

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.:	18/528,624	Confirmation No.:	3522
Inventor(s):	Keith George Ferry	Group Art Unit:	2855
Filed:	December 4, 2023	Examiner:	Andre J. Allen
Title:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT	Attorney Docket No.	90608.01017

PRELIMINARY AMENDMENT

Mail Stop Amendment
Commissioner of Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

Prior to examination of the above-identified U.S. patent application, please enter the following preliminary amendment:

Amendments to the Claims begin on page 2 of this paper.

Remarks/Arguments begin on page 18 of this paper.

Amendment to the Claims

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of the Claims:

1. to 57. (Cancelled)

58. (Currently Amended) A sensing system for monitoring an object that is rotated in use comprising:

a sensor assembly configured ~~for attachment~~ to connect with the object or an element that rotates with the object ~~that is rotated in use~~, the sensor assembly comprising:

a housing comprising an outer surface and an internal cavity that is enclosed within the housing; and

an electrical device disposed within the internal cavity and attached thereto to prevent movement of the electrical device within the internal cavity, wherein the electrical device comprises electrical components including one or more sensors, wherein the housing includes an opening through the outer surface to the internal cavity, wherein the electrical device is configured to sense, transmit and/or receive information regarding surrounding conditions, orientation and/or location when the sensor assembly is attached with the object and the object is rotated in use.

59. (Currently Amended) The sensing system of claim 58, further comprising a retaining member configured to accommodate attachment of the housing therewith, wherein the retaining member has an outside surface configured for attachment with the object or the element that rotates with the object ~~to rotate with the object when the object is in use~~.

60. (Previously Presented) The sensing system of claim 58, wherein the housing outer surface includes one or more display features or indicia that are viewable to a user.

61. (Previously Presented) The sensing system of claim 58, wherein the electrical device is attached within the internal cavity by one or more surface features within the cavity that contact the electrical device to fix its position therein.

62. (Previously Presented) The sensing system of claim 58, wherein the electrical device is encapsulated by the inner cavity of the housing during a process of making the housing that operates to retain the position of the electrical device within the housing.

63. (Currently Amended) The sensing system of claim 59, wherein the retaining member is formed from an elastomeric material that mitigates transmission of forces from the object or the element that rotates with the object to the housing when the housing is attached to the retaining member ~~is attached to the object and the housing is attached to the retaining member~~ and the retaining member is attached to the object or the element that rotates with the object.

64. (Previously Presented) The sensing system of claim 59, wherein the retaining member includes an inwardly directed lip disposed at least partially around an opening of the retaining member, wherein the lip projects radially inwardly from a wall structure of the retaining member and is sized smaller than a wall structure of the housing so as to cover at least a portion of the housing outer surface adjacent a top of the housing when the housing is attached to the retaining member.

65. (Previously Presented) The sensing system of claim 58, wherein the housing includes a filter that is positioned to filter air passing from the opening in the outer surface into the internal cavity before reaching the electrical device.

66. (Previously Presented) The sensing system of claim 58 further comprising a receiver that is external from the sensor assembly and that is configured to receive one or more of a signal, information, and data from the electrical device wirelessly.

67. (Currently Amended) The sensing system of claim 66, wherein the electrical device comprises separately or together an accelerometer sensor and processor chip connected therewith, and wherein the electrical device is configured to send one or more of a signal, information, and data from the sensor wirelessly to the external receiver.

68. (Previously Presented) The sensing system of claim 67, wherein the electrical device is capable of processing data from the accelerometer sensor prior to sending the one or more of a signal, information, and data to the external receiver.

69. (Previously Presented) The sensing system of claim 67, wherein at least one of the electrical device or accelerometer sensor is capable of processing fast fourier transformation algorithms to derive information about the rotating object useful for determining one or more of tread depth, tire health, tire load, vehicle dynamics, alignment, and location.

70. (Previously Presented) The sensing system of claim 67, wherein the object comprises a vehicle tire, and wherein one or more parameter selected from the group consisting of tire diameter, tire tread depth, tire health, tire radial load, slip, road or soil conditions, strain, vehicle dynamics, vehicle camber and/or toe alignment is determined from data provided by the accelerometer sensor.

71. (Previously Presented) The sensing system of claim 70, wherein one or more of the tire diameter, tire tread depth, tire health, vehicle dynamics, and tire radial load is determined from data including a specific rotational speed of the tire at a given velocity of a vehicle that the vehicle tire is attached to.

72. (Previously Presented) The sensing system of claim 67, wherein the object comprises a vehicle tire and a radial load experienced by the tire is determined from data comprising an interval of radial deformation.

73. (Previously Presented) The sensing system of claim 66, wherein the electrical device or receiver is configured to determine a location or position of the electrical device.

74. (Previously Presented) The sensing system of claim 73, wherein the object comprises a vehicle tire and the location or position is at least one of a location or position of the vehicle tire on a vehicle that the vehicle tire is attached to, or a global location of the vehicle tire are determined from information provided by one or both of the electrical device or the receiver.

75. (Previously Presented) The sensing system of claim 68, wherein the electrical device comprises a gyroscope.

76. (Previously Presented) The sensing system of claim 75, wherein the object comprises a vehicle tire and information from the gyroscope is used to determine one or more parameter selected from the group consisting of tire alignment, tire orientation, tire health, vehicle dynamics, tire radial load, and tire tread depth.

77. (Previously Presented) The sensing system of claim 68, comprising a radio frequency identification element internal or external to the sensor assembly, and wherein the electrical device is configured to transmit a signal to the radio frequency element, and wherein the radio frequency identification element is configured to receive the signal and transmit a signal to the electrical device to read information provided from the radio frequency element.

78. (Previously Presented) The sensing system of claim 58, wherein the electrical device electrical components further comprise:

a printed circuit board comprising electrical circuitry;
one or more of a portable primary, rechargeable, or regenerative power source for providing power to the electrical device; and
an antenna for receiving and/or transmitting information from the electrical device.

79. (Previously Presented) The sensing system of claim 78, wherein the electrical device comprises one or both of a storage element and a processor.

80. (Previously Presented) The sensing system of claim 77, wherein the electrical device comprises one or more of an accelerometer sensor, antenna, and a sensor or chip capable of determining a location or position of the electrical device.

81. (Previously Presented) The sensing system of claim 77, wherein the one or more sensor of the electrical device is configured to sense one or more variables selected from the group consisting of air pressure, temperature, acceleration, tread depth, tire health, load,

alignment, vehicle dynamics, and orientation or location of the environment, the sensor assembly, or the object.

82. (Currently Amended) The sensing system of claim 77, wherein the object comprises a vulcanized rubber vehicle tire, and wherein the housing is configured for connecting ~~attaching~~ with an inside surface of the vehicle tire or connecting with part of a wheel assembly ~~an element attached with the vehicle tire~~ that rotates with the vehicle tire.

83. (Previously Presented) The sensing system of claim 82, wherein the housing is configured for attaching internally or externally to a wheel that the vehicle tire is mounted on.

84. (Currently Amended) The sensing system of claim 82, wherein the housing is configured for attaching ~~with~~ to a valve stem or valve cap of a wheel that the vehicle tire is mounted on.

85. (Previously Presented) The sensing system of claim 59, wherein the object comprises a vulcanized vehicle tire and the retaining member is attached to an inside surface of the vehicle tire by a bonding layer before or after the vehicle tire has been vulcanized.

86. (Currently Amended) A sensing system used with an object that rotates in use comprising:

a sensor assembly comprising a housing having an outer wall structure that defines an open internal cavity therein, wherein the housing is configured for connecting ~~attaching~~ with the object or an element that rotates with the object;

an electrical device comprising electrical components that include one or more sensors, wherein the electrical device is fixedly disposed within the internal cavity, wherein the electrical device is configured to monitor and transmit and/or receive one or more of signals, data, and information regarding surrounding conditions, orientation and/or location, of the sensor assembly, wherein the electrical device comprises:

one or more of a portable primary, rechargeable, or regenerative power source;

an antenna for transmitting and/or receiving one or more of signals, data, and information relating to an operating parameter being monitored by the electrical device;

and

one or more of a receiver, and a transmitter external from the sensor assembly and the object that are configured to wirelessly receive or transmit the one or more of signals, data, and information to or from the electrical device.

87. (Currently Amended) A sensing system used with an object that rotates in use comprising:

a sensor assembly comprising a housing having an outer wall structure that defines an open internal cavity therein; and

an electrical device fixedly disposed within the internal cavity, wherein the electrical device comprises electrical components including one or more sensors, wherein the electrical device is configured to monitor and transmit and/or receive one or more of signals, data, and information regarding surrounding conditions, orientation and/or location, wherein the electrical device comprises:

one or more of a portable primary, rechargeable, or regenerative power source;

and

an antenna for transmitting and/or receiving information relating to an operating parameter of the object being monitored by the electrical device;

a retaining member having an outside surface configured for attaching with ~~a surface of~~ the object or an element connected with the object ~~to rotate with the object in use~~, wherein the retaining member is configured to accommodate placement of a portion of the housing therein to provide an attachment between the housing and the retaining member; and

one or more of a receiver and a transmitter external from the sensor assembly and the object that are configured to wirelessly communicate with the electrical device;

wherein the housing includes a wall structure having a top cover at a first axial end of the wall structure and a base section at an opposed second axial of the wall structure, wherein the retaining member has a wall structure and an open chamber defined therein that is configured to complement the housing wall structure to accept placement of the housing within the retaining member and attachment therewith.

88. (Previously Presented) The sensing system of claim 87, wherein the internal cavity comprises an open space above or below the electrical device disposed within the internal cavity.

89. (Currently Amended) The sensing system of claim 87, wherein the retaining member is formed from an elastomeric material that mitigates transmission of forces received from the object when attached to the object or the element when attached to the element before reaching the housing attached with the retaining member.

90. (Previously Presented) The sensing system of claim 87, wherein the electrical device comprises an accelerometer sensor and is configured to send one or more of data, signals, and information from the accelerometer sensor wirelessly to the external receiver.

91. (Previously Presented) The sensing system of claim 87, wherein the object comprises a vehicle tire and the system is configured to determine one or more parameters consisting of a tire diameter, slip, strain, road conditions or soil conditions, a tire tread depth, tire health, a tire radial load, vehicle dynamics, and vehicle camber and/or toe alignment from data or information provided by the accelerometer sensor.

92. (Previously Presented) The sensing system of claim 87, wherein the object comprises a vehicle tire and the system is configured to determine one or more of a tire diameter, a tire tread depth, tire health, slip, strain, road or soil conditions, vehicle dynamics, and a tire radial load from data including a specific rotational speed of the tire at a given vehicle velocity.

93. (Previously Presented) The sensing system of claim 87, wherein the electrical device or receiver comprises one or more of an antenna, sensor, or chip used for determining a location of the electrical device.

94. (Previously Presented) The sensing system of claim 93, wherein the object comprises a vehicle tire and the system is configured to determine the location of the vehicle tire on a vehicle that the vehicle tire is attached with and/or a global location of the vehicle tire from information provided by the antenna, sensor, or chip.

95. (Previously Presented) The sensing system of claim 87, wherein the electrical device comprises a gyroscope.

96. (Previously Presented) The sensing system of claim 95, wherein the object comprises a vehicle tire the gyroscope is configured to provide information used to determine one or more of tire alignment, tire orientation, tire radial load, tire health, vehicle dynamics, and tire tread depth.

97. (Previously Presented) The sensing system of claim 87, comprising a receiver that is a radio frequency identification element, wherein the electrical device is configured to transmit a signal to read information of the radio frequency identification element.

98. (Currently Amended) A method for using a sensing system comprising a sensor assembly with an object that rotates in use comprising the steps of:

installing an electrical device within an internal cavity of a housing, wherein the housing includes an outer structure that defines the internal cavity, and wherein the electrical device comprises one or more sensors, a portable power source, an antenna, a printed circuit board, and related electrical circuitry, wherein the housing may be open or substantially filled and comprises an opening extending from an outer surface of the housing to at least one sensor of the electrical device;

attaching the housing ~~after the step of installing~~ to a retaining member, wherein the retaining member is configured to accommodate attachment with the housing by mechanical or bonding technique, wherein the retaining member is connected with the object before or after formation of the object; and

monitoring an operating parameter of the object through the use of the electrical device, wherein one or more signals, data, and information related to the operating parameter is wirelessly transmitted from the electrical device to a receiver that is external from the sensor assembly.

99. (Previously Presented) The method of claim 98, wherein during the step of installing, the electrical device is disposed through an opening of the housing internal cavity and

positioned inside of the internal cavity, after the electrical device is positioned inside the internal cavity the opening of the housing is substantially closed by one or more techniques including injection or encapsulation molding, or attaching together or separately a top, wall, and bottom section of similar or different material to the housing internal cavity.

100. (Previously Presented) The method of claim 98, wherein during the step of installing, the electrical device is attached and positioned in place within the internal cavity by contact between the electrical device and one or more surface features of the internal cavity.

101. (Previously Presented) The method of claim 98, wherein the object is a vulcanized rubber vehicle tire, and before the step of attaching, the retaining member is attached with the vehicle tire or with an element that rotates with the vehicle tire when in use before or after the vehicle tire has been vulcanized.

102. (Previously Presented) The method of claim 101, wherein the retaining member is attached to a surface of the vehicle tire by use of an adhesive layer, mechanical fixturing, or during a process of forming the vehicle tire.

103. (Previously Presented) The method of claim 102, wherein the retaining member is attached to the vehicle tire after the step of attaching the housing to the retaining member.

104. (Currently) The method of claim 98, wherein during the step of attaching, the housing is positioned relative to the retaining member according to a display feature that is located on at least one of the housing and the retaining member.

105. (Previously Presented) The method of claim 98, wherein during the step of monitoring, the one or more sensors monitor operating parameters comprising one or more of operating conditions, orientation, and location and transmits by use of the antenna one or more signals, data, and information related to the monitored operating parameter to the receiver, and wherein the electrical device is configured to receive information transmitted from an external device to change one or more feature of the electrical device.

106. (Previously Presented) The method of claim 98, further comprising processing the one more signals, data, or information provided by the electric device by a processing or control unit that is external to the sensor assembly, wherein the processing or control unit is configured to provide one or more of data, signals, or information to adjust or control one or more operating parameters of an object that is connected with the object that rotates in use.

107. (Previously Presented) The method of claim 106, wherein the object that rotates in use comprises a vehicle tire and the object connected with the vehicle tire is a vehicle.

108. (Previously Presented) The method of claim 98, wherein electrical device comprises an accelerometer sensor.

109. (Previously Presented) The method of claim 108, wherein the object comprises a vehicle tire, and wherein during the step of monitoring, one or more of a tire outside diameter, a tire tread depth, tire health, slip, strain, road or soil conditions, a tire radial load, vehicle dynamics, and a vehicle camber and/or toe alignment parameter is determined from the one or more of the signals, data, or information provided by the electronic device.

110. (Previously Presented) The method of claim 106, wherein the object comprises a vehicle tire, and wherein during the step of monitoring, one or more of a tire outside diameter, a tire tread depth, tire health, slip, strain, road or soil conditions, vehicle dynamics, and a tire radial load is determined from the one or more of the signals, data, or information provided by the electrical device relating to a specific rotational speed of the tire at a given vehicle velocity.

111. (Previously Presented) The method of claim 98, wherein the object comprises a vehicle tire and the electrical device or receiver comprises one or more of an antenna, sensor, or a chip used for determining a location of the electrical device, and wherein the step of monitoring comprises monitoring a one or more of a location of the vehicle tire on a vehicle that the vehicle tire is attached to, and a tire location of the vehicle tire as determined from information provided by one or more of the antenna, the sensor, or chip.

112. (Previously Presented) The method of claim 111, wherein the location of the vehicle tire is determined by transmitting information from the antenna, sensor, or chip of the electrical device to one or more receivers that are external to the sensor assembly.

113. (Previously Presented) The method of claim 98, wherein the electrical device comprises a gyroscope.

114. (Previously Presented) The method of claim 113, wherein the object comprises a vehicle tire and the gyroscope if configured to provide information used to determine one or more of tire alignment, tire orientation, tire radial load, tire health, vehicle dynamics, and tire tread depth.

115. (Previously Presented) The method of claim 98, wherein the system comprises a receiver that is a radio frequency identification element, and wherein the electrical device is configured to transmit a signal to read information or data provided by the radio frequency identification element.

116. (Previously Presented) The method of claim 115, wherein the object comprises a vehicle tire and the radio frequency identification element includes information about the vehicle tire comprising one or more of specifications of manufacturer, production date, production location, size, performance specifications, regulatory standards, information relating to a vehicle that the vehicle tire is attached to.

117. (Previously Presented) The method system of claim 115, wherein the electrical device having gathered information or data from the radio frequency identification element, performs a task comprising one or more functions of changing firmware, changing operating parameters, changing identification information, transmitting a signal to an external receiver separate from the radio frequency identification element, or responding to the radio frequency identification element with an additional similar or different signal or task to change specifications.

118. (Currently Amended) A system for monitoring an object that rotates in use comprising a sensor assembly, wherein the sensor assembly is configured to attach connect with the object or an element that rotates with the object, wherein the sensor assembly comprises an electrical device comprising one or more sensors, and wherein the electrical device is configured to provide information for determining a location of the object.

119. (Previously Presented) The system of claim 118, wherein the object comprises a vehicle tire and the electrical device provides information related to one or more of a location of the vehicle tire relative to a vehicle that the vehicle tire is attached to, or a global location of the vehicle tire.

120. (Previously Presented) The system of claim 118, wherein the electrical device is configured to comprise or communicate with at least one of a system or device capable of determining global positioning, or a radio frequency identification element.

121. (Previously Presented) The system of claim 120, wherein one or more of the system or device capable of determining global positioning, or the radio frequency identification element are external to the sensor assembly.

122. (Previously Presented) The system of claim 118, wherein the object comprises a vehicle tire, and wherein the electrical device is configured to provide information for relating to a parameter of the vehicle tire or parameter of a vehicle that the vehicle tire is attached to.

123. (Previously Presented) The system of claim 122, wherein the parameter comprises at least one of vehicle tire load, and vehicle tire tread depth, vehicle tire diameter, vehicle tire health, slip, strain, road or soil conditions, vehicle dynamics, vehicle tire alignment.

124. (Previously Presented) The system of claim 118, comprising:
a transmitter for sending information from the sensor assembly;
a receiver located external of the sensor assembly and object and that is configured to receive information transmitted from the sensor assembly; and

a processor configured to determine from at least one of the information detected from the electrical sensor device and the information transmitted from the sensor assembly, information relating to the location of the object.

125. (Previously Presented) The system of claim 118, wherein the system is configured to one or more of store or process information provided by the sensor assembly external of the sensor assembly.

126. (Previously Presented) The system of claim 118, wherein the electrical device is configured to provide one or more of signals, data, or information relating to object radial load, object tread depth, object diameter, object health, slip, strain, road or soil conditions, vehicle dynamics, and object alignment.

127. (Currently Amended) A system for monitoring an object that rotates in use comprising a sensor assembly, wherein the sensor assembly is configured to connect ~~attach~~ with the object or an element that rotates with the object, wherein the sensor assembly comprises an electrical device comprising one or more sensors, and wherein the electrical device is configured to detect information for determining a dynamic parameter of the object.

128. (Previously Presented) The system of claim 127, wherein the object comprises a vehicle tire, and wherein the dynamic parameter comprises at least one of vehicle tire load, vehicle tire tread depth, vehicle tire diameter, vehicle tire health, slip, strain, road or soil conditions, vehicle dynamics, and vehicle tire alignment.

129. (Previously Presented) The system of claim 127, comprising:
a transmitter for sending information from the sensor assembly;
a receiver located external of the electronic device and object and that is configured to receive information transmitted from the sensor assembly; and
a processor configured to determine from at least one of the information detected from the electrical device and the information transmitted from the sensor assembly, information relating to the dynamic parameter of the object.

130. (Previously Presented) The system of claim 129, wherein the system is configured to one or more of store or process information provided by the sensor assembly external of the sensor assembly.

131. (Previously Presented) The system of claim 128, wherein the electrical device comprises an accelerometer sensor that is configured to provide information relating to the dynamic parameter.

132. (Currently Amended) A system for monitoring an object that rotates in use comprising a sensor assembly, wherein the sensor assembly is configured to connect ~~attach~~ with the object or an element that rotates with the object, wherein the sensor assembly comprises an electrical device comprising one or more sensors, and wherein the electrical device is configured to detect information for determining a parameter of the object as attached to a nonrotating object.

133. (Previously Presented) The system of claim 132, wherein the object comprises a vehicle tire and the nonrotating object is a vehicle, and wherein the electrical device is configured to provide information relating to an alignment of the vehicle tire on the vehicle.

134. (Previously Presented) The system of claim 133, wherein the electrical device is configured to detect information useful for determining one or more of vehicle tire radial load, and vehicle tire tread depth.

135. (Previously Presented) The system of claim 132, comprising:
a transmitter for sending information from the sensor assembly;
a receiver located external of the sensor assembly and object and that is configured to receive information transmitted from the sensor assembly; and
a processor configured to determine from at least one of the information detected from the electrical sensor device and the information transmitted from the sensor assembly, information relating to the parameter of the object as attached to the nonrotating object.

136. (Previously Presented) The system of claim 135, wherein the system is configured to store or process information provided by the sensor assembly external of the sensor assembly.

137. (Currently Amended) A method for determining a location of an object that rotates during use comprising the steps of:

detecting information using a sensor assembly connected ~~attached~~ to the dynamic rotating object or an element that rotates with the object, wherein the sensor assembly comprises an electrical device comprising one or more sensors and that is configured to detect the information from the dynamic rotating object while rotating in use or while not rotating; and

determining from the detected information the location relating to the dynamic rotating object.

138. (Previously Presented) The method of claim 137, wherein the step of determining takes place externally from the sensor assembly.

139. (Previously Presented) The method of claim 137, wherein the object comprises a vehicle tire, and the location that is determined is one or more of a location of the vehicle tire on a vehicle that the vehicle tire is attached to, or a global location of the vehicle tire.

140. (Previously Presented) The method of claim 137, wherein the object comprises a vehicle tire, wherein the electrical device is configured to detect information from the vehicle tire one or more parameters, the method further comprising determining from the detected information vehicle tire load, vehicle tire tread depth, vehicle tire diameter, vehicle tire health, slip, strain, road or soil conditions, vehicle dynamics, and vehicle tire alignment.

141. (Currently Amended) A method for determining a dynamic parameter of an object that rotates in use comprising the steps of:

detecting information using a sensor assembly connected ~~attached~~ to the object or an element that rotates with the object, wherein the object comprises a vehicle tire, and wherein the sensor assembly comprises an electrical device comprising one or more antennas and sensors, wherein the electrical device is configured to detect information from the vehicle tire; and

determining from the detected information the dynamic parameter of one or more of vehicle tire load and vehicle tire tread depth.

142. (Previously Presented) The method of claim 141, wherein during the step of determining, both the vehicle tire load and vehicle tire tread depth are determined.

143. (Previously Presented) The method of claim 141, wherein the sensor assembly is configured to detect information relating to a location of the vehicle tire, and during the step of determining, the location of the vehicle tire is determined from the detected information.

144. (Previously Presented) The method of claim 141, wherein the sensor assembly is configured to detect information relating to an alignment of the vehicle tire, and during the step of determining, the alignment of the vehicle tire as attached to a vehicle is determined from the detected information.

145. (Currently Amended) A method for determining a parameter of an object that rotates in use comprising the steps of:

detecting information using a sensor assembly connected ~~attached~~ to the object or an element that rotates with the object, wherein the dynamic rotating object comprises a vehicle tire that is attached to a vehicle, wherein the sensor assembly comprises an electrical device comprising one or more antennas and sensors, and wherein the electrical device is configured to detect information from the vehicle tire; and

determining from the detected information the parameter of an alignment of the vehicle tire as attached to the vehicle.

146. (Previously Presented) The method of claim 145, wherein the electrical device is configured to detect information relating to a location of the vehicle tire, and during the step of determining, the location of the vehicle tire is determined from the detected information.

REMARKS

Applicant requests that this amendment be entered prior to examination of this application. Applicant has amended claims 58, 59, 63, 67, 82, 84, 86, 87, 89, 98, 104, 118, 127, 132, 137, 141 and 145. No new matter has been introduced by this amendment.

CONCLUSION

Applicant respectfully submits that the present application is in condition for examination. Applicant invites the Examiner to telephone the undersigned if he or she has any questions regarding this Preliminary Amendment or the present application in general.

Further, the Commissioner is hereby authorized to charge any addition fees or credit any overpayment of fees in connection with this paper to Deposit Account No. 19-2814.

Respectfully submitted,

Dated: October 31, 2024

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