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DATA ACQUISITION SYSTEM AND METHOD APPLIED TO PETROLEUM EXPLORATION ENGINEERING

Abstract

A data acquisition system and method applied to petroleum exploration engineering comprises a bridge plug and at least one data logger, where the bridge plug is made of a soluble material, the bridge plug with the data logger is placed in a petroleum exploration channel and gradually displaced to an area with cracks, so that the data logger can monitor temperature and pressure in real time, and then the data logger is retrieved to read and analyze data.

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Background/Summary

TECHNICAL FIELD

[0001] The present invention relates to the technical field of equipment used in petroleum exploration engineering, in particular to a data acquisition system and method applied to petroleum exploration engineering.

BACKGROUND

[0002] At present, for petroleum exploration projects, petroleum exploration channels are generally drilled underground, and then bridge plugs are placed in the petroleum exploration channels in sections. During the placement process, cracks are impacted on an inner wall of a side area at one end portion of the bridge plug facing a channel mouth using the perforating projectile technology, then a fracturing fluid is injected, and finally one port of the bridge plug facing the channel mouth is plugged by a bridge plug ball, and so on. This process is repeated, so that there are fracturing fluid and cracks between two adjacent bridge plugs, and finally the channel mouth of the petroleum exploration channel is closed for a period of time, so that the fracturing fluid gradually expands and extends the cracks, and then the channel mouth of the petroleum exploration channel is manually checked for oil seepage. However, the bridge plug in the prior art lacks real-time monitoring and data acquisition functions, and cannot effectively evaluate plugging effect of the bridge plug and downhole environment state.

SUMMARY

[0003] The present invention provides a data acquisition system and method applied to petroleum exploration engineering to solve the above technical problems.

[0004] The present invention provides a data acquisition system applied to petroleum exploration engineering, including: a bridge plug made of a soluble material and configured to be placed in a petroleum exploration channel; and at least one data logger mounted on the bridge plug, where the at least one data logger is located in an area with cracks in the petroleum exploration channel after the bridge plug is expanded and snapped in the petroleum exploration channel.

[0005] The at least one data loggers includes a housing, and a pressure transducer, a temperature transducer, a data memory and a controller placed in a closed space of the housing; the pressure transducer and the temperature transducer monitor temperature and pressure in the area with cracks in the petroleum exploration channel in real time, and transmit monitored temperature signal and pressure signal to the controller; and the controller converts the temperature signal and the pressure signal into temperature data and pressure data respectively, and transmits the temperature data and the pressure data to the data memory for storage and retention.

[0006] In another aspect, a data acquisition method applied to petroleum exploration engineering includes: mounting at least one data logger on a bridge plug made of a soluble material; placing the bridge plug with the at least one data logger into a petroleum exploration channel and gradually displacing the bridge plug to a specified position; allowing the bridge plug to reach the specified position and be expanded and snapped in the petroleum exploration channel, so that the at least one data logger on the bridge plug is located in an area with cracks and a fracturing fluid in the petroleum exploration channel; allowing the at least one data logger on the bridge plug to enter an operating state to monitor temperature and pressure in the area with cracks in the petroleum exploration channel in real time by the pressure transducer and the temperature transducer of the data logger, and transmit monitored temperature signal and pressure signal to the controller of the data logger; allowing the controller of the data logger to convert the temperature signal and the pressure signal into temperature data and pressure data respectively, and transmit the temperature data and pressure data to the data memory of the data logger for storage and retention; after the bridge plug is dissolved in the fracturing fluid, allowing the at least one data logger to float to a mouth portion of the petroleum exploration channel under the buoyancy of the fracturing fluid; and retrieving the data logger, and then communicatively connecting an upper computer with the data logger to read the data stored in the data memory of the data logger, and analyzing the read data by the upper computer.

[0007] The present invention provides a data acquisition system and method applied to petroleum exploration engineering, which utilizes a data logger provided on a bridge plug to monitor temperature and pressure changes during an oil well plugging process in real time, so that when the bridge plug is dissolved, the data logger can be floated to a channel mouth using a fracturing fluid, and then the data logger is retrieved to read and analyze data to know temperature and pressure of an area with cracks, so that exploration workers can more intuitively observe oil seepage in each area with cracks.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1** is a schematic diagram of putting a bridge plug into a petroleum exploration channel;

[0009] FIG. **2** is a schematic diagram of putting a bridge plug ball into a petroleum exploration channel and plugging a channel port in the bridge plug;

[0010] FIG. **3** is a schematic diagram of a bridge plug after dissolution;

[0011] FIG. **4** is a schematic structural diagram of a bridge plug with a dimple;

[0012] FIG. **5** is a schematic structural diagram of a soluble mounting body mounted on a bridge plug by a connecting column;

[0013] FIG. **6** is a first schematic structural diagram of a data logger mounted in a soluble mounting body;

[0014] FIG. **7** is a second schematic structural diagram of the data logger mounted in the soluble mounting body;

[0015] FIG. **8** is a third schematic structural diagram of the data logger mounted in the soluble mounting body;

[0016] FIG. **9** is a fourth schematic structural diagram of the data logger mounted in the soluble mounting body;

[0017] FIG. **10** is a schematic structural diagram of a data logger mounted on a bridge plug using a soluble sleeve body;

[0018] FIG. **11** is a first schematic structural diagram of a data logger mounted on a soluble sleeve body;

[0019] FIG. **12** is a second schematic structural diagram of the data logger mounted on the soluble sleeve body;

[0020] FIG. **13** is a third schematic structural diagram of the data logger mounted on the soluble sleeve body;

[0021] FIG. **14** is a fourth schematic structural diagram of the data logger mounted on the soluble sleeve body;

[0022] FIG. **15** is a first schematic structural diagram of a data logger;

[0023] FIG. **16** is a second schematic structural diagram of the data logger; and

[0024] FIG. **17** is a flow block diagram of Embodiment 2 of the present invention.

[0025] Reference numerals in the drawings: **1**. data logger; **10**. housing; **11**. circuit board; **12**. pressure transducer; **13**. rechargeable battery; **14**. wireless charging coil; **15**. temperature transducer; **16**. transmitting module; **17**. infrared receiving module; **18**. indicator light; **19**. controller; **3**. soluble mounting body; **30**. through hole; **31**. first shell; **311**. annular recess; **32**. second shell; **321**. annular protrusion; **33**. connecting column; **4**. soluble sleeve body; **40**. mounting hole; **41**. first hoop body; **42**. second hoop body; **43**. convex strip; **44**. first connecting block; **45**.

second connecting block; **46**. elastic connecting wire; **47**. fixing hole; **100**. petroleum exploration channel; **101**. crack; **200**. bridge plug; **201**. soluble bridge plug body; **202**. dimple; and **20**. data memory.

DESCRIPTION OF THE EMBODIMENTS

[0026] The technical solutions in the embodiments of the present invention will be clearly and completely described below in conjunction with the accompanying drawings in the embodiments of the present invention. Obviously, the embodiments described are only part but not all of the embodiments of the present invention. All other embodiments obtained by those of ordinary skill in the art based on the embodiments of the present invention fall within the scope of the present invention.

Embodiment 1

[0027] As shown in FIGS. **1** to **16**, a data acquisition system applied to petroleum exploration engineering described in the present embodiment includes a bridge plug **200** and at least one data logger **1**, the bridge plug **200** is made of a soluble material and configured to be placed in a petroleum exploration channel **100**, and the at least one data logger **1** is located in an area with cracks **101** in the petroleum exploration channel **100** after the bridge plug **200** is expanded and snapped in the petroleum exploration channel **100**; where one or more data loggers **1** may be employed, preferably eight data loggers.

[0028] In one embodiment, the bridge plug **200** includes a soluble bridge plug body **201** and at least one dimple **202** provided on the soluble bridge plug body **201**, the at least one data logger **1** is mounted in the at least one dimple **202**, and a housing **10** of the at least one data logger **1** is arranged in tight fit with an inner wall of the at least one dimple **202**, as shown in FIG. **4**.

[0029] In another embodiment, the bridge plug **200** includes a soluble bridge plug body **201** and at least one soluble mounting body **3**, a mounting space and a through hole **30** communicating the mounting space with the outside are provided in the soluble mounting body **3**, the data logger **1** is placed in the mounting space, and the soluble mounting body **3** is mounted on the soluble bridge plug body **201** via a connecting structure before being placed into the petroleum exploration channel **100**, as shown in FIGS. **5** and **6**.

[0030] Further, the soluble mounting body **3** includes a first shell **31** and a second shell **32**, the first shell **31** and the second shell **32** are spliced and fixed together to form a mounting space therebetween, a through hole **30** is provided on at least one of the first shell **31** and the second shell **32**, the through hole **30** is in an exposed state, and the first shell **31** and the second shell **32** are both made of a soluble material; since an annular recess **311** is formed on an inner wall of a port of the first shell **31**, and an annular protrusion **321** is formed on an outer wall of a port of the second shell **32**, or an annular recess **311** is formed on an inner wall of a port of the second shell **32**, and an annular protrusion **321** is formed on an outer wall of a port of the first shell **31**, where the annular protrusion **321** and the annular recess **311** are formed in a radial direction, the annular protrusion **321** is embedded into the annular recess **311** after being spliced together, so that the first shell **31** and the second shell **32** are fixedly connected to each other, as shown in FIG. **7**.

[0031] In one way in another embodiment, the connecting structure includes a connecting column **33** provided on the first shell **31** or the second shell **32** and at least one connecting hole provided on the soluble bridge plug body **201**, the connecting column **33** on the at least one soluble mounting body **3** is placed in the at least one connecting hole and then threadedly connected or snap-fitted or interference-fitted with each other, and the connecting column **33** is made of a soluble material; or the connecting structure includes a connecting hole provided on the first shell **31** or the second shell **32** and at least one connecting column **33** provided on the soluble bridge plug body **201**, the at least one connecting column **33** on the soluble bridge plug body **201** is placed in the at least one connecting hole and then threadedly connected or snap-fitted or interference-fitted with each other, and the connecting column **33** is made of a soluble material; where the connecting hole is arranged at an end portion of the soluble bridge plug body **201**, and when the soluble bridge plug body **201** is placed into the petroleum exploration channel **100**, the data collector **1** is located at an end position of the soluble bridge plug body **201** facing a channel mouth of the petroleum exploration channel **100**, and the connecting column **33** and the connecting hole are preferentially threadedly connected, as shown in FIGS. **8** and **9**.

[0032] In another way in another embodiment, the bridge plug **200** includes a soluble bridge plug body **201** and a soluble sleeve body **4** hooped on the soluble bridge plug body **201**, at least one mounting hole **40** is provided on the soluble sleeve body **4**, and the housing **10** of the data logger **1** is at least partially placed in the mounting hole **40** and fixed to each other, preferably fixed by interference fit, as shown in FIG. **10**.

[0033] Preferably, the soluble sleeve body **4** includes an elastic connecting wire **46**, a first hoop body **41** and a second hoop body **42**, at least one of the first hoop body **41** and the second hoop body **42** is provided with at least one mounting hole **40**, the first hoop body **41** and the second hoop body **42** are both made of a soluble material, the elastic connecting wire **46** is located between an outer wall on the first hoop body **41** and a mounting area on the first hoop body **41** for mounting the data logger **1**, or the elastic connecting wire **46** is located between an outer wall on the second hoop body **42** and a mounting area on the second hoop body **42** for mounting the data logger **1**; when a half groove of the first hoop body **41** and a half groove of the second hoop body **42** are symmetrical with each other and in fit with an outer wall of the end portion of the soluble bridge plug body **201**, one end of the elastic connecting wire **46** is simultaneously connected with one end of the first hoop body **41** and one end of the second hoop body **42**, and the other end of the elastic connecting wire **46** is simultaneously connected with the other end of the first hoop body **41** and the other end of the second hoop body **42**, so that an inner wall on the half groove of the first hoop body **41** and an inner wall on the half groove of the second hoop body **42** are tightly adhered to an outer wall of the soluble bridge plug body **201**, so that the soluble sleeve body **4** is sleeved and fixed to the outer wall of the soluble bridge plug body **201**; where both ends of the first hoop body **41** are provided with a first connecting block **44**, and both ends of the second hoop body **42** are also provided with a second connecting block **45**, fixing holes **47** on the first connecting blocks **44** are arranged in correspondence to fixing holes **47** on the two second connecting blocks **45** respectively, one end of the elastic connecting wire **46** is simultaneously inserted into the fixing hole **47** on one of the first connecting blocks **44** and the fixing hole **47** on one of the second connecting blocks **45**, and the other end of the elastic connecting wire **46** is simultaneously inserted into the fixing hole **47** on the other of the first connecting blocks **44** and the fixing hole **47** on the other of the second connecting blocks **45**, and each of the fixing holes **47** is respectively fixed with both end portions of the elastic connecting wire **46** by interference fit; and the elastic connecting wire **46** is made of a metal material, generally a steel wire, as shown in FIG. **11**.

[0034] In another embodiment, a convex strip **43** is provided on the first hoop body **41** or the second hoop body **42**, and the convex strip **43** arranged continuously or at intervals is formed on upper and lower edges of the half groove of the first hoop body **41** or the second hoop body **42**, the elastic connecting wire **46** is located between an outer wall of the convex strip **43** and a mounting area on the first hoop body **41** or the second hoop body **42** for mounting the data logger **1**, both ends of the first hoop body **41** located on the convex strip **43** are respectively connected with the two first connecting blocks **44**, and both ends of the second hoop body **42** located on the convex strip **43** are respectively connected with the two second connecting blocks **45**, as shown in FIGS. **12** to **14**.

[0035] As shown in FIGS. **15** and **16**, the data logger **1** includes a pressure transducer **12**, a temperature transducer **15**, a data memory **20** and a controller **19**; the controller **19** may be an MCU chip and has a built-in data processing program; the pressure transducer **12** and the temperature transducer **15** monitor temperature and pressure in the area with cracks **101** in the petroleum exploration channel **100** in real time, and transmit monitored temperature signal and pressure signal to the controller **19**; and the controller **19** converts the temperature signal and the pressure signal into temperature data and pressure data respectively, and transmits the temperature data and the pressure data to the data memory for storage and retention.

[0036] The data logger **1** further includes an infrared transmitting module **16** and an infrared receiving module **17**, and the infrared transmitting module **16** and the infrared receiving module **17** are respectively connected with and controlled by the controller **19**. Here, the infrared transmitting module **16** wirelessly transmits the data stored in the data memory to an upper computer, and the infrared receiving module **17** receives control instructions and configuration information for controlling operation of the data logger **1**, thus realizing wireless data communication.

[0037] The data logger **1** further includes a rechargeable battery **13**, and the rechargeable battery **13** is connected with the controller **19**; and the data logger **1** further includes a wireless charging coil **14**, and the wireless charging coil **14** is connected with the rechargeable battery **13**, and such structural arrangement enables the data logger **1** to be retrieved for charging and reuse, thus realizing the purpose of reuse, so that the battery can be fully charged and prepared for next exploration.

[0038] The data logger **1** further includes the housing **10**; the pressure transducer **12**, the temperature transducer **15**, the data memory, a controller **19**, the infrared transmitting module **16**, the infrared receiving module **17**, the rechargeable battery **13** and the wireless charging coil **14** are all integrated on a circuit board **11** to form a data acquisition module, and the data acquisition module is placed in a closed space of the housing **10**; and the housing **10** is made of an insoluble material, and the housing **10** can be formed by splicing two half shells together, and the two half shells can be fixed by threaded connection or ultrasonic welding during splicing, thus forming a closed space for the data acquisition module to be placed on the housing **10**.

[0039] The first shell **31** and the second shell **32** are made of a soluble material, so that the first shell **31** and the second shell **32** can effectively wrap the data logger in a solid state for a certain period of time, so that the data logger **1** is in a solid state and reaches a predetermined area with the bridge plug, and a fracturing fluid reacts with the first shell **31** and the second shell **32** to slowly dissolve, and the fracturing fluid applies pressure to the cracks during the dissolution process, so that the data logger **1** monitors temperature and pressure changes in the predetermined area, and after the first shell **31**, the second shell **32**, the bridge plug **200** and the soluble sleeve body **4** are all completely dissolved, the data logger **1** floats to a wellhead under the buoyancy of the fracturing fluid, which further facilitates retrieval of the data logger **1**.

Embodiment 2

[0040] As shown in FIGS. **1** to **17**, a data acquisition method applied to petroleum exploration engineering described in the present embodiment is a data acquisition method based on the data acquisition system of Embodiment 1, and the method is as follows.

[0041] At least one data logger **1** is mounted on a bridge plug **200** made of a soluble material. During mounting, the at least one data logger **1** is mounted in at least one dimple **202** on a soluble bridge plug body **201** of the bridge plug **200**, an outer wall of a housing **10** of the at least one data logger **1** is closely fitted to an inner wall of the at least one dimple **202** on the soluble bridge plug body **201** of the bridge plug **200**, or a mouth portion of the at least one dimple **202** on the soluble bridge plug body **201** of the bridge plug **200** is plugged with a soluble plug body to mount the data logger **1**. Generally, the dimples **202** are provided at both ends of the soluble bridge plug body **201** of the bridge plug **200** to mount the data logger **1**.

[0042] Alternatively, the at least one data logger **1** is placed in a mounting space of at least one soluble mounting body **3**, and the at least one soluble mounting body **3** is connected with a connecting hole at an end portion of the soluble bridge plug body **201** of the bridge plug **200** by a connecting column **33** to mount the at least one data logger **1** on the soluble bridge plug body **201** of the bridge plug **200**.

[0043] Alternatively, the at least one data logger **1** is mounted in a mounting hole **40** of a soluble sleeve body **4** and fixed to each other, and the soluble sleeve body **4** is sleeved and fixed to an end portion of the soluble bridge plug body **201** of the bridge plug **200** to mount the at least one data logger **1** on the soluble bridge plug body **201** of the bridge plug **200**.

[0044] In the foregoing description, the number of data loggers **1** is generally eight, but the number of data loggers **1** may be selected to be more or less than eight according to the actual situation.

[0045] The bridge plug **200** with the at least one data logger **1** is placed into a petroleum exploration channel **100** and gradually displaced to a specified position.

[0046] The bridge plug **200** reaches the specified position, and the bridge plug **200** is expanded and snapped in the petroleum exploration channel **100**, so that the at least one data logger **1** on the bridge plug **200** is located in an area with cracks **101** and a fracturing fluid in the petroleum exploration channel **100**. Thus, it is possible to more accurately detect temperature and pressure environment in the area, allowing exploration workers to better judge oil seepage in the area after reading corresponding data.

[0047] The at least one data logger **1** on the bridge plug **200** enters an operating state to monitor temperature and pressure in the area with cracks **101** in the petroleum exploration channel **100** in real time by a pressure transducer **12** and a temperature transducer **15** of the data logger **1**, and transmit monitored temperature signal and pressure signal to a controller **19** of the data logger **1**. The controller **19** of the data logger **1** converts the temperature signal and the pressure signal into temperature data and pressure data respectively, and transmits the temperature data and pressure data to a data memory of the data logger **1** for storage and retention, thus facilitating subsequent retrieval and reading.

[0048] After the bridge plug **200** is dissolved in the fracturing fluid, the at least one data logger **1** floats to a mouth portion of the petroleum exploration channel **100** under the buoyancy of the fracturing fluid. Here, the data logger **1** has buoyancy in the fracturing fluid as the data logger has a hollow and fully enclosed housing **10**.

[0049] The data logger **1** is retrieved, and then an upper computer is communicatively connected with the data logger **1** to read the data stored in the data memory of the data logger **1**, and the upper computer analyzes the read data.

[0050] During gradual displacement of the soluble bridge plug body **201** in the petroleum exploration channel **100**, the pressure transducer **12** and the temperature transducer **15** of the data logger **1** sense environmental conditions around the data logger **1** in real time to determine whether it has reached the specified position, and when the detected environmental data is within the controlled preset threshold range, it is determined that the soluble bridge plug body has reached the specified position.

[0051] A specific structure for mounting the soluble mounting body **3** on the soluble bridge plug body **201** via a connecting structure is the mounting structure in Embodiment 1.

[0052] In the present embodiment, the data logger **1** uses an infrared transmitting module **16** to wirelessly transmit the data stored in the data memory to the upper computer, and/or the data logger **1** uses an infrared receiving module **17** to receive control instructions and configuration information for controlling operation of the data logger **1**, which performs data communication in a wireless manner, so that the pressure transducer **12**, the temperature transducer **15**, the data memory, the controller **19**, the infrared transmitting module **16**, the infrared receiving module **17**, a rechargeable battery **13** and a wireless charging coil **14** are all placed in a closed space of the insoluble housing **10**, and data transmission and reception can also be achieved.

[0053] In the present embodiment, after the data logger **1** is retrieved, the rechargeable battery **13** is charged by the wireless charging coil **14** to prepare for next use.

[0054] In the present embodiment, an operating state of an indicator light **18** of the data logger **1** allows a user to know corresponding device state, where the indicator light **18** is an LED indicator light **18**.

[0055] When the indicator light **18** of the data logger **1** is in an on state, the data logger **1** is in the operating state.

[0056] When the indicator light **18** of the data logger **1** is in an off state, the data logger **1** is in a shutdown state.
[0057] When the indicator light **18** of the data logger **1** is in a flashing state, the data logger **1** is in an operating state of receiving or transmitting data.
[0058] In the foregoing description, the insoluble housing **10** may be light-transmissive, so that the on/off state of the indicator light **18** can be directly observed.

Claims

1. A data acquisition system applied to petroleum exploration engineering, comprising: a bridge plug made of a soluble material and configured to be placed in a petroleum exploration channel; and at least one data logger mounted on the bridge plug, the at least one data logger being located in an area with cracks in the petroleum exploration channel after the bridge plug is expanded and snapped in the petroleum exploration channel; and wherein the at least one data loggers comprises a housing, and a pressure transducer, a temperature transducer, a data memory and a controller placed in a closed space of the housing; the pressure transducer and the temperature transducer monitor temperature and pressure in the area with cracks in the petroleum exploration channel in real time, and transmit monitored temperature signal and pressure signal to the controller; and the controller converts the temperature signal and the pressure signal into temperature data and pressure data respectively, and transmits the temperature data and the pressure data to the data memory for storage and retention.
2. The data acquisition system applied to petroleum exploration engineering according to claim 1, wherein the bridge plug comprises a soluble bridge plug body and at least one dimple provided on the soluble bridge plug body, and the at least one data logger is mounted in the at least one dimple.
3. The data acquisition system applied to petroleum exploration engineering according to claim 1, wherein the bridge plug comprises a soluble bridge plug body and at least one soluble mounting body, a mounting space and a through hole communicating the mounting space with the outside are provided in the at least one soluble mounting body, the at least one data logger is placed in the at least one mounting space, and the soluble mounting body is mounted on the soluble bridge plug body via a connecting structure.
4. The data acquisition system applied to petroleum exploration engineering according to claim 1, wherein the at least one soluble mounting body comprises a first shell and a second shell, the first shell and the second shell are spliced together to form a mounting space therebetween, the through hole is arranged on at least one of the first shell and the second shell, the through hole is in an exposed state, and the first shell and the second shell are both made of a soluble material.
5. The data acquisition system applied to petroleum exploration engineering according to claim 4, wherein the connecting structure comprises a connecting column provided on the first shell or the second shell and at least one connecting hole provided on the soluble bridge plug body, the connecting column on the at least one soluble mounting body is placed in the at least one connecting hole and then threadedly connected or snap-fitted or interference-fitted with each other, and the connecting column is made of a soluble material, or the connecting structure comprises a connecting hole provided on the first shell or the second shell and at least one connecting column provided on the soluble bridge plug body, the at least one connecting column on the soluble bridge plug body is placed in the at least one connecting hole and then threadedly connected or snap-fitted or interference-fitted with each other, and the connecting column is made of a soluble material.
6. The data acquisition system applied to petroleum exploration engineering according to claim 1, wherein the bridge plug comprises a soluble bridge plug body and a soluble sleeve body hooped on the soluble bridge plug body, and at least one mounting hole is provided on the soluble sleeve body; and the housing of the at least one data logger is at least partially placed in the at least one mounting hole and is fixed to each other.

7. The data acquisition system applied to petroleum exploration engineering according to claim 6, wherein the soluble sleeve body comprises a first hoop body and a second hoop body, the first hoop body and the second hoop body are symmetrically arranged and fixed to each other, at least one of the first hoop body and the second hoop body is provided with the at least one mounting hole, and the first hoop body and the second hoop body are both made of a soluble material.
8. The data acquisition system applied to petroleum exploration engineering according to claim 7, wherein the soluble sleeve body further comprises an elastic connecting wire; the elastic connecting wire is located between an outer wall on the first hoop body and a mounting area on the first hoop body for mounting the data logger, or the elastic connecting wire is located between an outer wall on the second hoop body and a mounting area on the second hoop body for mounting the data logger; and one end of the elastic connecting wire is simultaneously connected with one end of the first hoop body and one end of the second hoop body, and the other end of the elastic connecting wire is simultaneously connected with the other end of the first hoop body and the other end of the second hoop body, so that an inner wall on a half groove of the first hoop body and an inner wall on a half groove of the second hoop body are tightly adhered to an outer wall of the soluble bridge plug body, so that the soluble sleeve body is sleeved and fixed to the outer wall of the soluble bridge plug body, and an outer side of the elastic connecting wire is abutted against an outer wall of the data logger.
9. The data acquisition system applied to petroleum exploration engineering according to claim 8, wherein the soluble sleeve body further comprises an elastic connecting wire; and a convex strip is provided on the first hoop body or the second hoop body, and the convex strip is arranged continuously or at intervals along an edge of the inner wall of the half groove of the first hoop body or the second hoop body, and the elastic connecting wire is located between an outer wall of the convex strip and the mounting area on the first hoop body or the second hoop body for mounting the data logger.
10. The data acquisition system applied to petroleum exploration engineering according to claim 1, wherein the data logger further comprises an infrared transmitting module and an infrared receiving module, and the infrared transmitting module and the infrared receiving module are electrically connected with and controlled by the controller respectively.
11. The data acquisition system applied to petroleum exploration engineering according to claim 10, wherein the data logger further comprises a rechargeable battery and a wireless charging coil, the rechargeable battery is electrically connected with the controller, and the wireless charging coil is electrically connected with the rechargeable battery.
12. The data acquisition system applied to petroleum exploration engineering according to claim 11, wherein the pressure transducer, the temperature transducer, the data memory, the controller, the infrared transmitting module, the infrared receiving module, the rechargeable battery and the wireless charging coil are all placed in the closed space of the housing, and the housing is made of an insoluble material.
13. A data acquisition method applied to petroleum exploration engineering, comprising: mounting at least one data logger on a bridge plug made of a soluble material; placing the bridge plug with the at least one data logger into a petroleum exploration channel and gradually displacing the bridge plug to a specified position; allowing the bridge plug to reach the specified position and be expanded and snapped in the petroleum exploration channel, so that the at least one data logger on the bridge plug is located in an area with cracks and a fracturing fluid in the petroleum exploration channel; allowing the at least one data logger on the bridge plug to enter an operating state to monitor temperature and pressure in the area with cracks in the petroleum exploration channel in real time by the pressure transducer and the temperature transducer of the data logger, and transmit monitored temperature signal and pressure signal to the controller of the data logger; and allowing the controller of the data logger to convert the temperature signal and the pressure signal into temperature data and pressure data respectively, and transmit the temperature data and pressure

data to the data memory of the data logger for storage and retention; after the bridge plug is dissolved in the fracturing fluid, allowing the at least one data logger to float to a mouth portion of the petroleum exploration channel under the buoyancy of the fracturing fluid; and retrieving the data logger, and then communicatively connecting an upper computer with the data logger to read the data stored in the data memory of the data logger, and analyzing the read data by the upper computer.

14. The data acquisition method applied to petroleum exploration engineering according to claim 13, wherein the at least one data logger is mounted in at least one dimple on the soluble bridge plug body of the bridge plug, an outer wall of a housing of the at least one data logger is closely fitted to an inner wall of the at least one dimple on the soluble bridge plug body of the bridge plug, or a mouth portion of the at least one dimple on the soluble bridge plug body of the bridge plug is plugged with a soluble plug body.

15. The data acquisition method applied to petroleum exploration engineering according to claim 13, wherein the at least one data logger is placed in a mounting space of at least one soluble mounting body, and the at least one soluble mounting body is connected with a connecting hole at an end portion of the soluble bridge plug body of the bridge plug by a connecting column to mount the at least one data logger on the soluble bridge plug body of the bridge plug.

16. The data acquisition method applied to petroleum exploration engineering according to claim 13, wherein the at least one data logger is mounted in a mounting hole of a soluble sleeve body and fixed to each other, and the soluble sleeve body is sleeved and fixed to an end portion of the soluble bridge plug body of the bridge plug to mount the at least one data logger on the soluble bridge plug body of the bridge plug.

17. The data acquisition method applied to petroleum exploration engineering according to claim 13, wherein the data logger wirelessly transmits the data stored in the data memory to the upper computer using an infrared transmitting module, and/or the data logger receives control instructions and configuration information for controlling operation of the data logger using an infrared receiving module.

18. The data acquisition method applied to petroleum exploration engineering according to claim 13, wherein after the data logger is retrieved, a rechargeable battery is charged by a wireless charging coil in preparation for next use.

19. The data acquisition method applied to petroleum exploration engineering according to claim 13, wherein an operating state of an indicator light of the data logger enables a user to know corresponding device state; when the indicator light of the data logger is in an on state, the data logger is in the operating state; when the indicator light of the data logger is in an off state, the data logger is in a shutdown state; and when the indicator light of the data logger is in a flashing state, the data logger is in an operating state of receiving or transmitting data.

20. The data acquisition method applied to petroleum exploration engineering according to claim 13, wherein the data logger has buoyancy in the fracturing fluid due to a hollow and fully enclosed housing.