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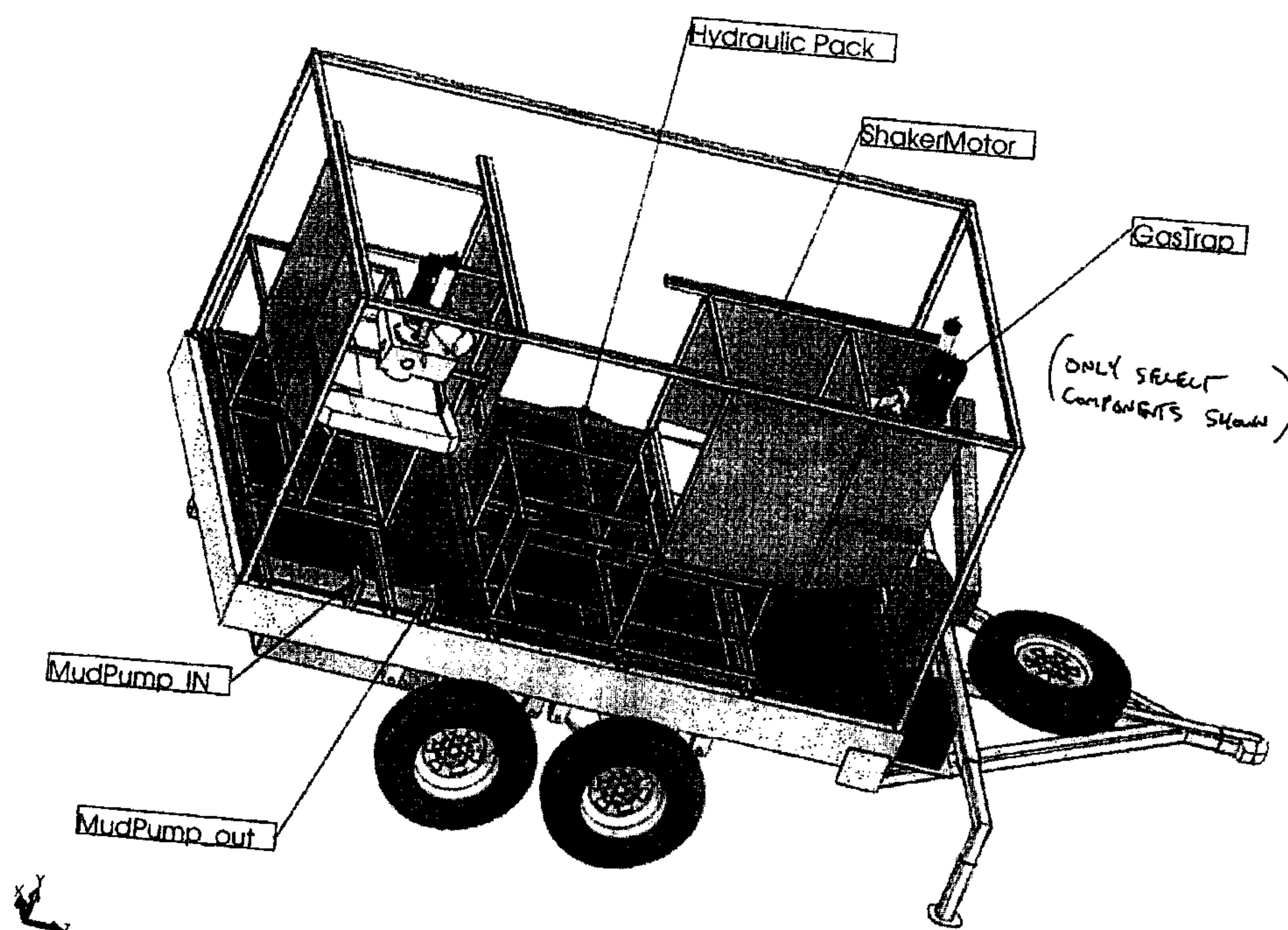
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(54) Titre : METHODE ET EQUIPEMENT D'ANALYSE DES DEBLAIS DE FORAGE SUR PLACE

(54) Title: METHOD AND APPARATUS FOR ON-SITE DRILLING CUTTINGS ANALYSIS



(57) Abrégé/Abstract:

A method and system for drill cuttings analysis including collecting a sample, taking measurements and readings from the sample to provide data, and keeping a portion of sample for storage and/or future analysis. The sample is representative of the formation being drilled and the data may be correlated or indexed to the formation by time, gamma ray or otherwise. The data collection and analysis may be substantially continuous.



## **ABSTRACT**

A method and system for drill cuttings analysis including collecting a sample, taking measurements and readings from the sample to provide data, and keeping a portion of sample for storage and/or future analysis. The sample is representative of the formation being drilled and the data may be correlated or indexed to the formation by time, gamma ray or otherwise. The data collection and analysis may be substantially continuous.

## **METHOD AND APPARATUS FOR ON-SITE DRILLING CUTTINGS ANALYSIS**

### **FIELD OF THE INVENTION**

**[0001]** The present invention relates generally to a method and system for drill cuttings analysis. More particularly, the present invention relates to a method and system for on site drill cuttings analysis while drilling.

### **BACKGROUND OF THE INVENTION**

**[0002]** During drilling of sub-surface formations, drilling mud is circulated down the hole to flow up the drill bit cuttings. The cuttings are separated from the mud and then may be directed to an apparatus for further processing and measurements, for example as described by the author in US Patent # 6,386,026 "Cuttings Sample Catcher and Method of Use" and additionally disclosed in US Patent Application No. 10/711,333 "Drilling Cutting Analyzer System and Methods of Applications" (Published US 2005-0082468).

### **SUMMARY OF THE INVENTION**

**[0003]** It is an object of the present invention to obviate or mitigate at least one disadvantage of previous systems for drilling cuttings data collection and analysis.

**[0004]** In general terms, in an active mud drilling system, drilling fluid (mud) is returned to surface containing drill cuttings generated at the cutting face of the drill bit. A slipstream sample portion of the drilling mud containing drill cuttings is taken as representative of the drilling mud containing drill cuttings. The sample is conveyed to a portable analysis/collection system. The portable analysis/collection system may provide analysis and collection of the gas and the drilling cuttings. A wide range of analysis may be performed. A small representative sample is continuously or substantially continuously collected for storage and/or further analysis. The bulk of the slipstream is returned to the mud tanks for treatment/reuse/recycling/disposal. The data collected from analysis may be correlated to open hole logs, known geological markers or interfaces, and/or from the dept of the drill bit from where the drill cuttings were generated.



**[0005]** Other aspects and features of the present invention will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

**[0006]** Embodiments of the present invention will now be described, by way of example only, with reference to the attached Figures, wherein:

Fig. 1 is a simplified schematic of an embodiment of the present invention;  
and

Fig. 2 is one embodiment of a simplified schematic of a mobile data analysis and collection module of the present invention.

## **DETAILED DESCRIPTION**

**[0007]** Generally, the present invention provides a method and system for drill cuttings analysis including collecting a sample, taking measurements and readings from the sample to provide data, and keeping a portion of sample for storage and/or future analysis. The sample is representative of the formation being drilled and the data may be correlated or indexed to the formation by time, gamma ray or otherwise. The data collection and analysis may be substantially continuous.

### **1. MECHANICAL**

**[0008]** During the drilling of a well, a portion of the drilling fluid (mud) returns containing drilling cuttings may be sampled (for example continuously, semi-continuously, or intermittently).

**[0009]** One particularly advantageous location for drawing the sample is at the possum belly (See Fig. 1). The sample is conveyed to a moveable analysis/collection system, for example through the use of a mud pump, for example using the methods and apparatus of US 10/907,485 CENTRIFUGAL PUMP WITH SCREW PUMP ACCELERATOR, US 11/945,095 and CA 2,612,392 CENTRIFUGAL PUMP WITH SCREW PUMP ACCELERATOR AND REVERSE FLOW VANE, or otherwise.

**[0010]** Optionally, gases may be liberated and analyzed, for example using the methods and apparatus of US Patent No. 6,389,878 and CA 2,270,833 GAS TRAP for DRILLING MUD or otherwise.

**[0011]** The mechanical equipment may be conveniently housed in a portable building, vehicle mounted such as truck and/or trailer or skid mounted. Fig. 1 depicts an example of trailer mounted.

**[0012]** The sample stream may be analyzed to obtain a wide variety of measurements and a small sample may be retained for storage and subsequent further analysis or measurement.

**[0013]** The bulk of the sample stream is returned to the mud tank for processing/re-use/recycling/treatment/disposal.

## 2. MEASUREMENT

**[0014]** The sample stream may be processed, for example, using the methods and apparatus of US 10/711,33 published US 20050082468 DRILLING CUTTING ANALYZER SYSTEM and US 12/033,560 and CA 2,499,013, using the methods and apparatus of US 12/000,723 and CA 2,615,140 FLOW DENSITY TOOL, using the method and apparatus of US 12/000,722 and CA 2,615,144 SPECTROGRAPH TOOL, using the method and apparatus of US 09/301,726 and CA 2,236,615 DIFFERENTIAL TOTAL-GAS DETERMINATION WHILE DRILLING, using the methods and apparatus of US 6,290,000 and CA 2,256,248 QUANTIFICATION OF THE CHARACTERISTICS OF POROUS FORMATIONS WHILE DRILLING - HYDROCARBON SATURATION, using the methods and apparatus of US 6,301,953 and CA 2,256,255 QUANTIFICATION OF DRILLING MUD CUTTINGS CHARACTERISTICS AS A MEASURE OF RELATIVE PERMEABILITY, using the methods and apparatus of US 60/929,348 NON POLARIZED CONTACTS FOR RESISTIVITY MEASUREMENT IN DRILL CUTTINGS SAMPLES FOR SLWD, or other measurement/analysis.

**[0015]** As mentioned above, optionally, gases may be liberated and analyzed, for example using the methods and apparatus of US Patent No. 6,389,878 and CA 2,270,833 GAS TRAP for DRILLING MUD or otherwise. The liberated gas may be dried, for example,



using the methods and apparatus of US 60/929,355 FLOATING BUBBLE JAR GAS DRYER FOR MUD GAS ANALYZER.

**[0016]** A number of further measurement and calculations may be used to generate further data, for example using the methods and apparatus of US 60/996,517 method and apparatus for measurement of formation fluid loss.

### 3. SAMPLE COLLECTION

**[0017]** In one embodiment, the sample may be returned to the mud tanks without collecting and retaining a representative sample. In one embodiment, a small representative sample may be collected and retained for storage and/or further analysis.

**[0018]** A relatively small sample may be collection, for example, using the methods and apparatus of US 6,386,026 and CA 2,2289,333 CUTTINGS SAMPLE CATCHER AND METHOD OF USE.

### 4. DATA TRANSMISSION AND COLLECTION

**[0019]** The data collected may be transferred and/or collected wirelessly of via wired systems.

### 5. DATA NOISE FILTERING AND CORRECTION

**[0020]** The data may be filtered and/or corrected using software data filtering and/or drilling and geological logic.

### 6. DATA PROCESSING

**[0021]** The data measurement and analysis may be correlated to the subsurface formation through a number of techniques. Those techniques, for example, may include comparison of select data to known data to provide a correction factor, based on time or depth and redetermining the correction factor applying or reapplying the correction factor. Those techniques include gamma correlation, time correlation, depth correlation. The data collected from analysis may be correlated to open hole logs, known geological markers or interfaces, and/or from the dept of the drill bit from where the drill cuttings were generated.

## 7. SAMPLE ANALYSIS AND STORAGE

**[0022]** The relatively small sample may be collected and stored, for example using the methods and apparatus of US 10/711,467 and US 11/649,826 and CA 2,499,862 and CA 2,617,048 MINI CORE IN DRILLING SAMPLES FOR HIGH RESOLUTION FORMATION EVALUATION ON DRILLING CUTTINGS SAMPLES.

**[0023]** The relatively small sample may be washed, for example using the methods and apparatus of US 10/906,850 SAMPLE WASHER FOR DRILLING CUTTINGS AND OTHER UNCONSOLIDATED AND DISCREET MEDIAS.

**[0024]** The relatively small sample may be further analyzed, for example using the methods and apparatus of US 10/711,469 and CA 2,499,762 FORMATION GAS PORE PRESSURE EVALUATION ON DRILLING CUTTINGS SAMPLES, US 6,715,347 and CA 2,271,656 DETERMINING PERMEABILITY OF HC-BEARING FORMATIONS USING FLUORESCENCE, US 10/710,840 Microgranulometry and methods of applications.

**[0025]** Analysis and/or measurement of the relatively small sample may be assisted, for example using the methods and apparatus of US 10/711,435 and CA 2,499,767 HORIZONTAL BINOCULAR MICROSCOPE FOR VERTICALLY GRAVITATED AND FLOATING SAMPLES.

## 8. OTHER METHODS

**[0026]** Another method of achieving further date includes, for example, the methods and apparatus of US 6,273,202 and CA 2,256,258 SWAB TEST FOR DETERMINING RELATIVE FORMATION PRODUCTIVITY.

**[0027]** The subject matter contained in the patents and patent applications referred to herein are hereby incorporated by reference.

**[0028]** In the preceding description, for purposes of explanation, numerous details are set forth in order to provide a thorough understanding of the embodiments of the invention. However, it will be apparent to one skilled in the art that these specific details are not required in order to practice the invention.

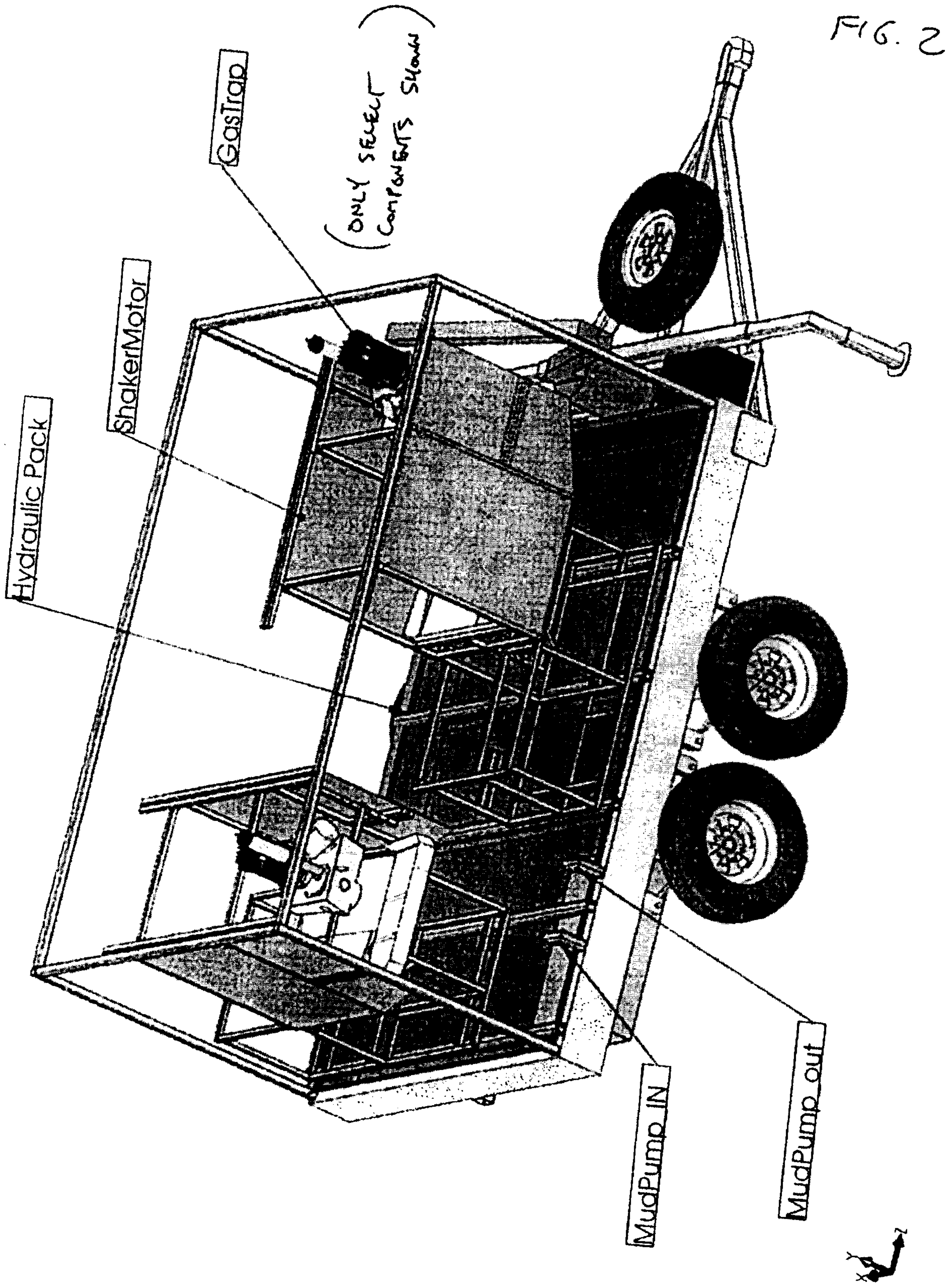
**[0029]** The above-described embodiments of the invention are intended to be examples only. Alterations, modifications and variations can be effected to the particular embodiments by those of skill in the art without departing from the scope of the invention, which is defined solely by the claims appended hereto.



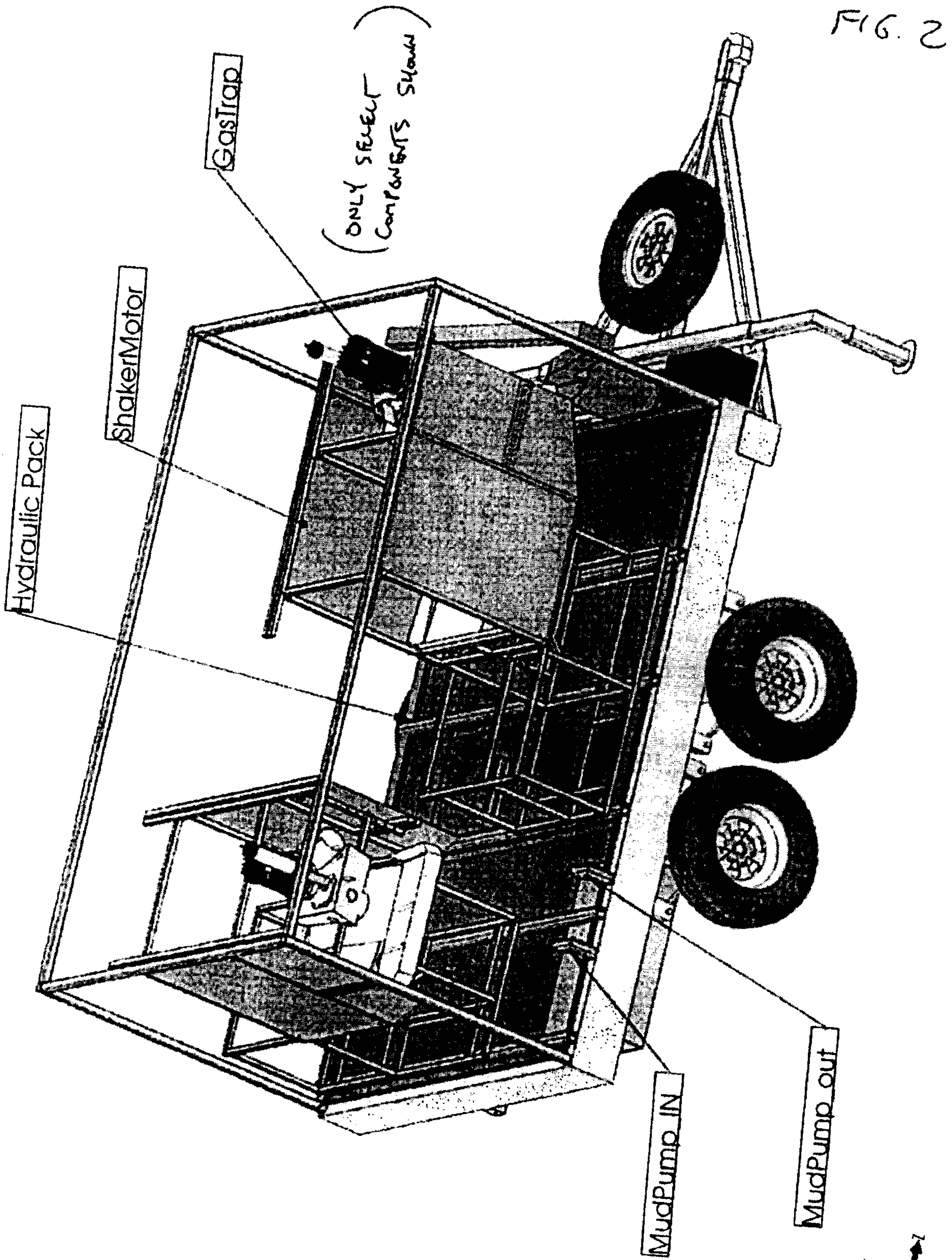
What is claimed is:

1. A method and system for drill cuttings analysis comprising:
  - a. obtaining a sample of the drill cuttings; and
  - b. measuring data from the sample.
2. The method of claim 1, further comprising returning the sample for recycling, treatment, or disposal.
3. The method of claim 1, wherein the sample is obtained from the possum belly.
4. The method of claim 1 further comprising providing a relatively small sample from the sample, the relatively small sample representative of the sample.
5. The method of claim 1, further comprising logging drilling parameters.
6. The method of claim 1, further comprising translating the data to industry standard parameters.
7. The method of claim 1, further comprising calibrating the data to industry standards.
8. The method of claim 1, further comprising noise filtering and/or correcting the data to industry standards.
9. The method of claim 5, wherein the drilling parameters comprise drilling depth, gamma ray emissions and/or other parameters.
10. The method of claim 6, wherein the data is correlated to one or more drilling parameters.
11. The method of claim 4, the relatively small sample vertically linearly representative of the sample.
12. The method of claim 4, further comprising retaining the relatively small sample for storage and/or further analysis.











Hydraulic Pack

Shaker Motor

Gas Trap

(ONLY SELECT  
COMPONENTS SHOWN)

Mud Pump IN

Mud Pump out

