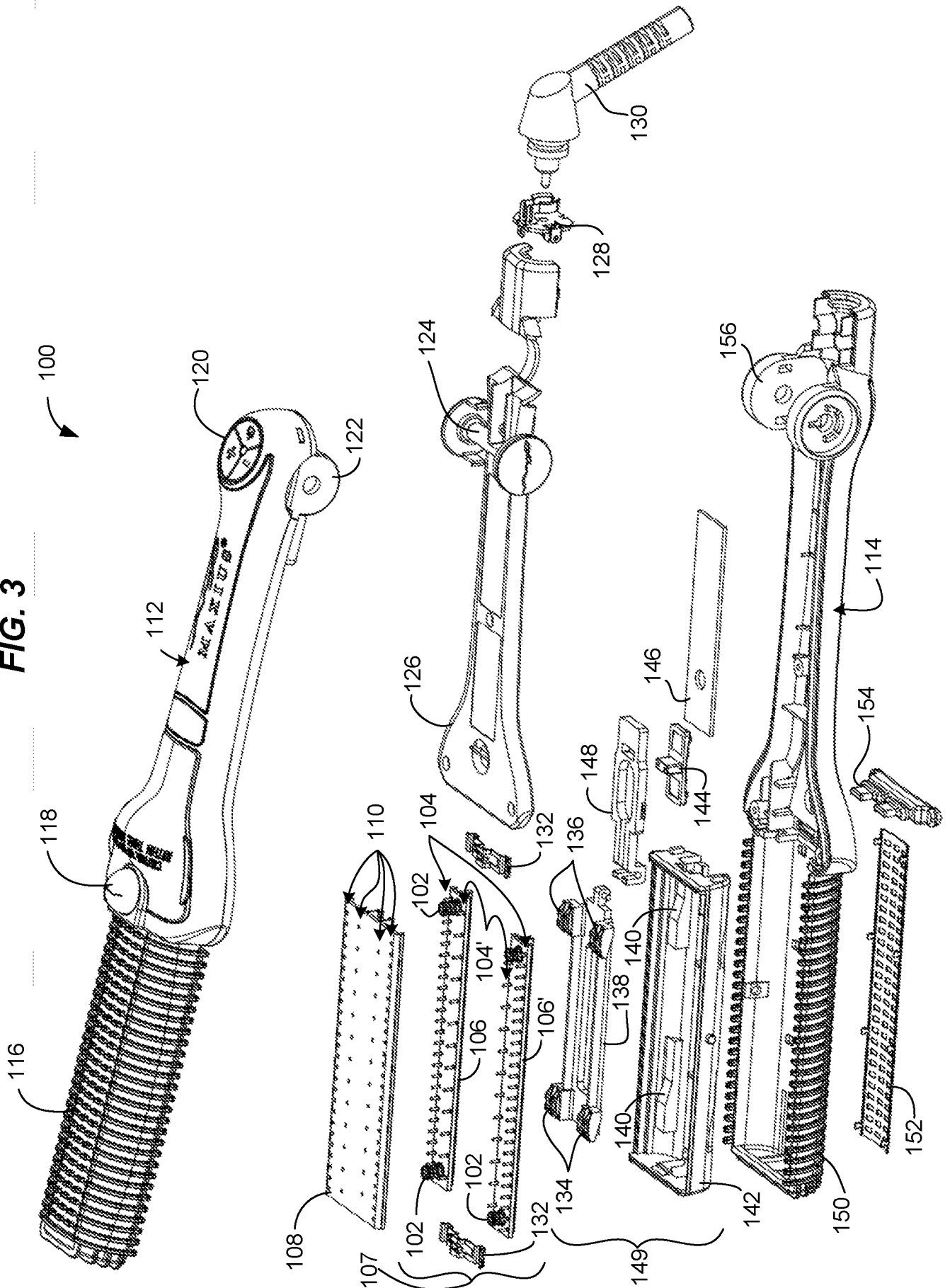


FIG. 4

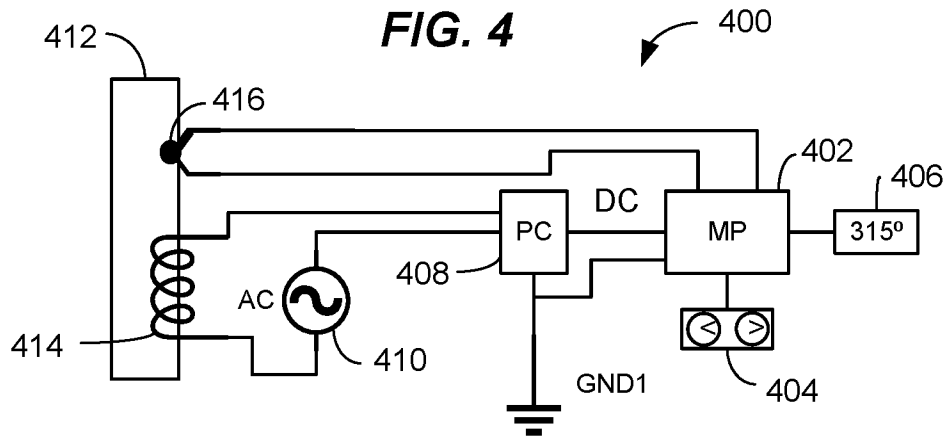


FIG. 5A

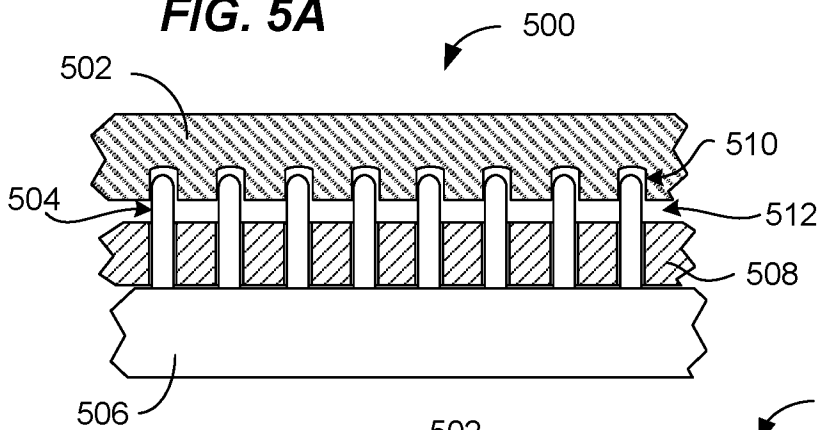


FIG. 5B

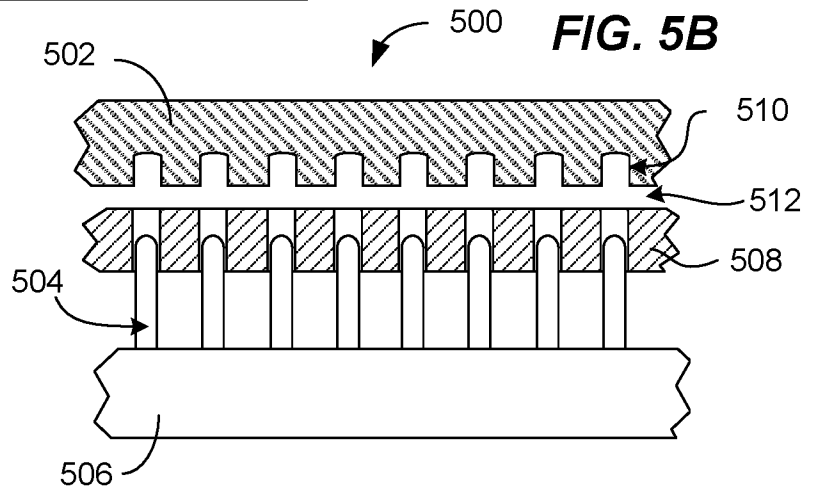
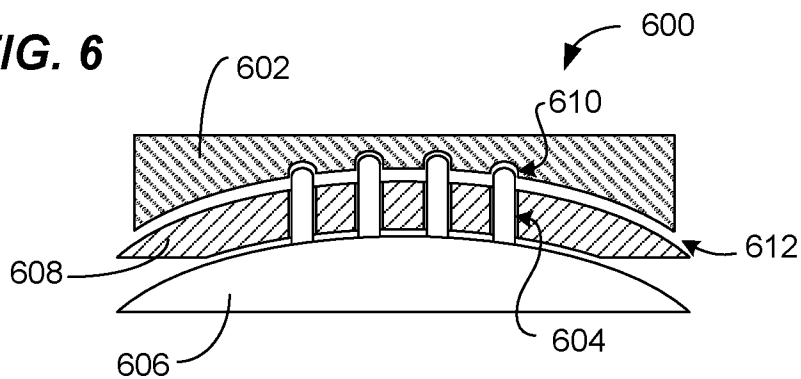


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2018/048620

A. CLASSIFICATION OF SUBJECT MATTER <i>A45D 7/02 (2006.01)</i> <i>A45D 1/08 (2006.01)</i> According to International Patent Classification (IPC) or to both national classification and IPC				
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) A45D 1/00, 1/02, 1/04, 1/06, 1/08, 1/18, 1/28, 7/00, 7/02 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PatSearch (RUPTO internal), Esp@cenet, PAJ, USPTO, Information Retrieval System of FIPS				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
Y	US 2004/0003824 A1 (MASOOD HABIBI) 08.01.2004, abstract, fig. 1	1-20		
Y	CN 104203036 A (CHAMBON VINCENT et al.) 10.12.2014, abstract, paragraphs [0005], [0007], [0010], [0017], [0018], [0019], [0031], [0035], [0038], [0042], [0046] - [0057], [0066], fig. 1, 2, 5,7,17,18,19,31	1-20		
Y	US 6119702 A (MASOOD HABIBI) 19.09.2000, abstract, fig. 1, col. 2, last paragraph, col. 3, lines 1-4	8-11		
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Date of the actual completion of the international search 06 December 2018 (06.12.2018)		Date of mailing of the international search report 20 December 2018 (20.12.2018)		
Name and mailing address of the ISA/RU: Federal Institute of Industrial Property, Berezhkovskaya nab., 30-1, Moscow, G-59, GSP-3, Russia, 125993 Facsimile No: (8-495) 531-63-18, (8-499) 243-33-37		Authorized officer I. Semochkina Telephone No. (495)531-64-81		