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Whitesell et al.

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(54) **SYSTEM FOR CALIBRATING A STATIONARY IMAGE CAPTURE MODULE OF AN OPTICAL SCANNER**

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H04N 1/00 (2006.01)

(52) **U.S. Cl.**
CPC ***H04N 1/00087*** (2013.01); ***H04N 1/00018*** (2013.01)

(58) **Field of Classification Search**
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USPC 358/3.32, 504, 518, 408, 406; 399/343, 399/350, 345
See application file for complete search history.

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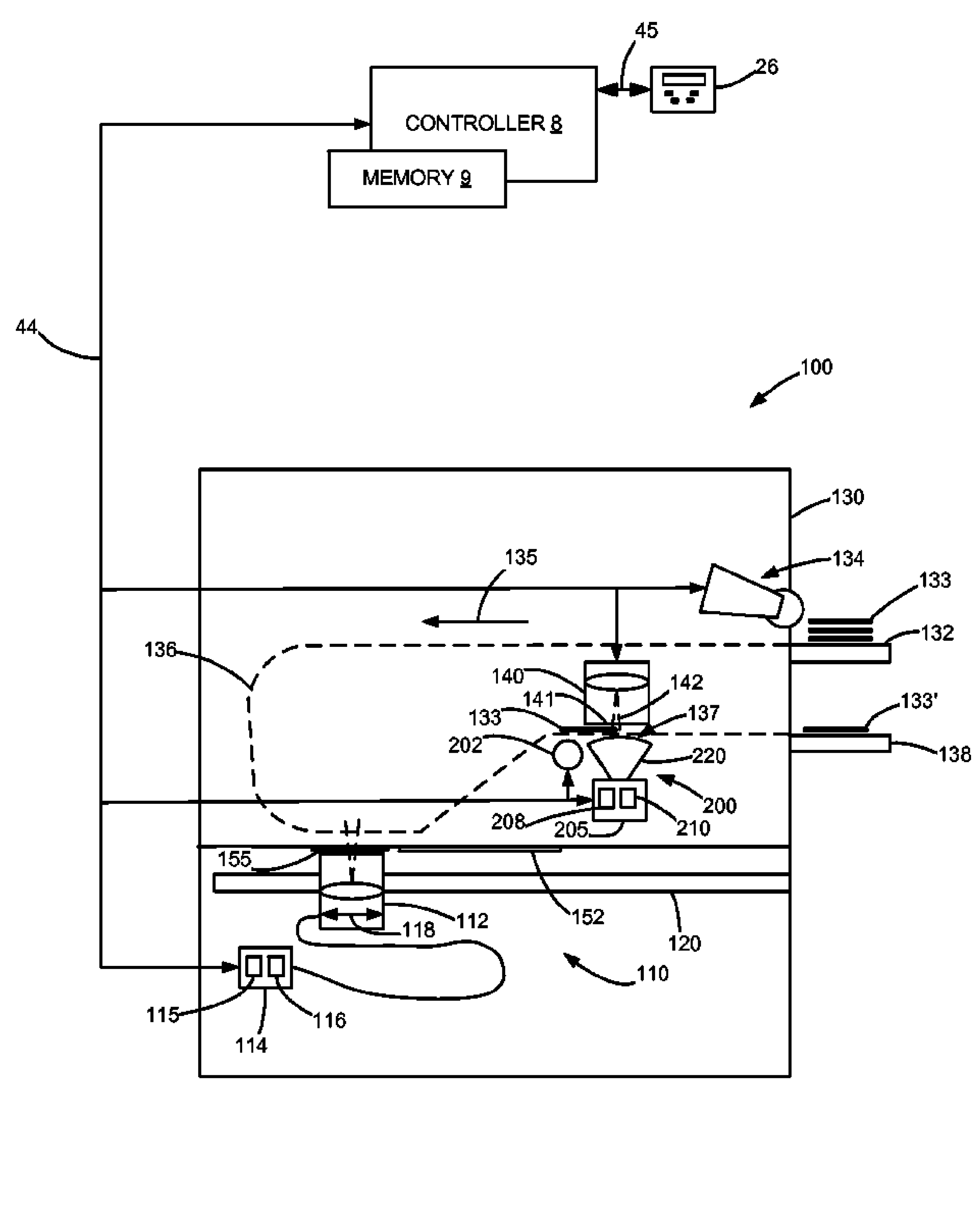
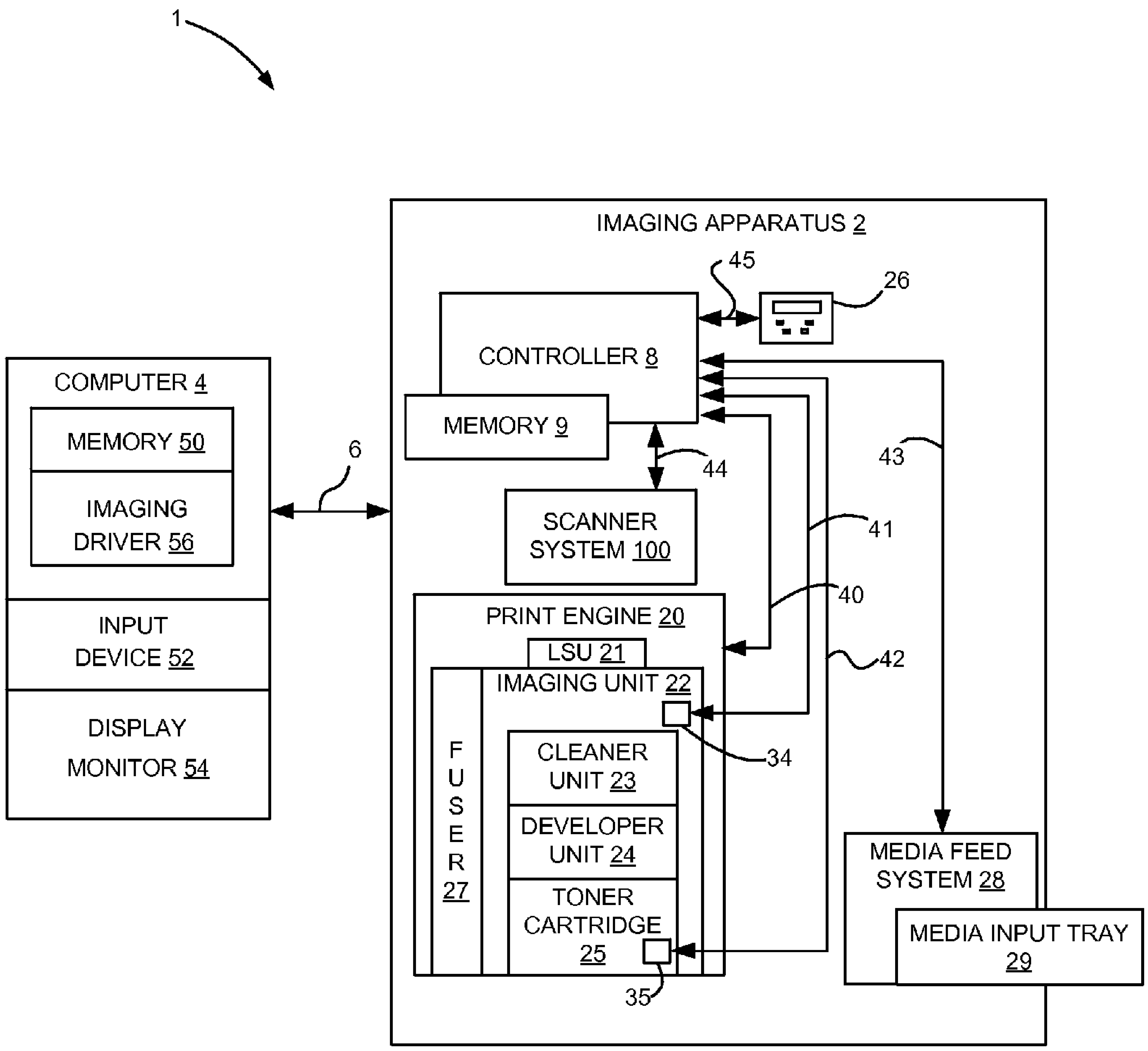
(74) *Attorney, Agent, or Firm* — John Victor Pezdek

(57) **ABSTRACT**

A system for calibrating a scan module of an automatic document feed (ADF) scanner. The system includes a rotatable frame disposed on a position opposite to an imaging surface of the ADF scanner. An image backer and a calibration surface portion formed along longitudinal portions of the frame extend substantially parallel to the imaging surface. The image backer and calibration surface portion have top surfaces of different reflectivity that respectively does not contact and contacts the imaging surface when the frame is rotated to position the image backer and the calibration surface portion in a field of view of the scan module. A drive mechanism coupled to the frame is controlled by a controller to rotate the frame and selectively position within the field of view of the image capture module the image backer during a scanning operation and the calibration surface portion during a calibration operation.

27 Claims, 10 Drawing Sheets

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IMAGING APPARATUS 2
45
26
CONTROLLER 8
MEMORY 9
44
43
COMPUTER 4
MEMORY 50
IMAGING DRIVER 56
6
SCANNER SYSTEM 100
41
INPUT DEVICE 52
PRINT ENGINE 20
40
LSU 21
IMAGING UNIT 22
42
DISPLAY MONITOR 54
FUSER 27
CLEANER UNIT 23
34
DEVELOPER UNIT 24
MEDIA FEED SYSTEM 28
TONER CARTRIDGE 25
MEDIA INPUT TRAY 29
35

Figure 1

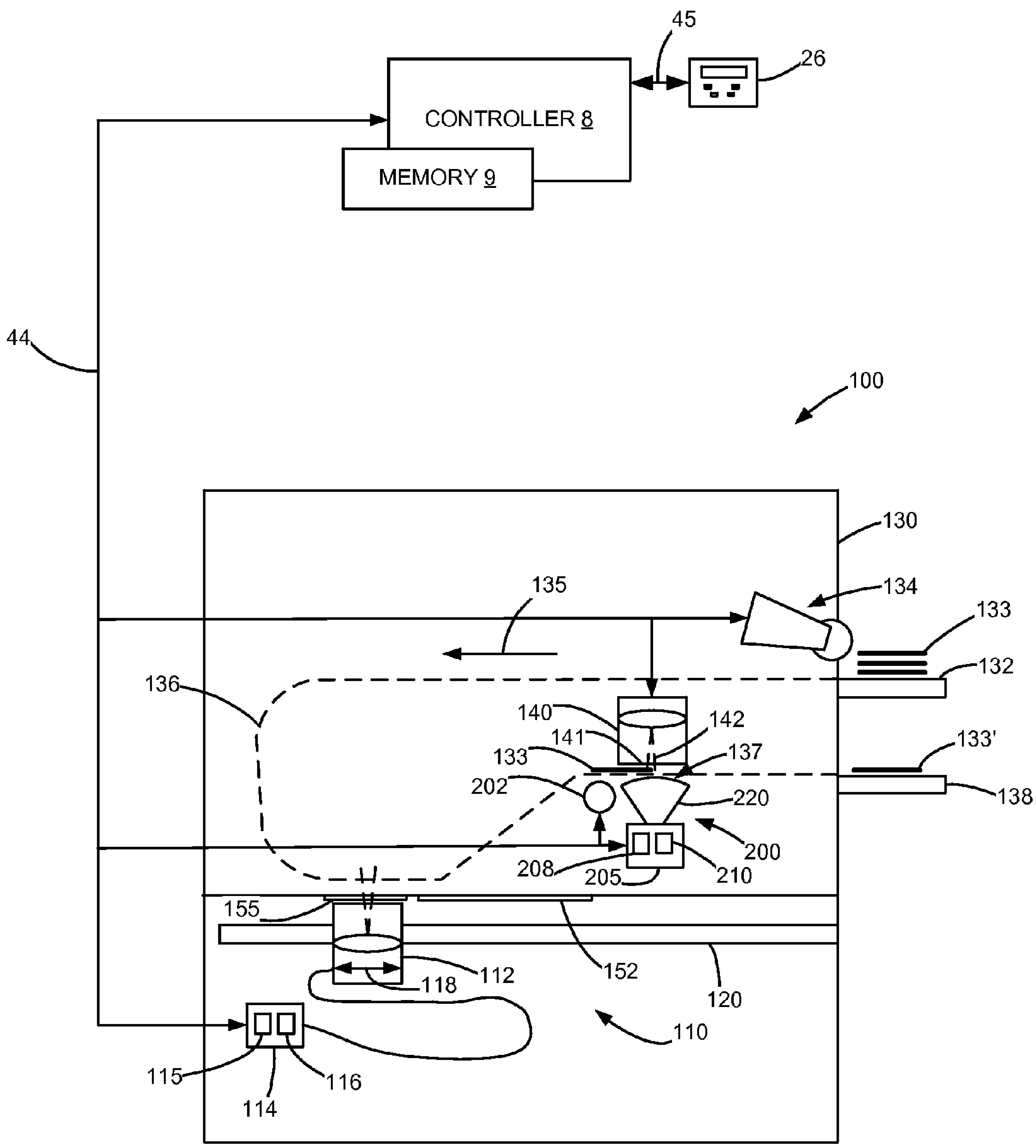

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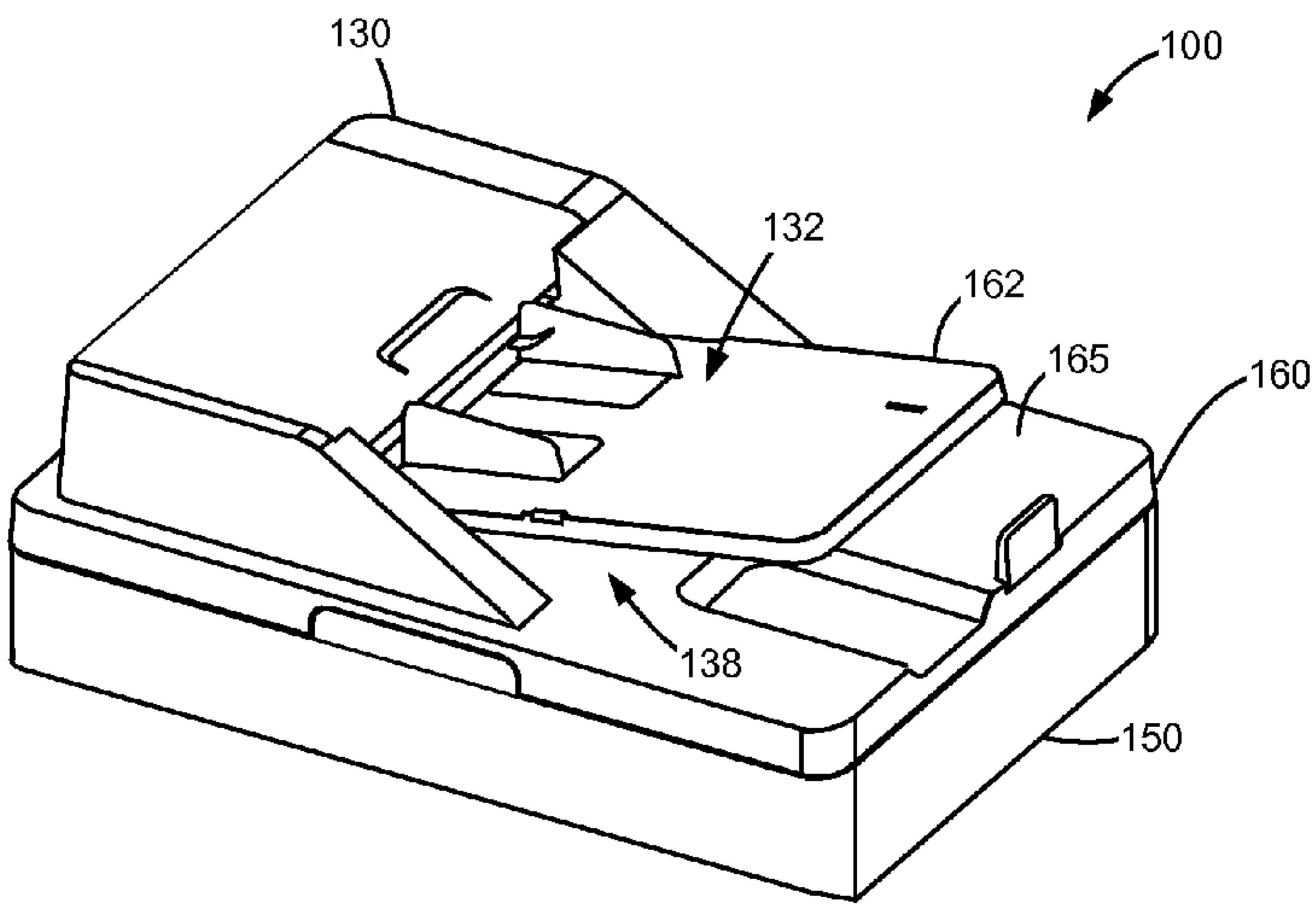
Figure 2



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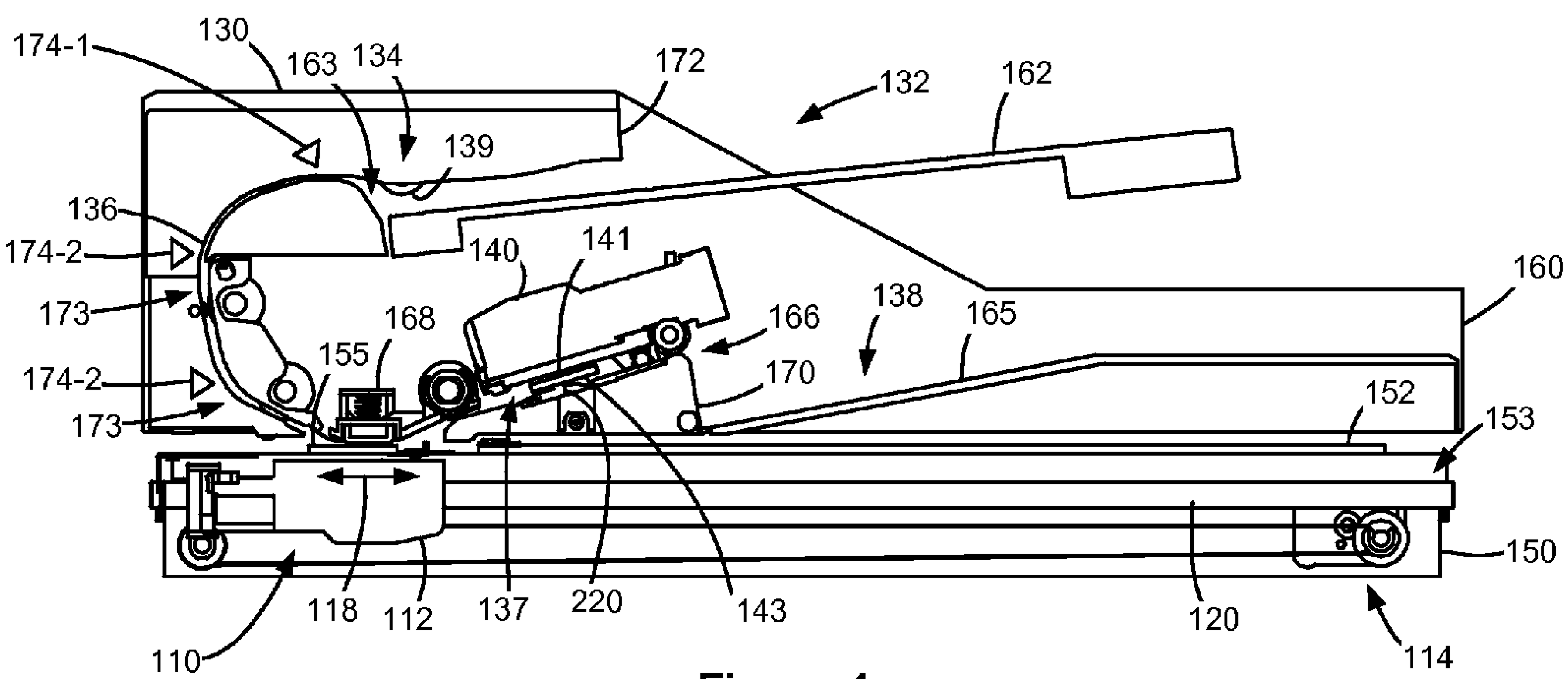

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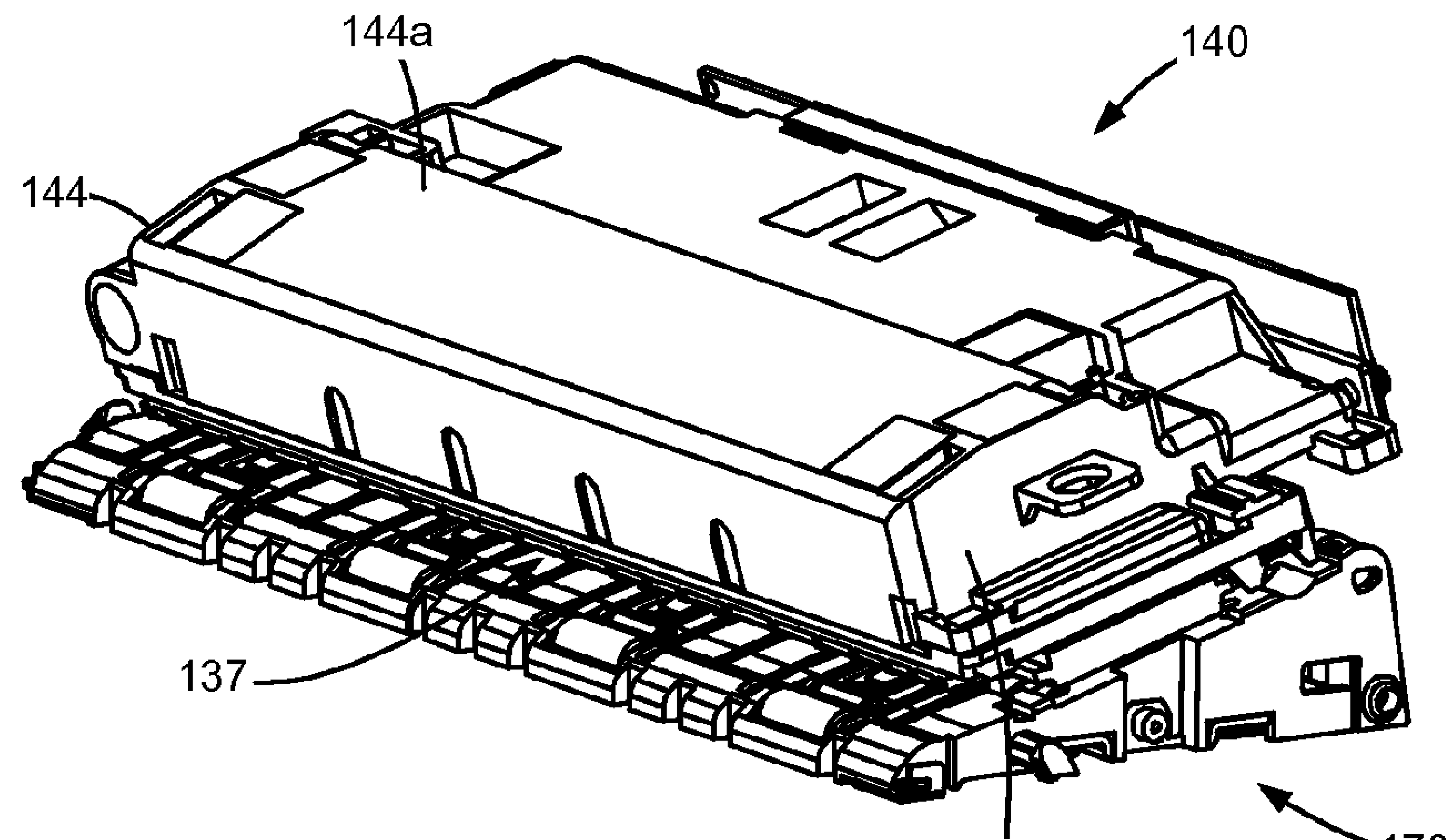

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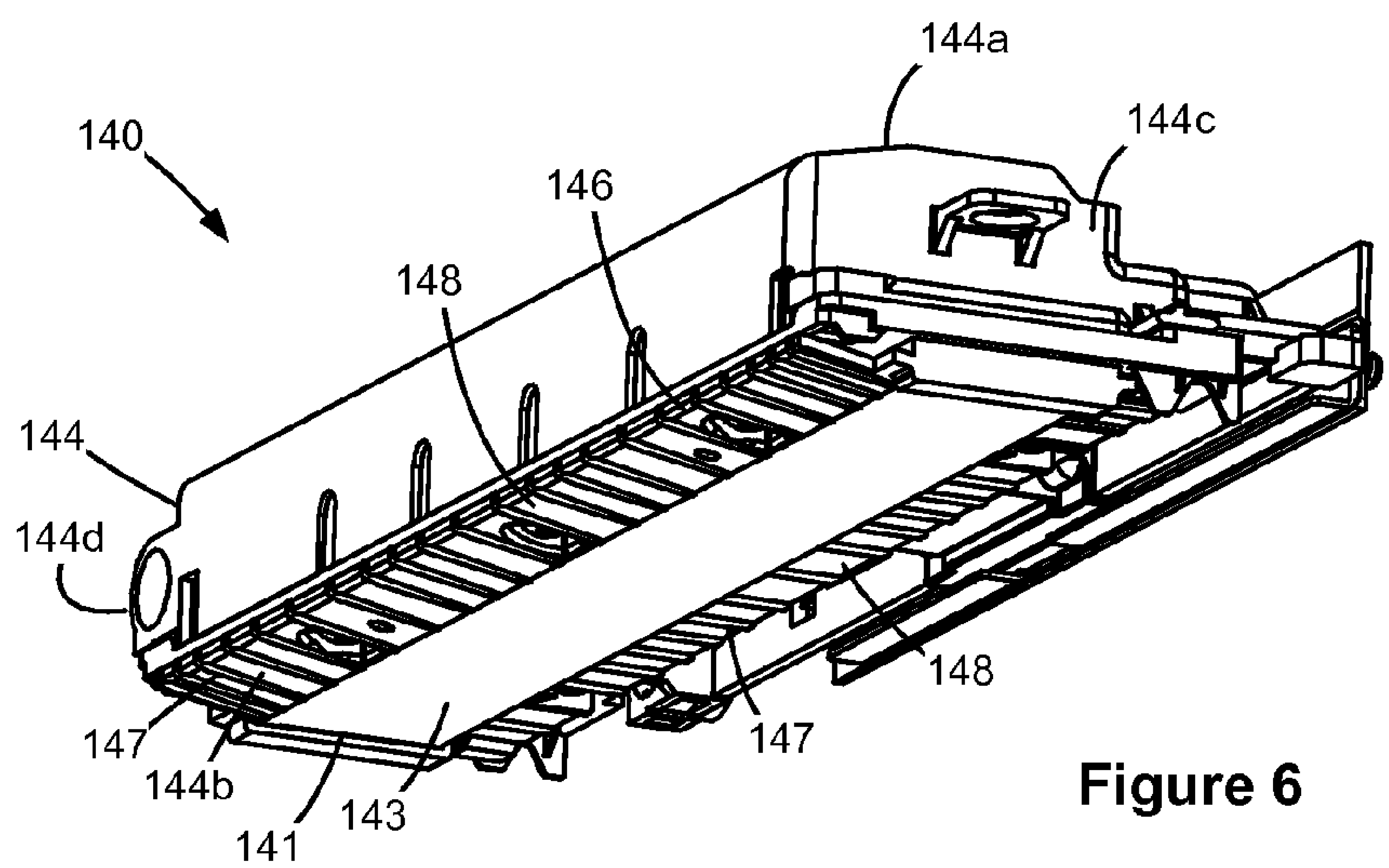

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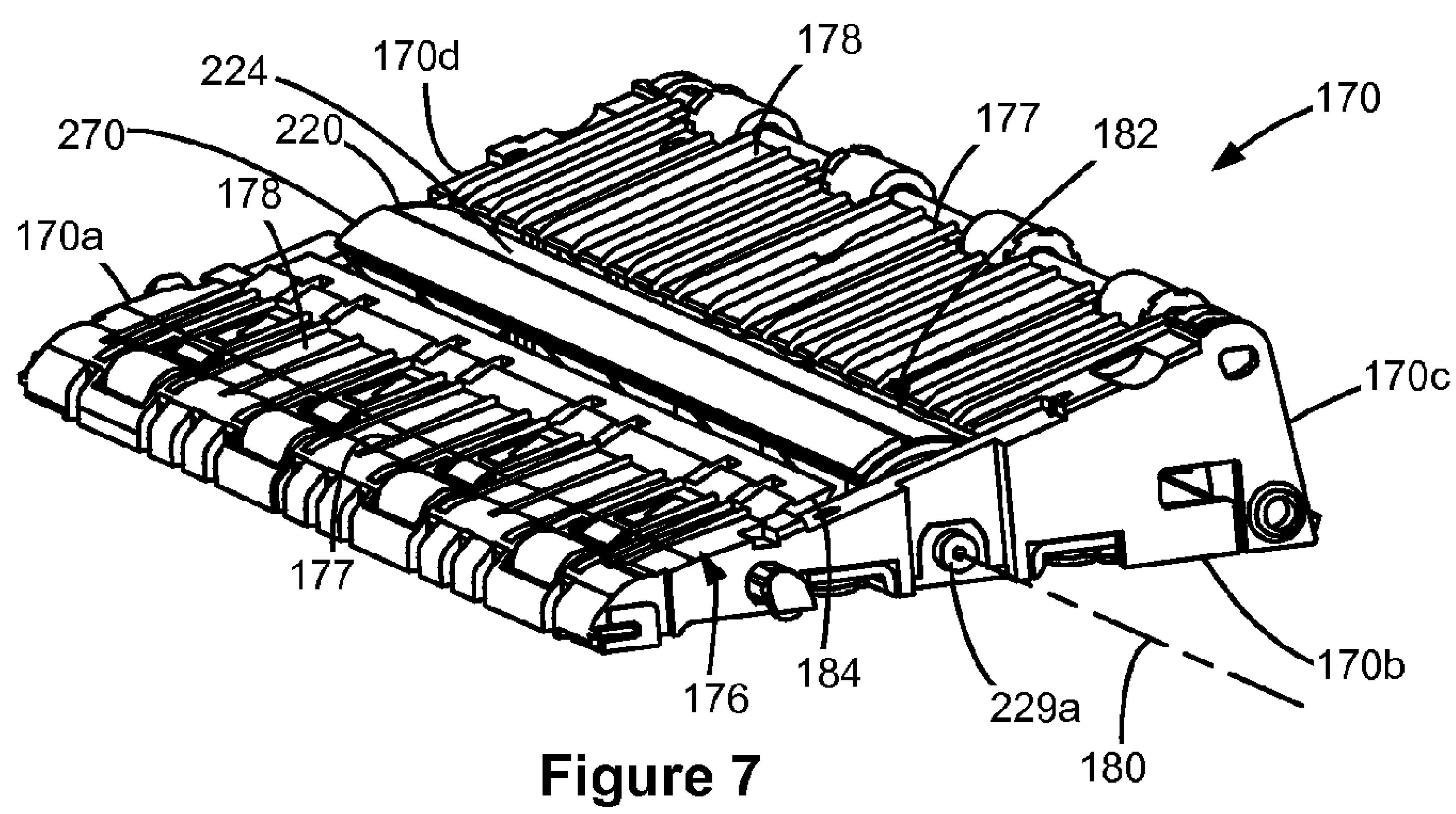

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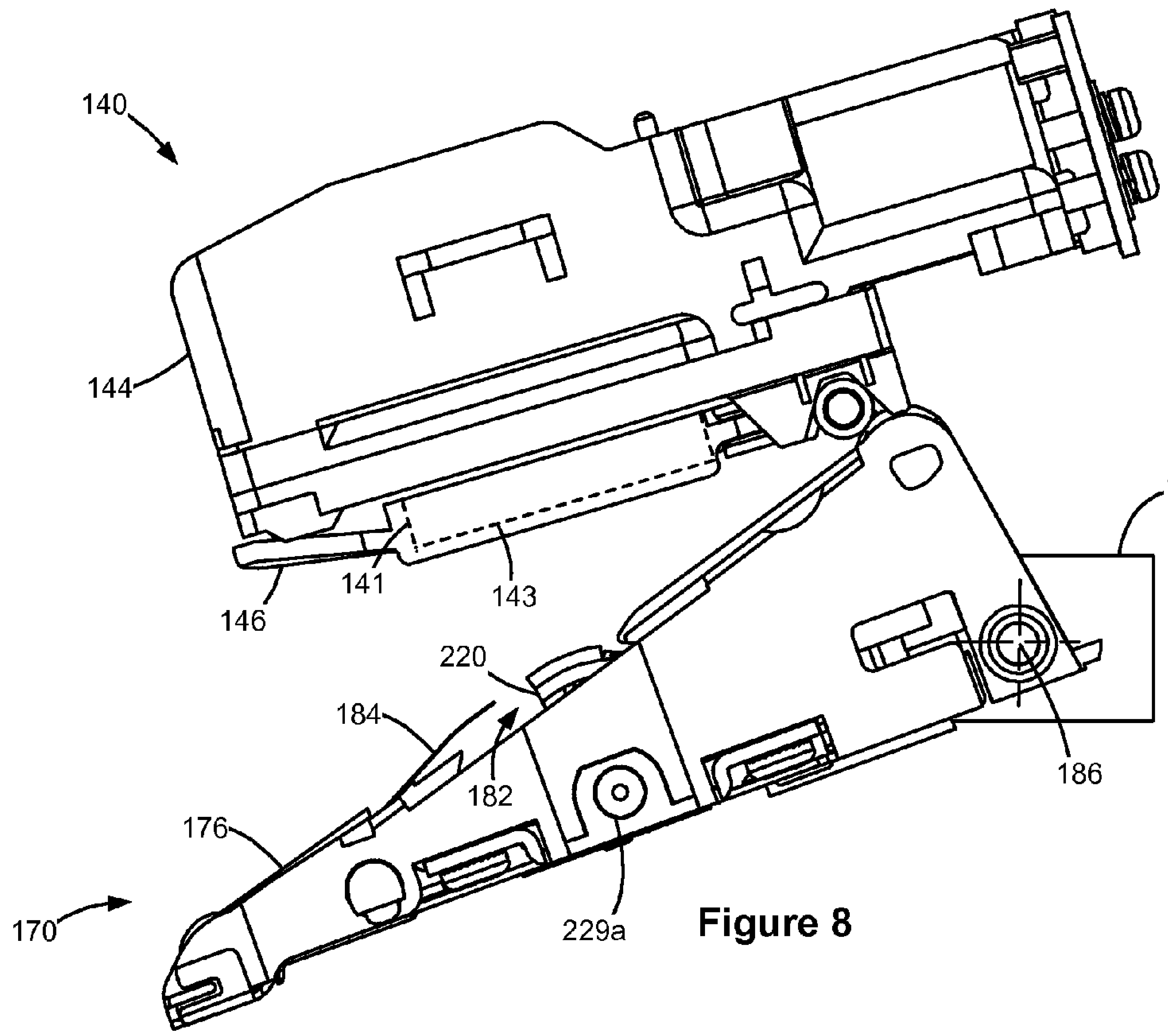

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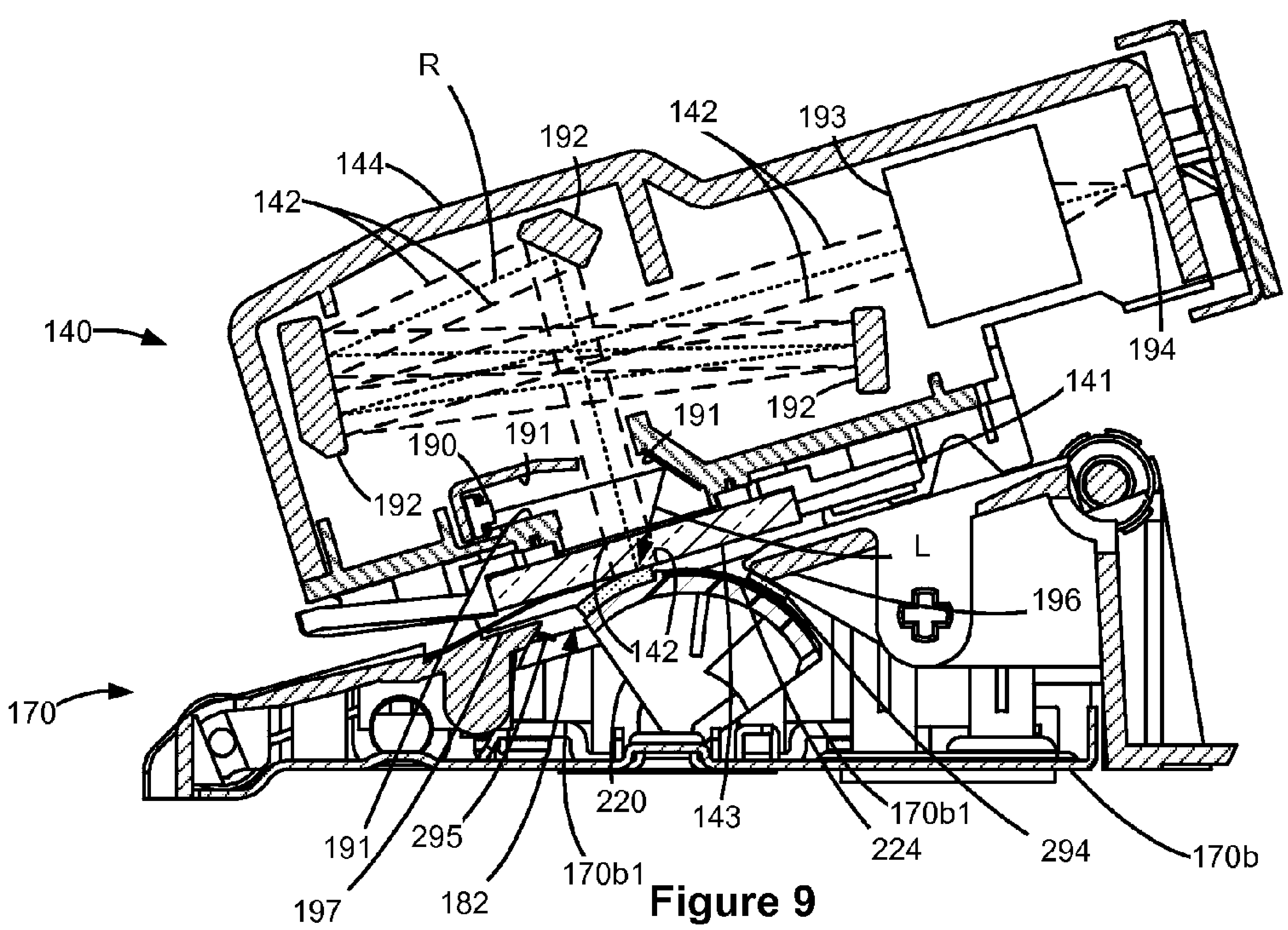

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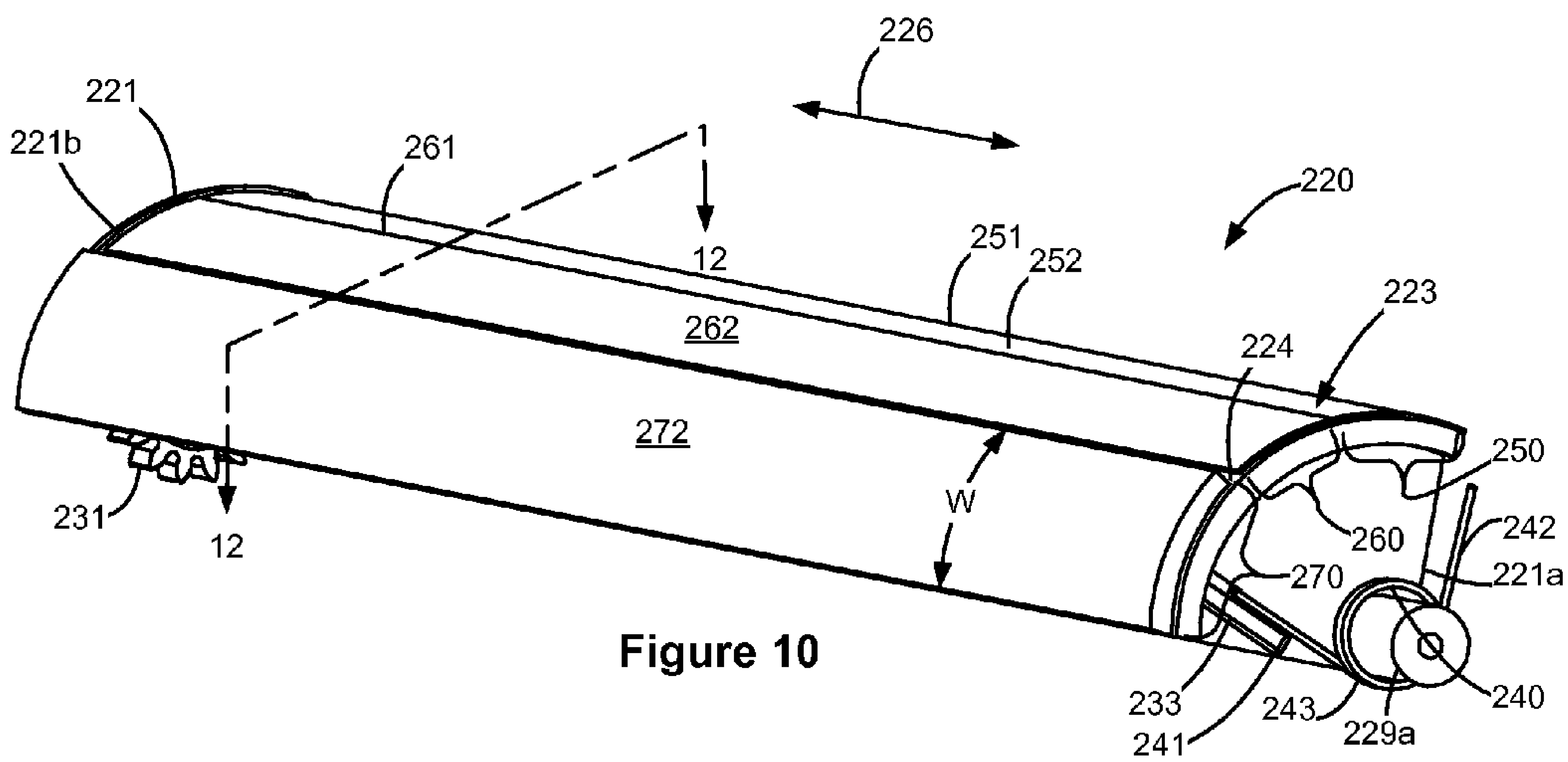
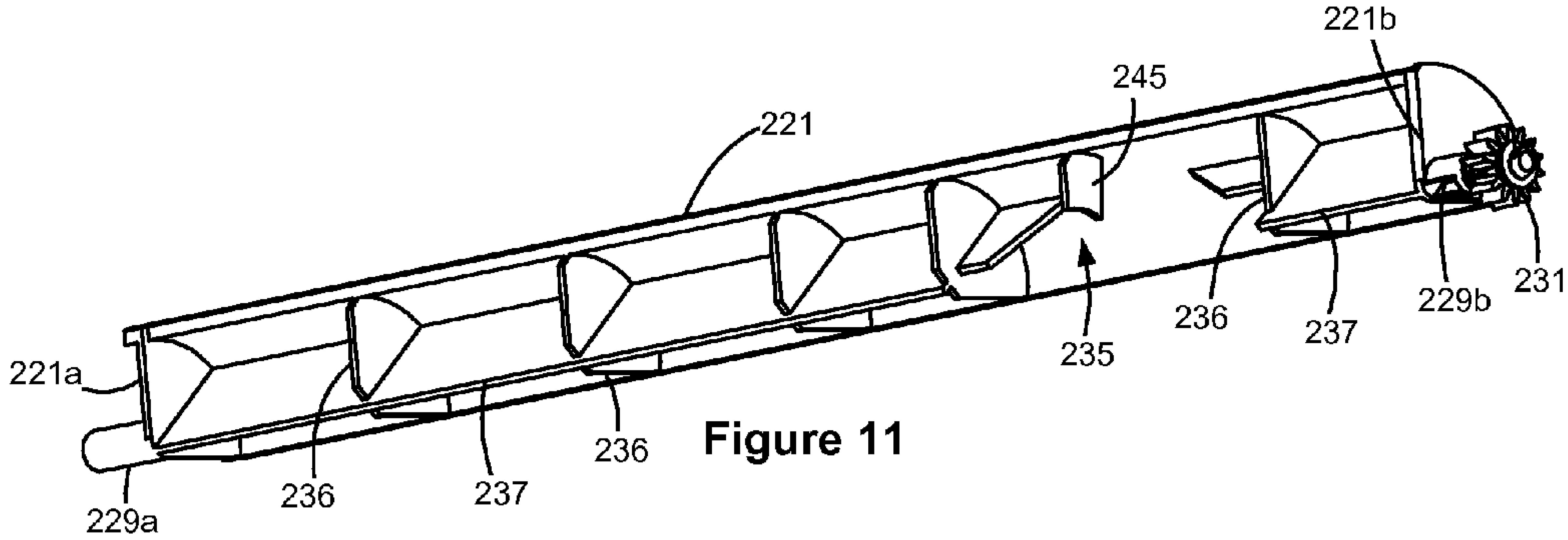


Figure 10



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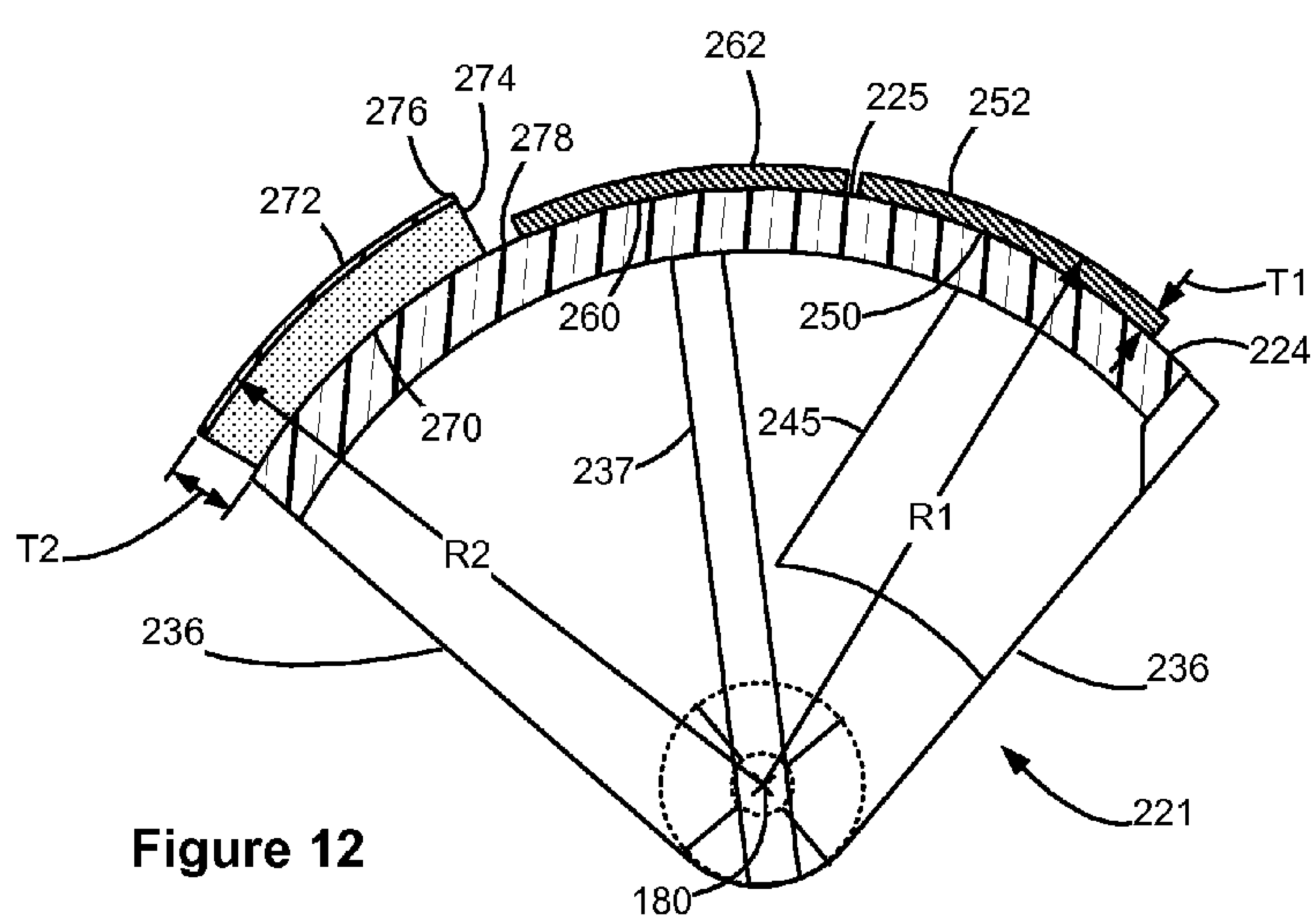

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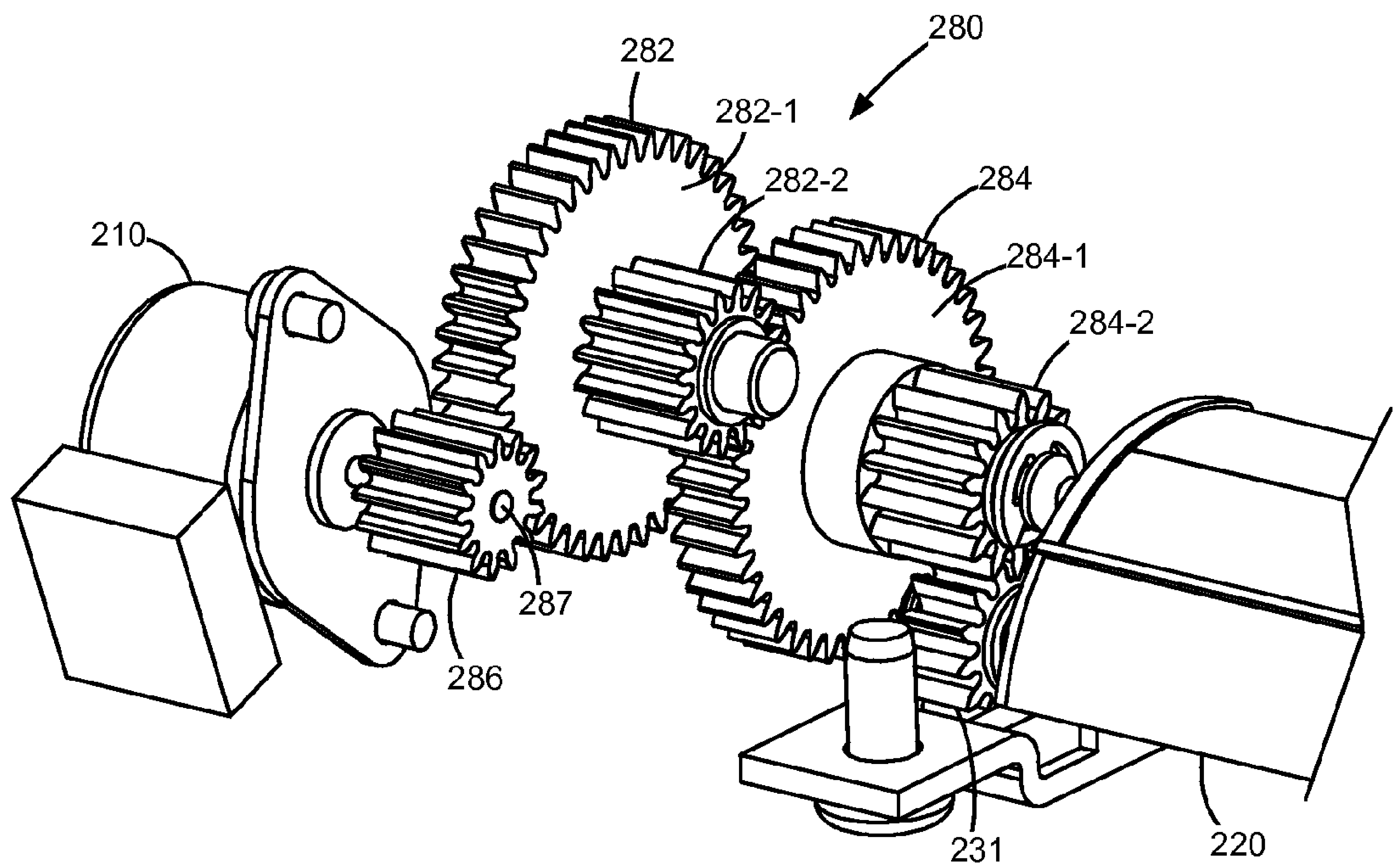

Figure 13

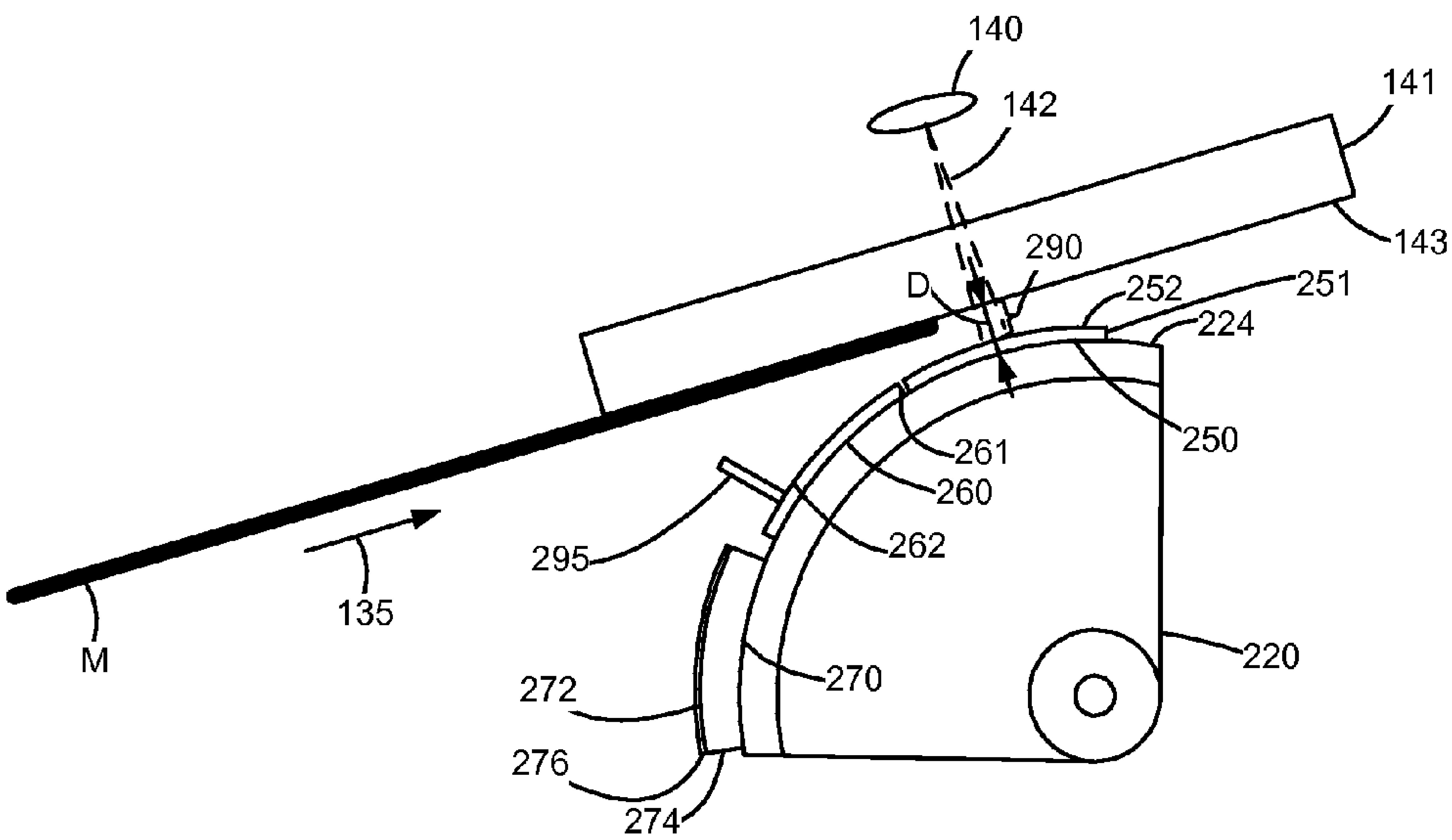

Figure 14A

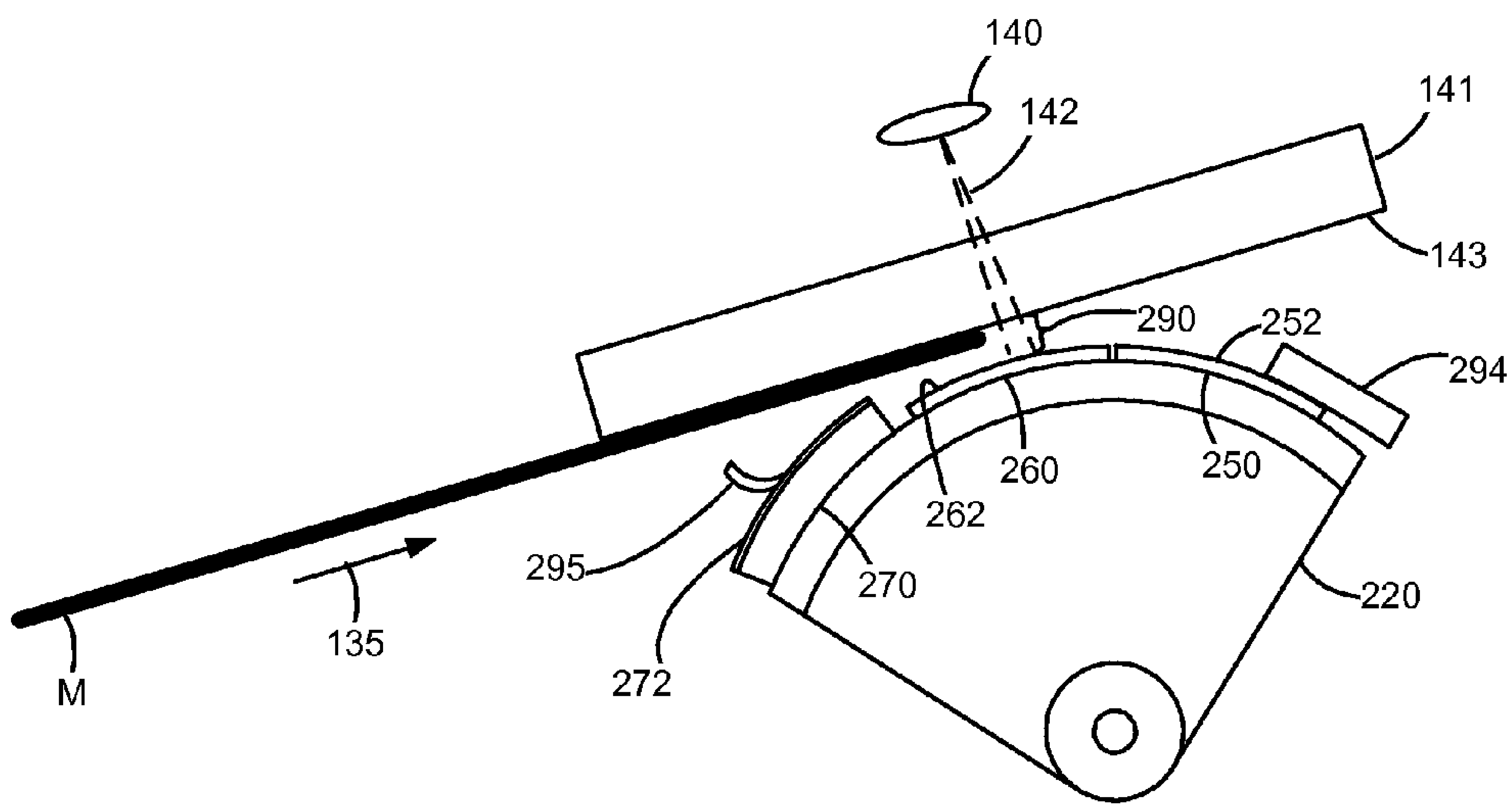

Figure 14B

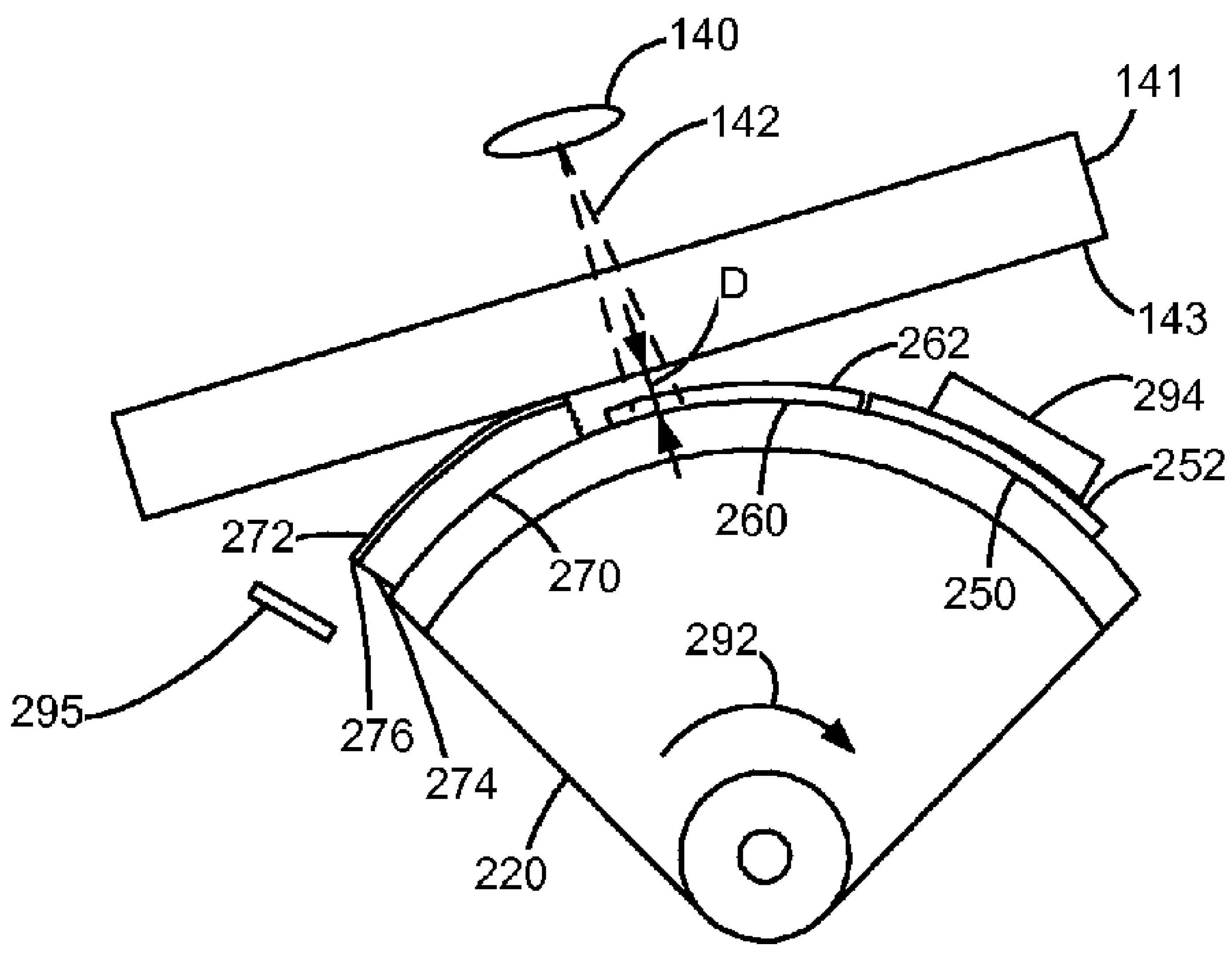

Figure 14C

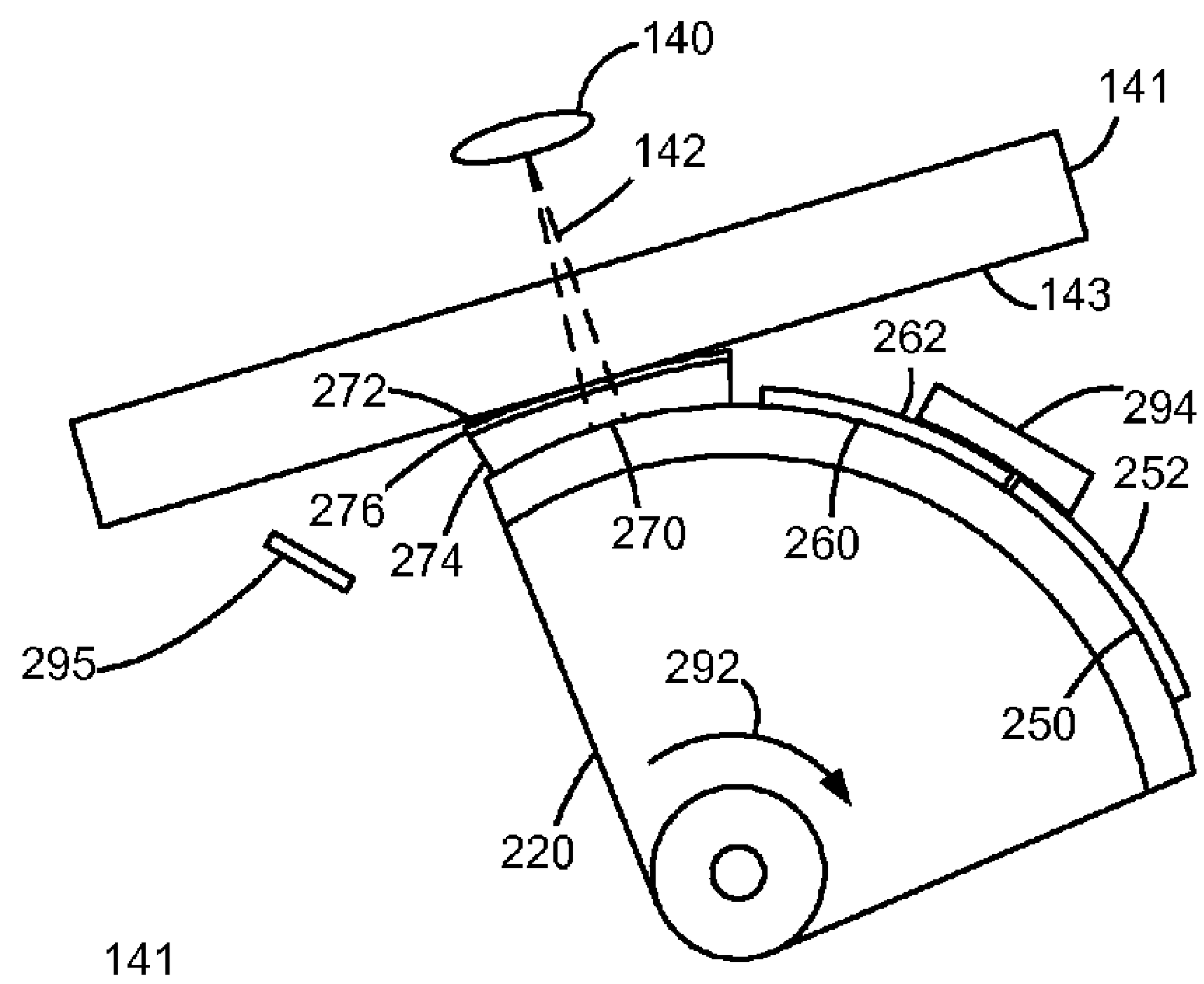

Figure 14D

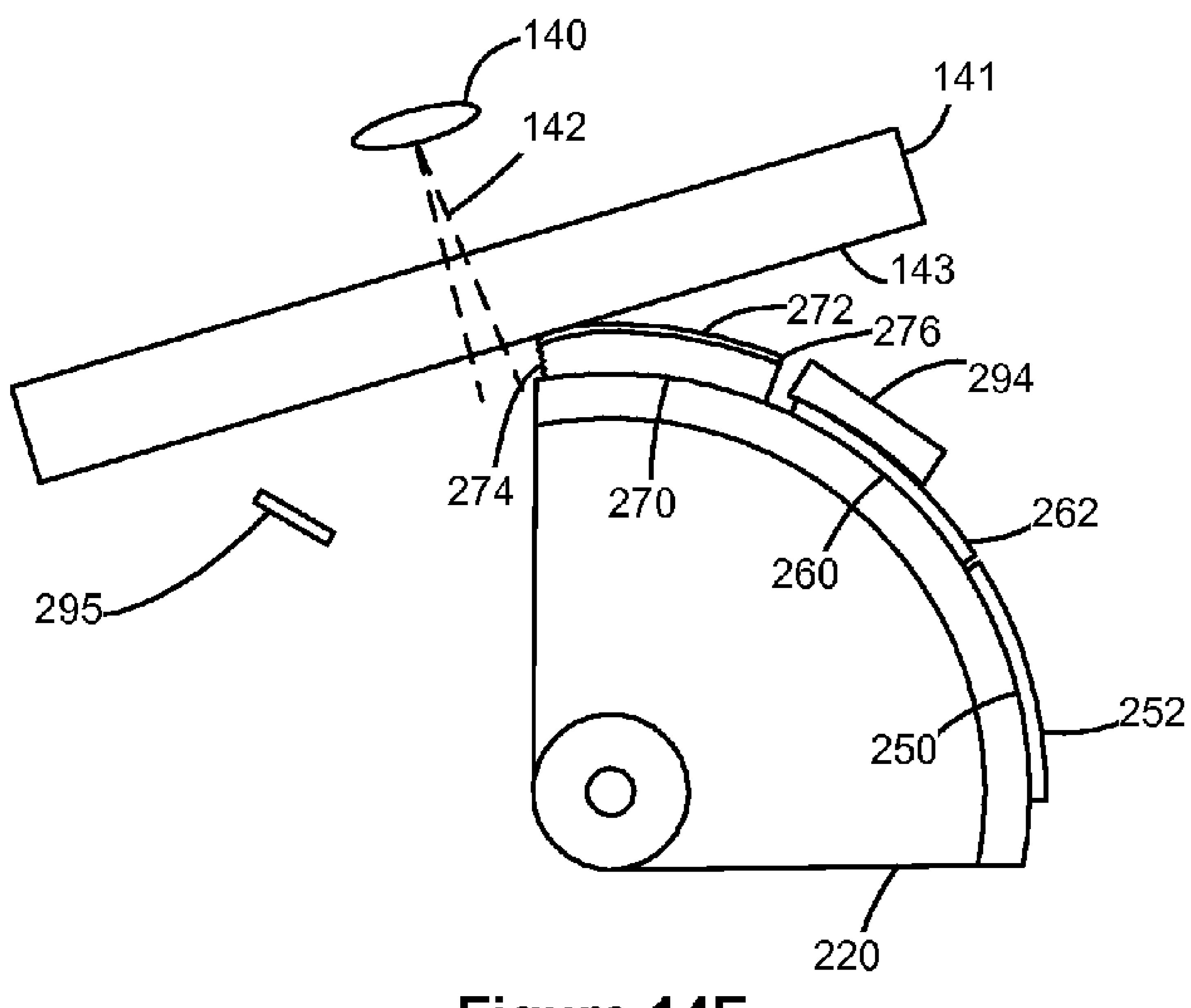

Figure 14E

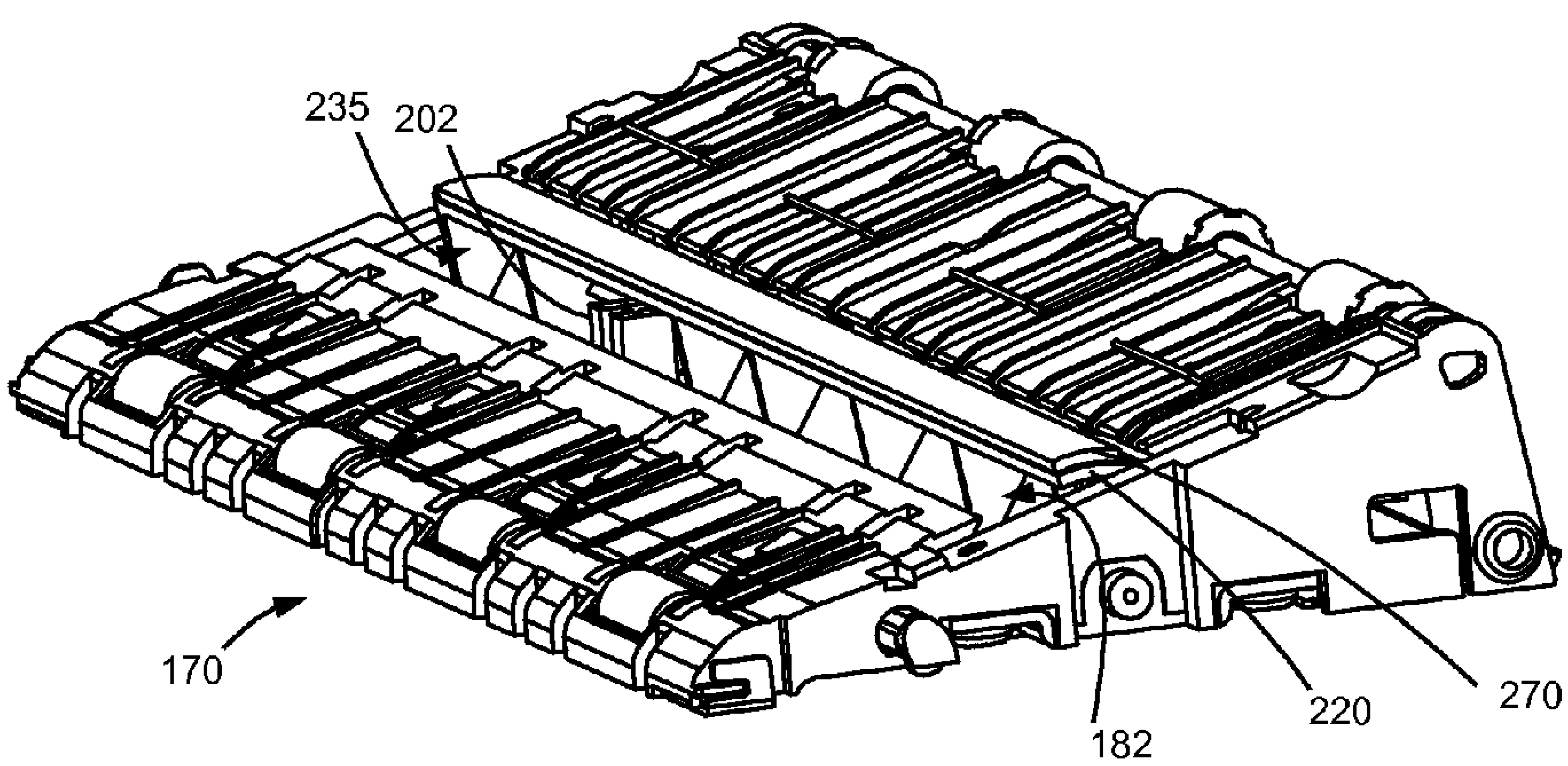

Figure 15

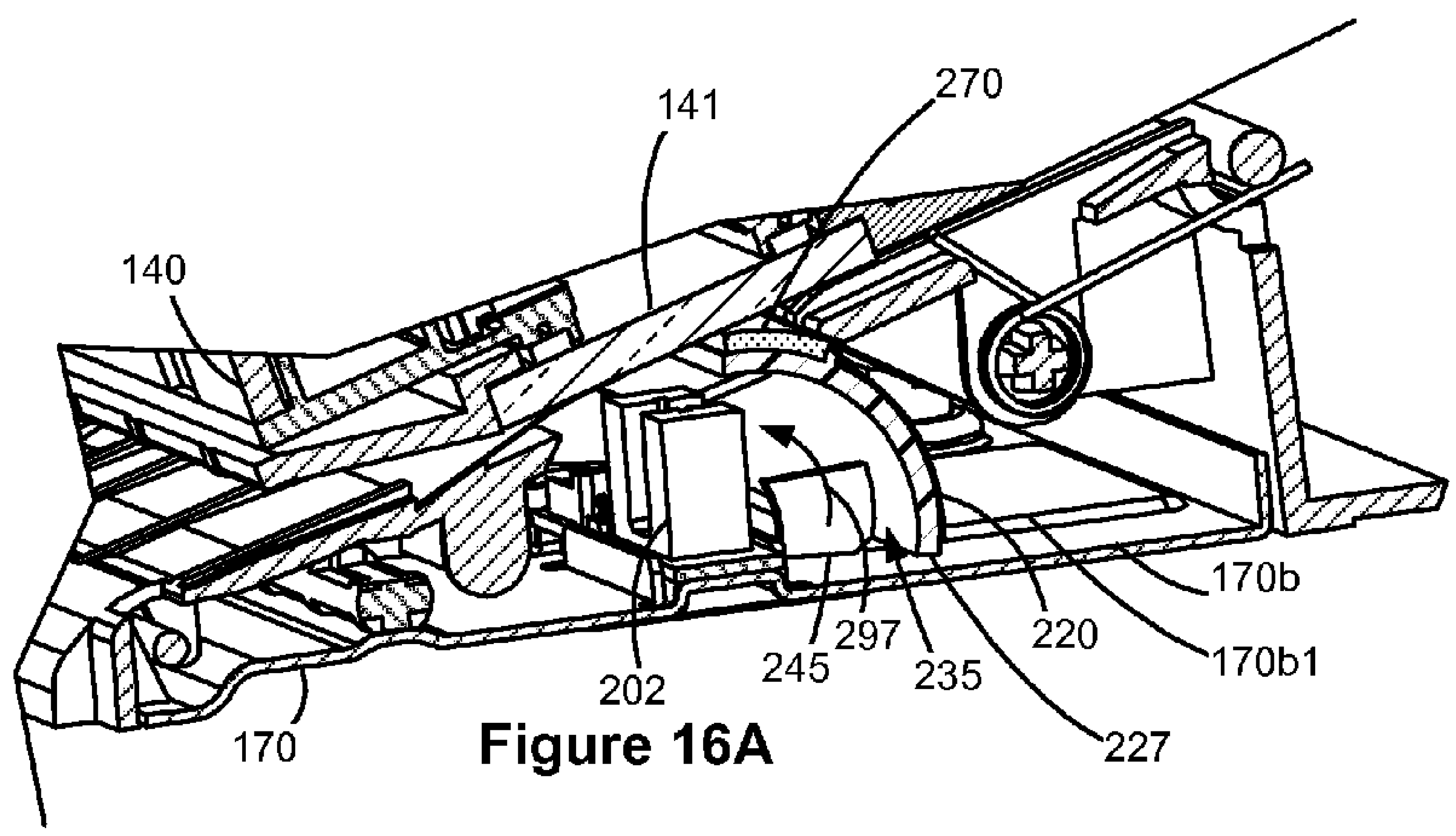

Figure 16A

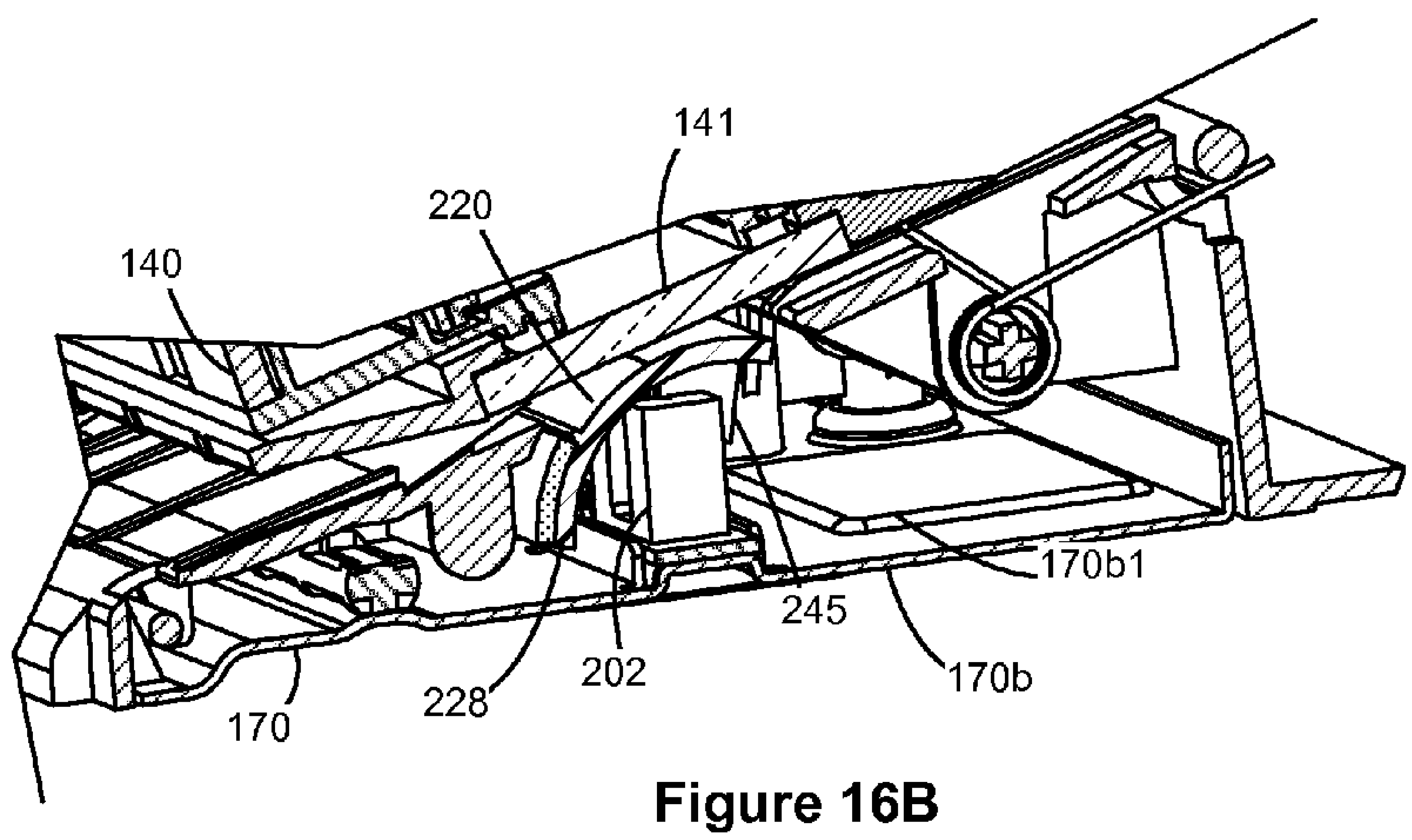

Figure 16B

SYSTEM FOR CALIBRATING A STATIONARY IMAGE CAPTURE MODULE OF AN OPTICAL SCANNER

CROSS REFERENCES TO RELATED APPLICATIONS

None.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

None.

REFERENCE TO SEQUENTIAL LISTING, ETC.

None.

BACKGROUND

1. Field of the Disclosure

The present disclosure relates generally to a duplexing optical scanner having an automatic document feeder (ADF), and, in particular, to a system for calibrating a stationary image capture module in the ADF.

2. Description of the Related Art

An imaging apparatus, such as a copier, scanner, or a multifunction printing device may include a scanning mechanism that operates in an ADF mode and/or a manual mode. In the manual mode, a media sheet is placed on a flatbed for scanning while in the ADF mode, media sheets are sequentially fed for scanning. In some scanning mechanisms, a duplex automatic document feeder (DADF) is employed whereby two scan modules scan both sides of a media sheet as the media sheet is fed in the ADF.

For a DADF to properly scan images, the two scan modules need to be calibrated. Typically, one of these scanning modules is located in a flatbed scanner and scans one side of a media sheet, and the other is a stationary scanner located inside of the DADF and scans the opposite side of the media sheet. A calibration target used for calibrating the scan module within the flatbed scanner is disposed therein such that contamination of the calibration target with dust is prevented or at least reduced. During calibration a scan is made of white calibration target image and typically has a green hue because the green channel on the scan module, such as a CCD scan module, has the highest sensitivity. Also the light source, reflectors, mirrors, etc., can all contribute to the colors being out of balance resulting in white not appearing to be white. In such a situation the output signals of the three uncalibrated channels, red, blue and green with the CCD scan module looking at a white calibration target would be two or more distinct bands. Calibration will adjust the three color channels with the analog front end (AFE) gain and offset settings to balance the three colors and make the target appear white. The AFE gain setting acts as a multiplier on the signal while the AFE offset acts as an addition or subtraction to move the signal up or down. A dark calibration is also done where the light source is turned off to provide a black target. Largely because of thermal drift, the light source and electronics aging, this calibration is checked and updated every so often. After calibration and adjustment of the AFE gain and offset, the output signals of the three color channels will substantially overlap one another.

Another part of scan module calibration is called shading. While the AFE gain and offset settings act on the entire color channel, shading will act on individual pixels. Shading will take each pixel and adjust it to a target. The ideal end result would be a perfectly flat signal output. There are several phenomena shading attempts to compensate for: 1) in the same CCD color channel, there will be a pixel to pixel variation in light sensitivity; 2) the edges of a scan are darker due to the vignetting effect of the lens; 3) any contamination in the optical path can partially block the light from reaching a pixel; and, 4) variation in light output across the scan line. The light source is typically a string of LEDs, and each individual LED's light output will not perfectly match the others. Shading requires a perfect calibration target in order to work properly. Any dust or scratch on the calibration target will cause those pixels to be overcorrected and a vertical band will show up on the scan of a document. In the flatbed scanner this is easy to solve with a moving scan which can be used to filter defects on the calibration target. In the ADF the CCD scan module is stationary, so no compensation is available for any defect on the target.

A calibration target for calibrating the DADF scan module is more susceptible to contaminants because it is typically located along the media path of the ADF, and, thus exposed to contamination such as from media sheets being fed through the media path. For a calibration process to be robust against dust and contamination on the calibration target, a wide area of the calibration target may need to be scanned. Any contamination on the calibration target may then be removed with a filter or averaged with other scan lines of correct data. In the flatbed scanner, this can be accomplished because the flatbed scan module is designed to translate. That is, while the flatbed scanner calibration target is stationary, the flatbed scan module can be moved to scan multiple locations on the flatbed scanner calibration target. In the DADF, however, it is generally difficult to move the DADF scan module to scan multiple locations on the calibration target because of space constraints. In some existing DADFs, stationary calibration targets are used for calibrating the DADF scan module where it scans only one unique location on the calibration target. This calibration process is susceptible to contamination and debris.

Accordingly, there is a need for an improved system for calibrating a scan module in a DADF that is more robust to dust and contamination.

SUMMARY OF THE INVENTION

Disclosed is a calibration member for use with an automatic document feed (ADF) scanner in calibrating a stationary image capture module thereof having an imaging surface against which a surface of a fed media sheet is scanned. The calibration member comprises a body rotatably mountable about a pivot axis in the ADF scanner opposite the imaging surface. The body has an arcuate outer surface and a length substantially spanning a length of the imaging surface. A first background strip of a first thickness is disposed on and extends along a first longitudinal portion of the outer surface of the body and has a top surface having a first reflectivity. A second background strip is disposed on and extends along a second longitudinal portion of the outer surface of the body. The second background strip has a second thickness that is greater than the first thickness of the first background strip and a top surface that is higher than a top surface of the first background strip and which has a second reflectivity that is different from the first reflectivity. When the calibration member is mounted within the ADF scanner at the position opposite the imaging surface, the top surface of the second background strip wipes the imaging surface when the body is rotated about the pivot axis during positioning of the second background strip within a field of view of the image capture module during a calibration operation thereof.

In another example embodiment, a calibration unit for calibrating a stationary image capture module of an automatic document feed (ADF) scanner includes a frame member positioned to extend substantially parallel to an imaging surface of the image capture module and is rotatable about a pivot axis. The frame member has an outer side that is rotatably moveable across and adjacent to the imaging surface upon rotating the frame member about the pivot axis. A compliant layer is attached to and extends along a longitudinal portion of the outer side of the frame member. A calibration strip extends along the longitudinal portion of the outer side of the frame and is attached over the compliant layer and has a top surface having a first reflectivity. The compliant layer and the calibration strip have a stack thickness that is greater than a closest distance between the imaging surface and the outer side of the frame member such that a top surface of the calibration strip wipes across the imaging surface when the frame member is rotated to move the calibration strip in a field of view of the image capture module during a calibration process.

In another example embodiment, a system for calibrating the image capture module includes a rotatable frame disposed on a position opposite to the imaging surface, an image backer formed on a first longitudinal portion of the frame, and a calibration surface portion formed on a second longitudinal portion of the frame. The image backer and calibration surface portion are substantially parallel to the imaging surface. The image backer has a top surface having a first reflectivity and that does not contact the imaging surface when the frame is rotated to position the image backer in the field of view of the image capture module. The calibration surface portion has a top surface having a second reflectivity that differs from the first reflectivity and that contacts the imaging surface when the frame is rotated to position the calibration surface portion in the field of view of the image capture module. The system further includes a drive mechanism coupled to the frame for rotating the frame, and a controller in operable communication with the drive mechanism. The controller is configured for controlling the drive mechanism to rotate the frame and selectively position the image backer in the field of view of the image capture module during an image capture operation, and the calibration surface portion in the field of view of the image capture module during calibration of the image capture module.

BRIEF DESCRIPTION OF THE DRAWINGS

The above-mentioned and other features and advantages of this invention, and the manner of attaining them, will become more apparent and the invention will be better understood by reference to the following description of embodiments of the invention taken in conjunction with the accompanying drawings.

FIG. **1** is a diagrammatic depiction of an imaging system according to one example embodiment.

FIG. **2** is a schematic diagram of a scanner system of the imaging system in FIG. **1** according to one example embodiment.

FIG. **3** is a perspective view of the scanner system according to one example embodiment.

FIG. **4** is a front elevation view of the scanner system showing internal components thereof according to one example embodiment.

FIG. **5** is a perspective view of an ADF scan module and a lower guide assembly according to one example embodiment.

FIG. **6** is a perspective view of the ADF scan module showing a bottom thereof.

FIG. **7** is a perspective view of the lower guide assembly including a calibration member according to one example embodiment.

FIG. **8** is a side view of the lower guide assembly in an open position relative to the ADF scan module according to one example embodiment.

FIG. **9** is a sectional view of the ADF scan module and the lower guide assembly according to one example embodiment.

FIG. **10** is a front perspective view of the calibration member according to one example embodiment.

FIG. **11** is a perspective view of the calibration member showing a bottom side thereof according to one example embodiment.

FIG. **12** is a cross-sectional view of the calibration member taken along section line **12-12** in FIG. **10**, according to one example embodiment.

FIG. **13** is a perspective view illustrating the calibration member operatively coupled to a drive motor according to one example embodiment.

FIG. **14**A illustrates a non-calibration position of the calibration member whereby a first image backer is positioned within a field of view of the ADF scan module, according to one example embodiment.

FIG. **14**B illustrates a non-calibration position of the calibration member whereby a second image backer is positioned within the field of view of the ADF scan module, according to one example embodiment.

FIGS. **14**C-**14**E illustrate various positions of the calibration member contacting an imaging surface of the ADF scan module.

FIG. **15** is a perspective view of the lower guide assembly with the calibration member rotated to expose a position sensor, according to one example embodiment.

FIGS. **16**A-**16**B illustrate the position sensor of FIG. **15** being unblocked and blocked by a flag on an inner side of the calibration member, respectively, according to an example embodiment of the present disclosure.

DETAILED DESCRIPTION

It is to be understood that the present disclosure is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the drawings. The present disclosure is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting. As used herein, the terms "having", "containing", "including", "comprising", and the like are open-ended terms that indicate the presence of stated elements or features, but do not preclude additional elements or features. The articles "a", "an" and "the" are intended to include the plural as well as the singular, unless the context clearly indicates otherwise. The use of "including," "comprising," or "having" and variations thereof herein is meant to encompass the items listed thereafter and equivalents thereof as well as additional items.

Unless limited otherwise, the terms "connected," "coupled," and "mounted," and variations thereof herein are used broadly and encompass direct and indirect connections, couplings, and mountings. In addition, the terms "connected" and "coupled" and variations thereof are not restricted to physical or mechanical connections or couplings. Spatially relative terms such as "top", "bottom", "front", "back", "rear", "side", "under", "below", "lower", "over", "upper", "up", "down", and the like, are used for ease of description to explain the positioning of one element relative to a second element. These terms are intended to encompass different orientations of the device in addition to different orientations than those depicted in the figures. Further, terms such as "first", "second", and the like, are also used to describe various elements, regions, sections, etc. and are also not intended to be limiting. Like terms refer to like elements throughout the description.

In addition, it should be understood that embodiments of the present disclosure include both hardware and electronic components or modules that, for purposes of discussion, may be illustrated and described as if the majority of the components were implemented solely in hardware. However, one of ordinary skill in the art, and based on a reading of this detailed description, would recognize that, in at least one embodiment, the electronic based aspects of the invention may be implemented in software. As such, it should be noted that a plurality of hardware and software-based devices, as well as a plurality of different structural components may be utilized to implement the invention. Furthermore, and as described in subsequent paragraphs, the specific mechanical configurations illustrated in the drawings are intended to exemplify embodiments of the present disclosure and that other alternative mechanical configurations are possible.

As used herein, the term "communication link" is used to generally refer to structure that facilitates electronic communication between multiple components, and may operate using wired or wireless technology. While several communication links are shown, it is understood that a single communication link may serve the same functions as the multiple communication links that are illustrated. "Media process direction" describes the movement of media within the imaging system as is generally meant to be from an input toward an output of the imaging system **1**. The explanations of these terms along with the use of the terms "top", "bottom", "front", "rear", "left", "right", "up", and "down", etc. are made to aid in understanding the spatial relationship of the various components and are not intended to be limiting.

In FIG. **1**, there is shown a diagrammatic depiction of an imaging system **1** embodying the present disclosure. As shown, imaging system **1** includes an imaging apparatus **2** and a computer **4**. Imaging apparatus **2** communicates with computer **4** via a communication link **6**. In the embodiment, imaging apparatus **2** is shown as a multifunction machine that includes a controller **8**, a print engine **20**, a laser scan unit (LSU) **21**, an imaging unit **22**, a developer unit **24**, a toner cartridge **25**, a user interface **26**, a media feed system **28** and a media input tray **29**, and a scanner system **100**. Imaging apparatus **2** may communicate with computer **4** via a standard communication protocol, such as for example, universal serial bus (USB), Ethernet or IEEE 802.xx. A multi-function machine is also sometimes referred to in the art as an all-in-one (AIO) unit. Those skilled in the art will recognize that imaging apparatus **2** may be, for example, an electrophotographic printer/copier including an integrated scanner system **100** or a standalone scanner system **100**.

Controller **8** includes a processor unit and associated memory **9**, and may be implemented as one or more Application Specific Integrated Circuits (ASICs). Memory **9** may be any volatile and/or non-volatile memory such as, for example, random access memory (RAM), read only memory (ROM), flash memory and/or non-volatile RAM (NVRAM). Alternatively, memory **9** may be in the form of a separate electronic memory (e.g., RAM, ROM, and/or NVRAM), a hard drive, a CD or DVD drive, or any memory device convenient for use with controller **8**. Controller **8** may be, for example, a combined printer and scanner controller.

In the present embodiment, controller **8** communicates with print engine **20** via a communication link **40**. Controller **8** communicates with imaging unit **22** and processing circuitry **34** therein via a communication link **41**. Controller **8** communicates with toner cartridge **25** and processing circuitry **35** therein via a communication link **42**. Controller **8** communicates with media feed system **28** via a communication link **43**. Controller **8** communicates with scanner system **100** via a communication link **44**. User interface **26** is communicatively coupled to controller **8** via a communication link **45**. Processing circuits **34**, **35** may provide authentication functions, safety and operational interlocks, operating parameters and usage information related to imaging unit **22** and toner cartridge **25**, respectively. Controller **8** serves to process print data and to operate print engine **20** during printing, as well as to operate scanner system **100** and process data obtained via scanner system **100**.

Computer **4**, which may be optional, may be, for example, a personal computer, electronic tablet, smartphone or other hand-held electronic device, including memory **50**, such as volatile and/or non-volatile memory, an input device **52**, such as a keyboard or keypad, and a display monitor **54**. Computer **4** further includes a processor, input/output (I/O) interfaces, and may include at least one mass data storage device, such as a hard drive, a CD-ROM and/or a DVD unit (not shown).

Computer **4** includes in its memory a software program including program instructions that function as an imaging driver **56**, e.g., printer/scanner driver software, for imaging apparatus **2**. Imaging driver **56** is in communication with controller **8** of imaging apparatus **2** via communication link **6**. Imaging driver **56** facilitates communication between imaging apparatus **2** and computer **4**. One aspect of imaging driver **56** may be, for example, to provide formatted print data to imaging apparatus **2**, and more particularly, to print engine **20**, to print an image. Another aspect of imaging driver **56** may be, for example, to facilitate collection of scanned data.

In some circumstances, it may be desirable to operate imaging apparatus **2** in a standalone mode. In the standalone mode, imaging apparatus **2** is capable of functioning without computer **4**. Accordingly, all or a portion of imaging driver **56**, or a similar driver, may be located in controller **8** and or memory **9** of imaging apparatus **2** so as to accommodate printing and scanning functionality when operating in the standalone mode.

Print engine **20** may include laser scan unit (LSU) **21**, imaging unit **22**, and a fuser **27**, all mounted within imaging apparatus **2**. The imaging unit **22** further includes a cleaner unit **23** housing a waste toner removal system and a photoconductive drum and developer unit **24** which is removably mounted within print engine **20** of imaging apparatus **2**. In one embodiment, the cleaner unit **23** and developer unit **24** are assembled together and installed onto a frame of the imaging unit **22**. The toner cartridge **25** is then installed on or in proximity with the frame in a mating relation with the developer unit **24**.

Laser scan unit **21** creates a latent image on the photoconductive drum in the cleaner unit **23**. The developer unit **24** has a toner chamber or sump containing toner which is transferred to the latent image on the photoconductive drum to create a toned image. The toned image is subsequently transferred to a media sheet received in the imaging unit **22** via media feed system **28** from media input tray **29**. Toner remnants are removed from the photoconductive drum by the waste toner removal system. The toner image is bonded to the media sheet in the fuser **27** and the media sheet is sent to an output location or to one or more finishing options such as a duplexer, a stapler or a hole punch (not shown).

Referring to FIG. **2**, there is illustrated a schematic representation of scanner system **100**. Scanner system **100** includes a flatbed scanner **110** and an automatic document feeder (ADF) **130**. Flatbed scanner **110** includes a flatbed image capture or scan module **112** operatively coupled to a drive mechanism **114**. Drive mechanism **114** includes one or more gear and/or belt mechanisms **115** and a flatbed drive motor **116**. Drive mechanism **114** is in operable communication with controller **8** via communication link **44** and is used to translate flatbed scan module **112** bi-directionally, as indicated by an arrow **118**, along a pair of spaced parallel rails **120**. ADF **130** includes an input media area **132**, a pick mechanism **134**, a media path **136**, an ADF stationary image capture module or scan module **140**, and an output media area **138**. Image capture module **140** is termed "stationary" in that during scanning the image capture module **140** does not move and is not translateable like image capture module **112**. Original media sheets **133** to be scanned are placed in input media area **132**. Pick mechanism **134** is in operable communication via communication link **44** with controller **8** and is used to feed each media sheet **133** placed on input media area **132** one at a time into media path **136** along a media feed direction **135** for scanning within ADF **130** by stationary image capture module **140** through imaging window **141** and by flatbed scanner **110** through imaging window **155**. Scanned media sheets **133'** are then fed to and are collected in output media area **138**.

ADF **130** includes a calibration system **200** for calibrating ADF stationary scan module **140**. Calibration system **200** includes a position sensor **202**, a drive mechanism **205**, and a calibration member **220**. Calibration member **220** is positioned about a media path portion **137** opposite ADF stationary scan module **140**. Position sensor **202** and drive mechanism **205** are in operable communication with controller **8** via communication link **44**. Drive mechanism **205** includes one or more gear mechanisms **208** and a drive motor **210**, and is used to drive calibration member **220** to rotate at least between a calibration position and a non-calibration or scanning position. In the calibration position, a top surface of a calibration strip of a known reflectivity and that is positioned on a longitudinal portion of calibration member **220** contacts an imaging surface of ADF scan module **140**. In the non-calibration or scanning position, a second strip is mounted on another longitudinal portion of calibration member **220** but is spaced apart from the imaging surface of image capture module **140** forming a gap therebetween and provides a background surface area or image backer for the media sheet positioned in the gap during a scanning operation, as will be explained in greater detail below. Position sensor **202** is used to provide a signal representative of the rotational position of calibration member **220** relative to a field of view **142** of ADF scan module **140**.

Each of the flatbed and ADF scan modules **112**, **140** generally includes a light source for illuminating a surface of a media sheet to be scanned, and a photoreceptor array for receiving light reflected from the illuminated surface. In one example embodiment, each of flatbed scanner and ADF scan modules **112**, **140** may comprise a charge-coupled device (CCD) module, a contact image sensor (CIS) scan bar, or an optical reduction scan bar. Flatbed and ADF scan modules **112**, **140** do not have to be of the same type.

FIG. **3** is a perspective view of scanner system **100** and FIG. **4** illustrates internal components thereof. Scanner system **100** includes a base **150** and a scan lid **160**. Base **150** houses flatbed scanner **110** and includes a platen **152** incorporated into an upper surface **153** thereof. Platen **152** is transparent and holds a media sheet having an image to be scanned. Within base **150** are flatbed scan module **112** and drive mechanism **114** used to translate flatbed scan module **112** on rails **120** mounted in base **150** beneath platen **152** along the length of platen **152** when scanning an image placed on platen **152**. Flatbed scan module **112** is generally used to illuminate and scan a bottom surface of an original. As used herein, "bottom surface" refers to that surface of the original being scanned that is in contact with the upper surface of platen **152**. Flatbed scan module **112** may also be held in a stationary position, a position upstream of ADF scan module **112** as shown, and used to scan the bottom surface of the original as the original is moved past it.

Scan lid **160** includes ADF **130**. Scan lid **160** is moveably attached to base **150** and moveable between an open position where scan lid **160** is raised away from platen **152** and a closed position, as shown, where scan lid **160** covers platen **152**. An input media support **162** extends from the input end **163** of media path **136** and provides input media area **132** where media having images to be scanned are placed. An output media support **165** extends from the output end **166** of media path **136** and provides output media area **138** for receiving the scanned media sheets. ADF scan module **140** is generally used to illuminate and scan a scan line on an upper surface of an original passing beneath it. As used herein, "upper surface" refers to that surface of the original being scanned that is facing away from platen **152**. ADF scan module **140** is positioned above media path portion **137** opposite a lower guide assembly **170**. In an example embodiment, lower guide assembly **170** incorporates therein calibration member **220** positioned opposite ADF scan module **140**. ADF **130** also includes a spring-biased pressure pad **168** for pressing a portion of the media being scanned against a scan window **155**, which is also a transparent window, on the upper surface **153** of base **150** through which flatbed scan module **112** may scan the bottom surface of the original being scanned and being fed through ADF **130**. The surface of pressure pad **168** is usually white in color or may be divided into a white portion and a black portion.

Pick mechanism **134** includes a pick roll **139** and is attached to an upper frame section **172** of ADF **130** for picking media sheets disposed on input media area **132**. A plurality of feed roll pairs **173**, each pair having opposed rolls forming feed nips therebetween, are spaced along media path **136** for conveying media sheets having images to be scanned from input media area **132** to output media area **138**. As would be understood by one of ordinary skill in the art, a drive mechanism including one or more gear mechanisms and a motor is used to drive feed roll pairs to advance media sheets along media path **136**. ADF **130** further includes a plurality of media sensors positioned to detect presence of media sheets and/or media position as they advance along media path. For example, media sensor **174-1** is positioned adjacent to input end **163** of media path **136** to provide signals to controller **8** indicative of at least one media sheet being disposed in input media area **132**. Media sensors **174-2** are positioned downstream of pick roll **139** to detect leading and/or trailing edges of the fed media sheet and provide signals to controller **8** indicative of the position of the media sheet to be scanned along media path **136**.

To scan a media sheet in manual mode, scan lid **160** is manually lifted to expose platen **152** and the media sheet to be scanned is placed on top of platen **152**. Scan lid **160** is then manually closed against base **150**. Under the direction of controller **8**, flatbed scan module **112** moves in a bi-directional scan direction, indicated by arrow **118**, along at least a portion of the length of platen **152**. While moving along rails **120**, flatbed scan module **112** illuminates and scans scan lines on the bottom surface of the original placed on platen **152**. The scan area and scan lines are directed orthogonally into the plane of the page on which FIG. **4** is shown. The scan area is sized to handle various sizes of media such as A4, Letter, Legal or Ledger sized media, or smaller.

To scan one or more originals in ADF mode, calibration member **220** is rotated to a scanning position. One or more sheets of originals is placed in input media area **132** then fed through ADF **130** and past flatbed scan module **112** and then ADF scan module **140** along media path **136**, and out to output media area **138**. For a one-sided or simplex scanning operation, sheets of media are fed through ADF **130** and one of flatbed scan module **112** and ADF scan module **140** is then used to scan the surface of the media containing the image or text, depending on the design of ADF **130**. For duplex scanning, media fed through ADF **130** from input media area **132** pass through both flatbed scan module **112** and ADF scan module **140** where the bottom and top surfaces of the media are scanned thereby, respectively. When flatbed scan module **112** of flatbed scanner **110** is used for scanning media sheets fed through ADF **130** either in simplex mode or duplex mode, flatbed scan module **112** may be moved to a fixed position beneath scan window **155** that is generally upstream of the ADF scan module **140** relative to the media feed direction as illustrated in FIG. **4**. Separation of the two scan modules along the media path **136** is done to reduce light interference between the two scan modules during duplex scanning. Again the scan area and scan lines for ADF image capture module **140** are directed orthogonally into the plane of the page on which FIG. **4** is shown.

FIGS. **5-7** show ADF scan module **140** and lower guide assembly **170** according to one example embodiment. ADF scan module **140** includes a housing **144** having a top **144***a*, a bottom **144***b*, and sides **144***c*, **144***d*. Bottom **144***b* of housing **144** defines an upper guide surface **146** having a plurality of ribs **147** that are arranged to retain media in alignment during feeding. ADF scan module **140** further includes an imaging window **141** incorporated in bottom **144***b* thereof and extending between sides **144***c*, **144***d*. Imaging window **141** is transparent, and, in one example form, comprises a glass material, and has an outer imaging surface **143** against which an upper surface of a fed original media sheet is scanned.

Lower guide assembly **170** has a top **170***a*, bottom **170***b*, and sides **170***c*, **170***d* that surround calibration member **220**. Top **170***a* defines a lower guide surface **176** having a plurality of ribs **177** that cooperate with the ribs **147** of upper guide surface **146** to reduce surface contact between the media being scanned and inner surfaces **148**, **178** of the upper and lower guide surfaces **146**, **176**, respectively, during feeding in order to reduce drag and possible media skewing. Calibration member **220** spans imaging window **141**, extends substantially parallel to imaging window **141**, is rotatably mounted using pivot pins **229***a*, **229***b* (see FIG. **11**) within lower guide assembly **170** to sides **170***c*, **170***d* thereof, and is rotatable about a pivot axis **180**. An aperture **182** is provided on top **170***a* of lower guide assembly **170** opposite imaging window **141** to provide a window for exposing the outer surface **224** of calibration member **220**. In FIG. **5**, ADF scan module **140** is shown positioned above lower guide assembly **170** such that upper guide surface **146** and lower guide surface **176** are separated from each other to provide media path portion **137** therebetween, and imaging window **141** and calibration member **220** are positioned opposite relative to each other. The gap between upper guide surface **146** and lower guide surface **176** may be selected to allow passage of different types and thicknesses of media sheets. A media deflector **184** is positioned on top **170***a* of lower guide assembly **170** upstream of aperture **182** to direct fed media sheets relatively close to or against imaging surface **143** when passing through media path portion **137**.

In one example embodiment, lower guide assembly **170** may be configured as a jam door which generally provides access to media path portion **137** for clearing media jams therein. For example, with reference to FIG. **8**, lower guide assembly **170** is pivotally connected at a pivot **186** to a peripheral frame **187** of scan lid **160** in order to allow lower guide assembly **170** to be rotatable between a closed position, in which lower guide assembly **170** covers upper guide surface **146** and imaging window **141**, and an open position shown in which upper guide surface **146** and imaging window **141** are uncovered and exposed, as shown in FIG. **8**. A spring mechanism (not shown) may be utilized to continuously bias lower guide assembly **170** towards its closed position. Alternatively, lower guide assembly **170** may be snap fit into its closed position using any form of latch/release mechanisms as are known in the art.

FIG. **9** illustrates internal components of ADF scan module **140** and lower guide assembly **170** with lower guide assembly shown in its closed position. In the example shown, housing **144** of ADF scan module **140** incorporates a light source **190**, reflective surfaces **191**, mirrors **192**, a lens **193**, and a sensor module **194**. Reflective surfaces **191** direct light L, indicated by the solid line, from light source **190** through imaging window **141** to scan a surface of an original media sheet that is in front of or held against imaging surface **143** of imaging window **141**, and light reflected therefrom, R, indicated by the small dashed line, is reflected by mirrors **192** towards lens **193**. Lens **193** focuses the reflected light R onto sensor module **194**, which, in turn, converts the received focused light into a digital image corresponding to an optical image of the scanned surface or an original media sheet. In one example embodiment, ADF scan module **140** has a focal distance corresponding to the imaging surface **143** of imaging window **141** and has field of view **142**, depicted by large dashed lines **142** at imaging surface **143**. Calibration member **220** rotatably mounted in lower guide assembly **170** is shown positioned within field of view **142**. Portions of the outer surface **224** of calibration member **220** may partially extend out of aperture **182** and are positionable within the field of view **142** of ADF scan module **140** when calibration member **220** is rotated about pivot axis **180**.

FIGS. **10-12** show calibration member **220** according to one example embodiment. Calibration member **220** includes an elongated frame or body **221**. Body **221** has an outer side **223** having a generally arcuate outer surface **224** that extends along a lengthwise dimension **226** between sides **221***a*, **221***b*. Pivot pins **229***a*, **229***b* axially extend from respective sides **221***a*, **221***b* of calibration member **220** and are rotatably mountable on corresponding sides **170***c*, **170***d* of lower guide assembly **170** along pivot axis **180** (see FIG. **7**). Pivot pin **229***b* is coupled with a pinion gear **231** which operatively couples calibration member **220** to drive motor **210** (See FIG. **13**) when lower guide assembly **170** is in the closed position. An inner side **235** of body **221** may include one or more radial support ribs **236**, and one or more axial support ribs **237** for stiffening and strengthening calibration member **220**. In the example shown, an optional torque member **233** protrudes from side **221***a* for engaging with a leg **241** of an optional torsion spring **240** that applies torque to calibration member **220**. The other leg **242** of torsion spring **240** is fastened to lower guide assembly **170**. The body **243** of spring **240** is mounted about pivot pin **229***a*. The torque from spring **240** helps calibration member **220** to move smoothly. The center of gravity of illustrated calibration member **220** is offset from pivot axis **180** and the torque from spring **240** smoothes out the motion of calibration member **220** due to backlash inherent in gear train **280** shown in FIG. **13**.

The outer side **223** of body **221** is divided into a plurality of longitudinal portions **250**, **260**, **270** that extend along lengthwise dimension **226**, span the length of imaging window **141**, and are rotatably moveable across imaging window **141** of ADF scan module **140** when rotating body **221** about pivot axis **180**. Each longitudinal portion generally provides a different background area for ADF scan module **140** depending on a rotational position of body **221**. In one example embodiment, the plurality of longitudinal portions include a first background portion **250**, a second background portion **260** and a calibration surface portion **270** extending substantially parallel relative to each other. The outer surfaces of portions **250**, **260**, **270** may have different reflectivities. In one example embodiment, first and second background portions **250**, **260** and calibration surface portion **270** may each have a width W, such as about 8 mm, and lengths of about 235 mm. However, each of portions **250**, **260**, **270** may have the same or different widths and the width W should not be considered as a limitation of the design. The width W is chosen so that several scan lines may be generated when a scan is being performed on a given portion. The color of each of portions **250**, **260**, **270** may be an inherent property of the material used in that portion of body **221** or may be painted onto the respective portion.

In one example form, first background portion **250** comprises a first background strip **251** adhesively attached to outer surface **224** of body **221** and having a top surface **252** having a reflectivity for providing a relatively dark or black background area for ADF scan module **140**, and second background portion **260** comprises a second background strip **261** adhesively attached to outer surface **224** of body **221** and having a top surface **262** having a reflectivity that is different from or greater than the reflectivity of the top surface **252** of first background strip **251** for providing a relatively bright or white background area for ADF scan module **140**. For example, first background strip **251** may have a black color and second background strip **261** may have a white color. First and second background strips **251**, **261** may be made from polyethylene terephthalate (PET). Example dimensions for a black top surface **252** are about 235 mm long and about 9 mm wide and those for a white top surface **262** are about 235 mm long and about 7 mm wide.

First background portion **250** in its various embodiments may be used as a black image backer to more accurately locate top, bottom and side edges or borders of a media sheet being scanned in order to support features such as auto-cropping, electronic deskew, and dynamic margin translation for different scan modes. Second background portion **260** in its various embodiments may be used as a white image backer when scanning media sheets with punched holes and/or folded or damaged corners to prevent such punched, folded, or damaged portions of the media from appearing black on the optical image, as would otherwise happen when a black image backer were used. Conversely, second background portion **260** may be black, and first background portion may be white. In the example shown, a gap **225** (see FIG. **12**) may be provided between first and second background portions **250**, **260**. In an alternative example embodiment, first and second background portions **250**, **260** may abut one another (see FIG. **10**). First and second background portions **250**, **260** each have a length that longitudinally extends beyond the side edges of the widest media expected to be scanned by ADF scan module **140**.

Top surfaces **252**, **262** may also be wiped by one or more optional wipers mounted on lower guide assembly **170** adjacent to aperture **182**. As shown in FIG. **9**, a strip or block wiper **294** made of foam or other similar material is mounted on a support **196** in lower guide assembly **170** while a blade wiper **295** made of rubber or acrylic material is shown mounted on a support **197** in lower guide assembly **170**. Both wipers **294**, **295** extend the longitudinal length of first or second background portions **250**, **260**. Regardless of style, wipers **294**, **295** are positioned to contact and wipe across top surfaces **252**, **262**. The style of wiper and its placement in lower guide assembly **170** is a matter of design choice and is not a limitation of the disclosed design.

Calibration surface portion **270** may have a substantially arcuate top surface **272** and may comprise one or more materials that provide properties to allow high reflectance of light and compliance such that its top surface **272** conforms to imaging window **141** when pressed thereagainst. In one example embodiment, calibration surface portion **270** may be provided as a homogeneous layer comprising a compliant strip or layer with the aforementioned characteristics. In another example embodiment, calibration surface portion **270** may be comprised of a plurality of layers. For example, FIG. **12** illustrates a cross-sectional view of calibration member **220** taken along line **12-12** of FIG. **10**. As shown, calibration surface portion **270** comprises a compliant layer **274** disposed on the outer surface **224** of body **221**, and a calibration strip **276** disposed over compliant layer **274**. Compliant layer **274** may be adhesively attached to outer surface **224** and may be made from foam or any suitable resilient material, such as urethane, polyurethane, felt, or other flocculated material. Calibration strip **276** may be adhesively attached over the top of compliant layer **274**, may have a top white surface area, may have a high reflectance, and/or may be made of PET material. A junction or transition zone **278** may be provided between calibration surface portion and the adjacent image backer. For example, transition zone **278** may comprise a black gap that longitudinally extends between calibration surface portion **270** and second background portion **260** in order to enable firmware to determine transitions between the calibration surface portion **270** and the other background portions **260**, **250** used during document scanning.

According to one example embodiment, first and second background portions **250**, **260** have substantially the same thickness T**1**, and calibration surface portion **270** has a thickness T**2** that is greater than the thickness T**1** of the first and second background portions **250**, **260** such that top surface **272** of calibration surface portion **270** is higher than the top surfaces **252**, **262** of first and second background portions **250**, **260** relative to the outer surface **224** of body **221**. In the embodiment illustrated in FIG. **12**, compliant layer **274** and calibration strip **276** may have a stack thickness corresponding to thickness T**2** that is greater than a closest distance D (See FIG. **14**A) between imaging window **141** and outer surface **224** of body **221** such that the top surface **272** of calibration surface portion **270** can press against and wipe across imaging window **141** when body **221** is rotated to move calibration surface portion **270** into the field of view **142** of ADF scan module **140**. First and second background portions **250**, **260** each have a thickness T**1** that is less than the closest distance D such that their top surfaces **252**, **262**, do not contact imaging window **141** when body **221** is rotated to position first and second background portions **250**, **260** into the field of view **142** of ADF scan module **140** and form a gap therebetween through which an original media sheet being scanned passes. In one example embodiment, thickness T**2** of calibration surface portion **270** may be greater than about 1 mm, such as about 1.4 mm, and thickness T**1** of first and second background portions **250**, **260** may be less than about 0.5 mm, such as about 0.25 mm. In another example embodiment, top surfaces **252**, **262** of first and second background portions **250**, **260** may have a radial distance R**1** of about 14 mm from pivot axis **180**, and top surface **272** of calibration surface portion **270** may have a radial distance R**2** of about 15 mm from pivot axis **180**.

Although the illustrated embodiments show three longitudinal portions including first and second background portions **250**, **260** and calibration surface portion **270** in a particular arrangement, it will be appreciated that arrangement between such sections can be interchanged. Additionally, it is contemplated that other colors for the background portions may be used, and that more than two background portions having different colors may be disposed on the outer side **223** of body **221**. For a non-limiting example, a grey color may be used. Further only a single background portion may be used as an image backer along with calibration surface portion **270**.

FIG. **13** illustrates drive motor **210** being operatively coupled to calibration member **220** via a coupling mechanism, generally designated **280**. Drive motor **210** is used to rotate calibration member **220** about pivot axis **180**. In the example shown, the coupling mechanism **280** includes a gear mechanism or gear train **280** comprising a first compound gear **282** and a second compound gear **284**. First and second compound gears **282**, **284** each comprises at least two different diameter gears, such as first gears **282-1**, **284-1** and second gears **282-2**, **284-2**, respectively, that are fixedly attached to each other and rotate together at the same direction and speed. First gears **282-1**, **284-1** are shown having larger diameters than respective second gears **282-2**, **284-2**. First gear **282-1** of first compound gear **282** meshes with a pinion gear **286** on shaft **287** of drive motor **210** while second gear **282-2** thereof meshes with first gear **284-1** of second compound gear **284**. In an example embodiment, drive motor **210** may comprise a stepper motor. Second gear **284-2** of second compound gear **284** meshes with pinion gear **231** coupled to pivot pin **229** of calibration member **220**. In an example embodiment, a gear ratio defined by gear train **280** may be about 8.5:1 such that calibration member **220** rotates at a relatively slower rotational speed than pinion gear **286** of drive motor **210**. For example, for a given radial travel arc of about 15 mm of top surface **272** of calibration surface portion **270** and twenty full steps per stepper motor revolution of drive motor **210**, travel distance of top surface **272** may be kept under 1 mm per step of motor rotation. It will be appreciated, however, that other gear ratios may be used to achieve different speed ratios for drive motor **210** and calibration member **220** and that non-compound gears may be used. Second gear **284-2** of second compound gear **284** disengages from pinion gear **231** coupled to pivot pin **229** of calibration member **220** when lower guide assembly **170** is rotated to its open position, and reengages with pinion gear **231** when lower guide assembly **170** is rotated to its closed position.

Referring now to FIGS. **14**A-**14**E, different positions of calibration member **220** relative to imaging window **141** and field of view **142** are illustrated. FIGS. **14**A-**14**B correspond to non-calibration or scanning positions whereby calibration member **220** is rotated to position first background portion **250** and second background portion **260** adjacent to but not in contact with imaging window **141** to be in the field of view **142** of ADF scan module **140**, which is represented by an ellipse in the example illustrations, respectively. As shown, a gap corresponding to closest distance D is provided between outer surface **224** of body **221** and imaging surface **143** of imaging window **141** such that there is a sufficient opening **290** between imaging window **141** and top surfaces **252**, **262** of first and second background strips **251**, **261** mounted on first and second background portions **250**, **260**, respectively to allow a media sheet M to pass through and be scanned by ADF scan module **140**. In FIG. **14**A, wiper blade **295** is shown wiping top surface **262**. In FIG. **14**B calibration member **220** has been rotated to show that wiper blade **295** is in contact with top surface **272** and wiper pad **294** in contact with top surface **252**. Accordingly, in the scanning positions, media path portion **137** is open for media M to pass through. In one example embodiment, one of the first and second background portions **250**, **260** (and first and second background strips **251**, **252**) may be automatically selected based on a scan mode selected by a user. In another example embodiment, one of first and second background portions **250**, **260** (or first and second background strips **251**, **261**) may be manually selected by the user such as by directly interacting with menu items implemented on user interface **26** of imaging apparatus **2**.

FIGS. **14**C-**14**E illustrate sequential views of calibration member **220** being rotated in a direction indicated by an arrow **292** to be in the field of view **142** of ADF scan module **140** for a calibration operation. Because thickness T**2** of calibration surface portion **270** is greater than gap D, the top surface **272** thereof contacts the imaging surface **143** of imaging window **141** and begins to compress as it initially approaches the field of view **142** of ADF scan module **140**, as shown in FIG. **14**C. In FIG. **14**C, second background portion **260** has been rotated to a new position at which ADF scan module **140** may take a second image of second background portion **260**. Controller **8** may be programmed to incrementally move calibration member **220** so that multiple images or multiple scan lines may also be taken of background portions **250** and calibration strip **276** as shown for background portion **260**. Controller **8** may be programmed to average the multiple images or multiple scan lines.

As calibration member **220** is further rotated in the direction **292** as shown in FIGS. **14**D-**14**E, portions of the top surface **272** continue to contact and are pressed against imaging surface **143**. In the example shown, the compliant layer **274** underneath calibration strip **276** allows for calibration strip **276** to deform or compress as it is pressed against imaging window **141**. Accordingly, media path portion **137** is closed off and the top surface **272** of calibration strip **276** wipes across the imaging surface **143** as calibration member **220** is rotated from the position shown in FIG. **14**C to the position shown in FIG. **14**E, thereby removing dust or contaminants not only on the imaging surface **143** but also contaminants on the top surface **272** of calibration strip **276**.

In FIG. **14**C calibration member **220** has rotated away from wiper blade **295** and wiper pad **294** has wiped further across top surface **252**. In FIG. **14**D, calibration member **200** has continued to rotate away from wiper blade **295** and wiper pad **294** is in contact with top surfaces **252**, **262**. In FIG. **14**E wiper pad **294** has wiped completely across top surface **262**. Calibration member **200** may be returned to the position shown in any of the prior figures. The action of wipers **294**, **295** helps to remove any particles that may have fallen on or otherwise accumulated on any or all of top surfaces **252**, **262**, **272**.

It should be noted that the example illustrations are provided to facilitate understanding of the invention and that the width of contact between imaging window **141** and calibration strip **276** may be narrower than that depicted in the example illustrations. Calibration strip **276** may have a thickness such that at least a tangential contact occurs between calibration strip **276** and imaging window **141** during calibration. For example, calibration strip **276** may have a top surface that is shaped to establish at least a single line of contact with imaging window **141** as calibration member **220** is rotated to move calibration strip **276** within the field of view **142** of ADF scan module **140**.

According to an example embodiment, ADF scan module **140** may be configured to scan a plurality of scan lines while calibration strip **276** is wiped across imaging window **141**. That is, while ADF scan module **140** is stationary, calibration strip **276** is rotated to allow ADF scan module **140** to scan multiple locations of calibration strip **276**. Thereafter, controller **8** may use the plurality of scan lines to calibrate ADF scan module **140**. Because dust or contaminants are removed from the surfaces of calibration strip **276** and imaging window **141** while ADF scan module **140** is acquiring a plurality of scan lines to be used for calibration, a calibration process that is more robust against dust and contamination is provided. In other example embodiments, wiping by calibration member **220** may be done anytime to wipe off contaminants on imaging surface **143**. For example, calibration member **220** may be rotated to have calibration strip **276** wipe imaging surface **143** after a predetermined number of media sheets are scanned.

In the above example embodiments, calibration member **220** is housed within lower guide assembly **170** such that calibration member **220** may be decoupled from gear train **280** when lower guide assembly **170** is opened. In order to provide accurate positioning of calibration member **220** after lower guide assembly **170** is closed and calibration member **220** is recoupled to drive motor **210** via second gear **284-2** of second compound gear **284**, calibration system **200** may implement a homing sequence. The homing sequence allows for calibration member **220** to be reset to a known initial or starting position upon closing lower guide assembly **170**.

With reference to FIG. **15**, calibration member **220** has been rotated to a position to expose a position sensor **202** that is positioned within lower guide assembly **170**. Location of position sensor **202** corresponds to a location of a flag **245** (see FIG. **11**) on the inner side **235** of calibration member **220** so that flag **245** can actuate position sensor **202** as calibration member **220** rotates. In the example shown, position sensor **202** comprises an optical sensor and flag **245** is sized to move into or out of and block or unblock an optical path of position sensor **202**. It will be appreciated, however, that any type of sensing mechanism or arrangement may be used.

In one example embodiment, the homing sequence may be implemented by causing flag **245** to always approach position sensor **202** from the same direction in order to achieve consistent homing. For example, FIG. **16**A illustrates an initial position of calibration member **220** upon closing lower guide assembly **170** where position sensor **202** is unobstructed by flag **245**. A first longitudinal edge **227** of calibration member **220** is shown resting on bottom **170***b* which acts as a rotational stop when calibration member is rotated in the clockwise direction. In one form a rotational stop may be provided by raised portions **170***b***1** provided in bottom **170***b*. Optionally a second longitudinal edge **228** of calibration member **200** may be stopped by raised portion **170***b***1** shown in FIG. **9** when calibration member **200** is rotated in the counter-clockwise direction.

During the homing sequence, calibration member **220** is rotated counter-clockwise, as indicated by arrow **297**, until flag **245** actuates position sensor **202**, as shown in FIG. **16**B, which causes an output signal thereof to change from a first state to a second state. If, upon closing lower guide assembly **170**, position sensor **202** is initially obstructed by flag **245** (as shown in FIG. **16**B), calibration member **220** may be rotated clockwise until the output signal of position sensor **202** changes from the second state to the first state indicating that flag **245** has moved out of and unblocked the optical path of position sensor **202**. In one example embodiment, the size of flag **245** may be selected such that flag **245** would continue to block position sensor **202** at the position where the rotational movement of calibration member **220** has been stopped by bottom **170***b* at second longitudinal edge **228**. Thereafter, the system may proceed with the homing sequence whereby calibration member **220** is rotated counter-clockwise until flag **245** actuates position sensor **202**. The position at which flag **245** actuates position sensor **202** may be referred to as a home position for calibration member **220**, and may be stored as a constant position. Controller **8** may then use the home position as a reference position when rotating calibration member **220** to move and position background portions **250**, **260** and calibration surface portion **270** into the field of view **142** of ADF scan module **140**.

The foregoing description of several methods and an embodiment of the present disclosure have been presented for purposes of illustration. It is not intended to be exhaustive or to limit the present disclosure to the precise steps and/or forms disclosed, and obviously many modifications and variations are possible in light of the above description. It is intended that the scope of the present disclosure be defined by the claims appended hereto.

What is claimed is:

1. A calibration member for use with an automatic document feed (ADF) scanner in calibrating a stationary image capture module thereof having an imaging surface against which a surface of a fed media sheet is scanned, the calibration member comprising:

a body rotatably mountable about a pivot axis in the ADF scanner opposite the imaging surface, the body having an arcuate outer surface and a length substantially spanning a length of the imaging surface;

a first background strip of a first thickness disposed on and extending along a first longitudinal portion of the outer surface of the body, a top surface of the first background strip having a first reflectivity; and

a second background strip disposed on and extending along a second longitudinal portion of the outer surface of the body, the second background strip having a second thickness that is greater than the first thickness and having a top surface that is higher than the top surface of the first background strip, the top surface of the second background strip having a second reflectivity that is different than the first reflectivity,

wherein, when the calibration member is mounted within the ADF scanner at the position opposite the imaging surface, the top surface of the second background strip wipes the imaging surface when the body is rotated about the pivot axis during positioning of the second background strip within a field of view of the image capture module during a calibration operation thereof.

2. The calibration member of claim **1**, further comprising a compliant strip positioned within and attached to the second longitudinal portion of the outer surface of the body with the second background strip being attached on top of the compliant strip.

3. The calibration member of claim **1**, wherein, when the calibration member is mounted within the ADF scanner and the body is rotated about the pivot axis to position the first background strip in the field of view of the image capture module for an image capture operation of the fed media sheet, a gap is formed between the top surface of the first background strip and the imaging surface allowing the fed media sheet to pass therebetween.

4. The calibration member of claim **1**, wherein the top surface of the second background strip comprises a substantially white area.

5. The calibration member of claim **1**, wherein the top surface of the first background strip comprises a substantially black area.

6. The calibration member of claim **1**, further comprising a transition zone longitudinally extending between the first and second background strips.

7. The calibration member of claim **1**, further comprising a third background strip extending along a third longitudinal portion of the outer surface of the body, the third background strip having a thickness that is substantially the same as the first background strip.

8. The calibration member of claim **7**, wherein a top surface of the third background strip has a reflectivity that is different from the first reflectivity of the first background strip.

9. A calibration unit for calibrating a stationary image capture module of an automatic document feed (ADF) scanner, the calibration unit comprising:

a housing;

a frame member positioned in the housing to extend substantially parallel to an imaging surface of the image capture module and rotatably mounted within the housing about a pivot axis, the frame member having an outer side that is rotatably moveable across and adjacent to the imaging surface upon rotating the frame member about the pivot axis;

a compliant layer attached to and extending along a longitudinal portion of the outer side of the frame member; and

a calibration strip extending along the longitudinal portion of the outer side of the frame and attached over the compliant layer, the calibration strip having a top surface having a first reflectivity,

wherein the compliant layer and the calibration strip have a stack thickness that is greater than a closest distance between the imaging surface and the outer side of the frame member such that the top surface of the calibration strip wipes across the imaging surface when the frame member is rotated to move the calibration strip in a field of view of the image capture module during a calibration process.

10. The calibration unit of claim **9**, wherein the outer side of the frame member includes a substantially arcuate surface and the compliant layer and the top surface of the calibration strip conforms to the arcuate surface of the outer side of the frame member.

11. The calibration unit of claim **9**, wherein the top surface of the calibration strip comprises a white area.

12. The calibration unit of claim **9**, further comprising at least one image backer extending along a second longitudinal portion of the outer side of the frame member, each of the at least one image backer having a thickness that is less than the closest distance between the imaging surface and the outer side of the frame member such that a gap is defined between the imaging surface and a top surface of each of the at least one image backer to allow a media sheet to pass through the gap when the frame member is rotated to move each of the at least one image backer in the field of view of the image capture module during an image capture operation.

13. The calibration unit of claim **12**, further comprising a wiper mounted to the housing adjacent to the frame member, the wiper having a length corresponding to at least the second longitudinal portion wherein the wiper wipes the top surface of the at least one image backer when the frame member is rotated into contact with the wiper.

14. The calibration unit of claim **12**, wherein the at least one image backer comprises a first image backer and a second image backer, the top surface of the first image backer having a reflectivity that is different from a reflectivity of the top surface of the second image backer.

15. The calibration unit of claim **12**, wherein the gap has a height that is about 1 mm.

16. The calibration unit of claim **9**, wherein the stack thickness of the compliant layer and the calibration strip is greater than about 1 mm.

17. A system for calibrating a stationary image capture module of an automatic document feed (ADF) scanner, the image capture module having an imaging surface against which a surface of a fed media sheet is scanned by the image capture module, the system comprising:

a housing;

a rotatable frame rotatably disposed in the housing at a position opposite to the imaging surface, the frame having an outer curved surface extending through an aperture in the housing;

an image backer formed on a first longitudinal portion of the outer curved surface of the frame extending substantially parallel to the imaging surface and having a top surface that does not contact the imaging surface when the frame is rotated to position the image backer in a field of view of the image capture module;

a calibration surface portion formed on a second longitudinal portion of the outer curved surface of the frame and extending substantially parallel to the imaging surface, the calibration surface portion having a top surface that contacts the imaging surface when the frame is rotated to position the calibration surface portion in the field of view of the image capture module;

a drive mechanism disposed within the housing and coupled to the frame for rotating the frame; and

a controller in operable communication with the drive mechanism, the controller configured for controlling the drive mechanism to rotate the frame and selectively position the image backer in the field of view of the image capture module during an image capture operation, and the calibration surface portion in the field of view of the image capture module during calibration of the image capture module.

18. The system of claim **17**, wherein, during the calibration, the controller is further configured to rotate the frame to allow the image capture module to acquire a plurality of scan lines while the calibration surface portion is moving against the imaging surface.

19. The system of claim **17**, further comprising a foam layer attached to and extending along the second longitudinal portion of the frame, wherein the calibration surface portion is disposed over the foam layer.

20. The system of claim **17**, wherein the foam layer and the calibration surface portion have a stack thickness that is greater than a closest distance between an outer side of the frame and the imaging surface.

21. The system of claim **17**, further comprising a jam door connected to a housing of the ADF scanner adjacent to the imaging surface, wherein the jam door is movable between an open position and a closed position relative to the imaging surface and the frame is rotatably mounted to the jam door.

22. The system of claim **17**, further comprising a position sensor disposed adjacent the frame and in operable communication with the controller, the position sensor providing a signal representative of a position of the frame.

23. The system of claim **17**, further comprising a second image backer having a reflectivity that is less than a reflectivity of the image backer, wherein the controller is further configured to rotate the frame to position one of the image backer and the second image backer in the field of view of the image capture module based on user input.

24. The system of claim **17**, further comprising a wiper mounted to the housing adjacent to a first longitudinal edge of the aperture, the wiper having a length corresponding to at least the second longitudinal portion wherein the wiper wipes the top surface of the image backer when the frame is rotated into contact with the wiper.

25. The system of claim **24**, further comprising a second wiper mounted to the housing adjacent to a second longitudinal edge of the aperture, the second wiper having a length corresponding to at least the second longitudinal portion wherein the second wiper wipes the top surface of the image backer when the frame is rotated into contact with the second wiper.

26. The system of claim **25**, wherein the first wiper is a foam block and the second wiper is a resilient blade.

27. The system of claim **17**, wherein the top surface of the calibration surface portion comprises a white area.

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