

[54] **APPARATUS FOR DETERMINING THE GAS CONTENT OF SAMPLES**

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[56] **References Cited**

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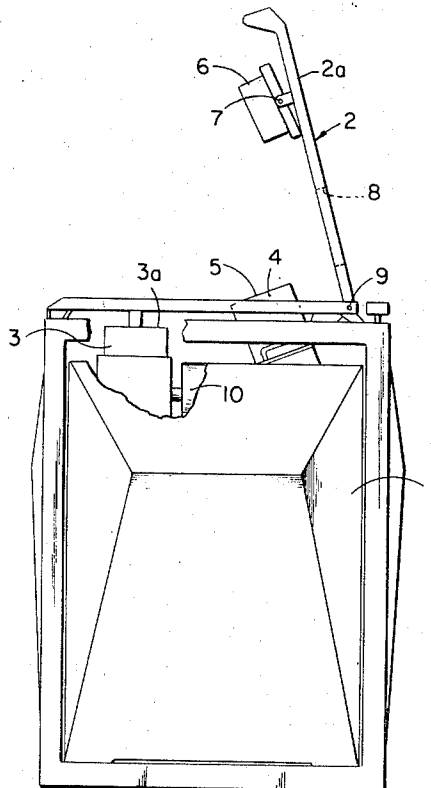
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[57] **ABSTRACT**

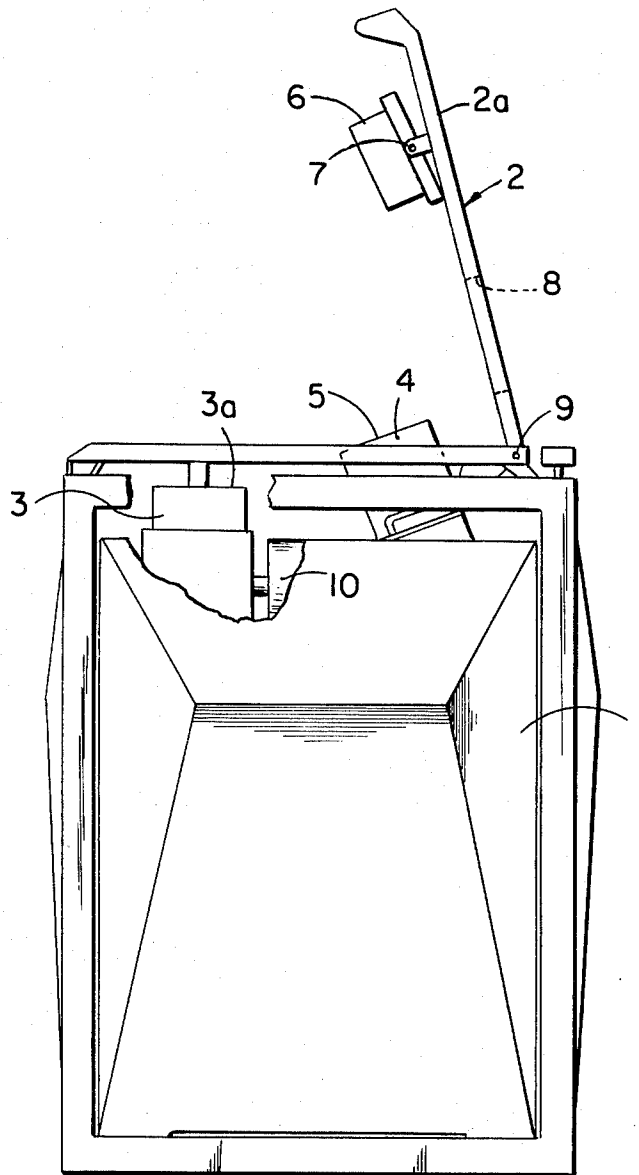
An apparatus for determining the gas content of samples includes a vacuum furnace for heating the samples to be tested which is arranged within a protective housing having a closeable cover and which is connected to a pump within the housing provided for evacuating the furnace. The apparatus includes an indicator for analyzing the gases extracted from the samples, arranged with the furnace in the upper portion of the housing adjacent the cover. The cover is hinged and carries a pivotally mounted cover for the furnace which is located so that it will seat over the furnace closure rim and close it in a gas tight manner when the cover is closed. The cover also includes an opening which is aligned with the indicator so that the indicator readings can be viewed through the cover.

**4 Claims, 1 Drawing Figure**



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## APPARATUS FOR DETERMINING THE GAS CONTENT OF SAMPLES

### SUMMARY OF THE INVENTION

This invention relates in general to the construction of gas content determining devices, and in particular, to a new and useful apparatus for determining the gas content of samples which is contained within a protective housing which includes a cover which pivotally mounts on its underside a cover for the vacuum furnace, the furnace cover being movable with the protective housing cover.

The present invention is particularly applicable to an apparatus for determining the gas content of samples and which comprises a vacuum furnace closed by a cover. A pump is connected to the furnace in order to permit evacuation of the furnace and the apparatus includes an indicator for indicating the gas analysis of the gases extracted from the samples within the furnace. For degasing the samples, a small induction heated graphite crucible is used principally and this is arranged in the vacuum furnace housing. The furnace, itself, is evacuated through a pump connected to the furnace and which consists of a diffusion pump and a backing pump. The gases which are given off by the sample on heating within the furnace are withdrawn from the furnace usually through the same pump and they are fed to suitable gas determining apparatus. For the determination of the type and manner of the extracted gases, there is employed for example, a thermal conductivity and infrared absorption. The result of this gas determination is shown visibly on an indicator arranged adjacent the top of the protective housing.

Before the evacuation, the furnace must be closed tightly and the furnace is usually provided with a cover having a packing which can be pressed on the furnace closure seat at the opening of the furnace housing. After an extraction the furnace can be opened again and a new sample can be introduced. Even if locks are provided for the introduction of the new samples the furnace must be opened from time to time, for the maintenance and cleaning operations, and then closed again.

In accordance with the present invention, there is provided an arrangement of the apparatus within a protective casing which has a cover which may be opened to also open the furnace top and which also includes a visual site area which may be aligned with the indicator for the gas analysis located within the housing. The arrangement permits a time saving operation and a reliable operation of the apparatus. In particular, the handles which are required for operating the apparatus are reduced to a minimum.

In the presently known arrangements, the so-called setting period, that is, the time required to charge the furnace with a sample, to evaluate it and to recover, after the extraction, the residues of the old samples so that the furnace is again ready for a new analysis, was a substantial part of the total working time necessary for a cycle. A short setting period is of great importance for the economical operation of gas determination apparatus for example, in the continuous examination of steel samples in a steel mill during production. This does not refer to the working time necessary for carrying out the analysis but to the waiting periods in the

course of the production, generally, and the possibility of having analytical results available in time during a production process which cannot be stopped. For example, the amount of alloying components to be added in a metallurgical process must be determined in time and added to the proper stage of the process. Similarly a refining process must be supervised on the basis of the current control of the composition of the steel. It is therefore advisable to arrange all of the parts in a protective housing which is to be used in production plants and which is provided with a door to make the various parts accessible for operation and attendance.

In accordance with the invention, such a housing includes a cover which carries a furnace cover on its interior side which is pivotally mounted and located so that it will be swung into position to align and close the top of the furnace when the cover is closed. The cover advantageously includes a sighting area which is aligned over an indicator for observing the gas condition which are determined by the apparatus.

Accordingly, it is an object of the invention to provide an improved apparatus for determining the gas content of samples and which includes a vacuum furnace for heating the samples to be tested arranged within a protective housing which is closed by a cover, the cover being pivotally mounted on the housing and having a furnace cover articulated thereto and oriented so that it will be positioned over and closed against the furnace when the cover is in a closed position.

A further object of the invention is to provide an apparatus for determining the gas content of samples which is simple in design, rugged in construction and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

### BRIEF DESCRIPTION OF THE DRAWINGS

The only FIGURE of the drawing is a side elevational view partly broken away of an apparatus for determining the gas content of samples constructed in accordance with the invention.

### GENERAL DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing in particular, the invention embodied therein comprises an apparatus for determining the gas content of samples which includes a protective housing 1 having a cover or closure door 2 which is pivotally mounted at 9 adjacent one side, for example, the top of the protective housing 1.

The protective housing contains a vacuum furnace 3 which is evacuated by pump means such as a pump 10 which is partially shown. Heating means are included in the protective housing for heating the furnace to suitable operational temperatures. An indicator 4 for visually showing the analysis of the gases extracted from the samples in the furnace is located directly beneath the cover 2. It includes a front side 5 on which the measuring result can be read.

In accordance with the invention, the cover 2 carries a furnace closure or furnace cover 6 which is pivotally mounted on bracket 7 on the underside of the housing cover 2. The furnace closure 6 is mounted so that when the cover 2 is closed it will engage on a seat 3a of the furnace and bear, due to its movable connection, on the bracket 7 until it is centered evenly on the packing surface of the seat 3a and pressed downwardly thereon upon further closing of the cover 2 with a corresponding closure force to seal the furnace 3 vacuum tight.

A further feature of the invention is that the protective housing cover 2 also has an opening or visual viewing area 8 which can be used in the closed state as a sight area for observing the front side of the indicator 4. The invention has a special advantage that by opening the door 2 the entire maintenance equipment can be exposed, and the furnace is also opened for introducing new samples for replacing the crucible or for other maintenance operations. The apparatus can immediately be conditioned for use again and the cover again closed to carry out further testing.

The cover 2 includes an interior surface 2a which is made substantially flat so that when it is closed it forms a surface which may be employed as a writing support.

What is claimed is:

1. An apparatus for determining the gas content of samples comprising a protective housing having an

opening, a housing cover for said housing pivotally mounted on said housing adjacent said opening and being pivotable between a closed position covering said opening and an opened position, a furnace for heating samples to be tested located within said housing and having a closure seat facing said cover, a pump connected to the furnace for evacuating said furnace, an indicator in said housing having an indicator face facing toward said cover, and a furnace cover pivotally carried on said housing cover and being movable therewith to engage over said closure seat on said furnace and to seal said first furnace when said housing cover is closed and to open said furnace when said housing cover is opened.

2. An apparatus, according to claim 1, wherein said furnace cover is pivotally mounted on the underside of said housing cover.

3. An apparatus, according to claim 1, wherein said cover includes a surface having a sight area thereon, orientable over said indicator face when said cover is closed to permit reading of the indicator face.

4. An apparatus, according to claim 1, wherein said cover comprises a substantially flat member having a flat exterior surface a bracket extending inwardly from the underside of said cover, said furnace cover being pivotally mounted on said bracket.

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