(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
14 July 2016 (14.07.2016)

WIPO | PCT

(10) International Publication Number
WO 2016/111794 A1

(51) International Patent Classification:
G01N 27/84 (2006.01)

(21) International Application Number:
PCT/US2015/064450

(22) International Filing Date:
8 December 2015 (08.12.2015)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10 2015 200 068.0
7 January 2015 (07.01.2015) DE

(71) Applicant: **ILLINOIS TOOL WORKS INC.** [US/US]; 155 Harlem Avenue, Glenview, Illinois 60025 (US).

(72) Inventor: **VETTERLEIN, Thomas**; Senefelder Strasse 66, 63069 Offenbach am Main (DE).

(74) Agent: **HAUPTMAN, Benjamin, J.**; Hauptman Ham, LLP, 2318 Mill Road, Suite 1400, Alexandria, Virginia 22314 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *with international search report (Art. 21(3))*

(54) Title: APPARATUS AND METHOD FOR MANUAL MAGNETIC POWDER TESTING

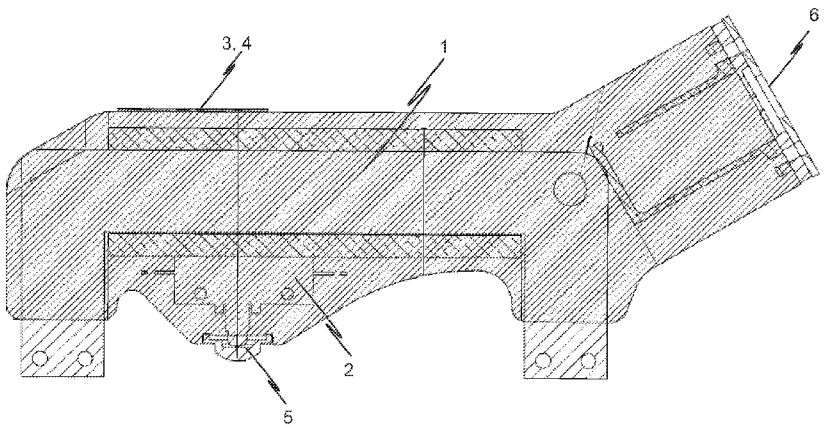

Fig. 2

(57) Abstract: An apparatus for manual magnetic powder testing, the apparatus having a magnetizing device (1) for magnetizing a workpiece as and when required. The apparatus additionally has a program control device (2), in which at least one test parameter for at least one magnetic powder testing application is stored.

WO 2016/111794 A1

APPARATUS AND METHOD FOR MANUAL MAGNETIC POWDER TESTING

Description

The present invention relates to an apparatus for manual magnetic powder testing, the apparatus having a magnetizing device for magnetizing a workpiece as and when required.

Non-destructive materials testing plays an important part for testing workpieces, in particular a welding seam on a workpiece. Non-destructive materials testing has a high significance not only with regard to industrial applications but also in everyday use. The safety of human life and goods is ensured only by well-established quality management, which also includes the testing of materials. This can be realized only by controlled and reproducible testing methods. If the test piece is magnetizable, magnetic powder testing should be given priority for reasons of test safety. For this purpose, manually guided test instruments for optical crack testing are used, inter alia, which can detect cracks in the surface or in the vicinity of the surface of a workpiece according to the magnetic powder testing method.

Surface cracks or superficial cracks can adversely affect the reliability of a workpiece or even result in failure of the workpiece. Particularly in the case of welding seams, for example in the case of pipelines, such cracks can entail fatal consequences for operation. Therefore, the checking of workpieces or other components with regard to material faults is of great importance.

This also applies to ongoing production of products already known, since any manufacturing method can also lead to faults or else there is a certain fault rate in a known manufacturing method.

Non-destructive materials testing is of great practical importance since the tested workpiece is undamaged and can continue to be used after testing. As a result, firstly, costs are saved and, secondly, the quality of a workpiece can be determined, which workpiece can then be supplied for its actual intended use.

During magnetic powder testing, a workpiece is magnetized or at least partly magnetized. Partial magnetizing is present here for example, if a large workpiece such as a pipeline is intended to be examined. In such a case, it suffices for the workpiece to be magnetized in the region which is intended to be examined. During magnetizing, magnetic field lines are induced in the surface of a workpiece. In this case, the field lines run parallel to the surface of the workpiece. If the workpiece has an inhomogeneity, in particular a crack, in its surface or in the vicinity of its surface substantially perpendicular to the field lines, the field lines are displaced from the crack in the region of the crack since the magnetic permeability is lower in the region of the crack (in

this case the medium is typically normal atmospheric air). These field lines displaced in this way emanate from the surface.

In order to visualize such leakage fields, ferro- or paramagnetic material, preferably iron powder, is applied to the surface of the workpiece. The powder material can be dry or moist and colored for better visibility. The ferromagnetic powder material accumulates along the magnetic field lines that emanated, as a result of which a material agglomeration occurs in this region. Said material agglomeration is visible to the naked eye and has the consequence that a crack in the workpiece which is not visible, or only visible with difficulty, to the naked eye can be identified.

In the magnetic powder testing method, handheld instruments having a yoke magnet are used in certain fields of application, said yoke magnet usually being designed as an electromagnet. When such handheld instruments are used, the user places the handheld instrument onto the workpiece to be tested and activates the electromagnet, such that the workpiece onto which the handheld device has been placed is magnetized. The workpiece must therefore be a material that has a relatively high magnetic permeability, in particular is ferromagnetic.

Following the magnetizing or partial magnetizing of the workpiece, the user applies a ferromagnetic powder in the test region. The magnetic powder accumulates, as described above, in regions of the workpiece in which superficial cracks of the workpiece are present.

What is problematic here is that a reproducible and good detectability of cracks depends on various test parameters. In particular the workpiece, depending on the characteristics of the workpiece, must be sufficiently magnetized and, after the ferromagnetic powder has been applied, post-magnetizing has to be carried out in order to amplify the crack indication and to prevent the ferromagnetic powder from being washed away.

Correct implementation of the magnetic powder testing method thus necessitates an experienced user who must be familiar both with the technical characteristics of the apparatus for magnetic powder testing and with the exact characteristics of the workpiece in order to be able to implement the test correctly. Particularly the required magnetizing time and the required post-magnetizing time must be implemented correctly depending on the abovementioned characteristics in order to achieve the effect that the workpiece test is reproducible.

On the basis of this problem, the present invention is based on the object of developing an apparatus for manual magnetic powder testing of the type mentioned in the introduction to the effect that a workpiece test using such an apparatus always yields optimum and reproducible results, even if the apparatus is operated by an inexperienced user.

Furthermore, the intention is to specify a correspondingly simplified method for operating an apparatus for manual magnetic powder testing.

With regard to the apparatus, the object on which the invention is based is achieved according to the invention by means of the subject matter of independent patent claim 1. With regard to the method, the object on which the invention is based is achieved by means of the subject matter of alternative independent patent claim 13. Advantageous developments are specified in the dependent patent claims.

Accordingly, the invention proposes, in particular, an apparatus for manual magnetic powder testing which has a magnetizing device for magnetizing a workpiece as and when required, and a program control device, wherein at least one test parameter for at least one magnetic powder testing application is stored in the program control device.

The advantages achievable by means of the invention are obvious. While the experience of the user is important in conventional apparatuses for magnetic powder testing, in order to obtain reproducible and correct test results, such an experienced user is no longer required in the case of the apparatus according to the invention since the test parameters relevant to magnetic powder testing are already stored in the program control device. Consequently, even an inexperienced user can optimally implement magnetic powder testing since the apparatus for magnetic powder testing provides said user with the relevant test parameters for this purpose or the test parameters are already stored. Therefore, a magnetic powder testing application is significantly simplified.

One aspect of the invention provides for a magnetizing time and/or a post-magnetizing time and/or a magnetizing intensity of the magnetizing device to be stored in the program control device.

This advantageously enables the user to use the relevant test parameters with respect to the magnetic powder testing application.

The term magnetizing time as used herein is taken to mean the time period from the beginning of magnetizing the workpiece by means of the magnetizing device until the point in time at which the magnetic powder was applied to the workpiece, which can be carried out in a wet method, as oil or using water as powder carrier, or else in a dry fashion. The magnetizing time is chosen in such a way that sufficient magnetizing of the workpiece to be tested is achieved. This magnetizing time is dependent on the strength of the electromagnet provided in the apparatus, or

the magnetizing device, the workpiece that is intended to be magnetized, and possible coatings, etc.

The post-magnetizing time indicates how long a user must maintain magnetizing of the workpiece after the magnetic powder has been applied, in order to ensure a sufficient detectability of cracks depending on the workpiece characteristics, the characteristics of the applied ferromagnetic material and the characteristics of the apparatus for magnetic powder testing. Therefore, the post-magnetizing time is the time period from the end of applying the magnetic powder to the end of magnetizing.

The magnetizing intensity indicates the magnetic (field) intensity that is generated by the magnetizing device during the magnetizing and/or during the post-magnetizing. This can be varied for example depending on the thickness of the workpiece to be examined or the external temperature. In this case, it is possible to examine thicker workpieces when a higher magnetizing intensity is applied, since magnetic field lines penetrate more deeply into the workpiece, and e.g. overheating of the magnetizing device or of the apparatus for magnetic powder testing is prevented if the magnetizing intensity is reduced at high external temperatures.

The magnetizing time, the post-magnetizing time and/or the magnetizing intensity can be stored as test parameters in the program control device.

In accordance with a further aspect of the invention, it is provided that at least one program which, depending on the magnetic powder testing application, defines at least one test parameter, preferably a portion of the test parameters relevant to a specific magnetic powder testing application, is stored in the program control device.

The programs are advantageously chosen such that all relevant test parameters with regard to a specific magnetic powder testing application are contained in the program. Consequently, even a complex magnetic powder testing application can be implemented optimally even by a relatively inexperienced user, without the latter having to have specific knowledge about the characteristics of the test to be carried out.

A magnetic powder testing application is characterized by the testing of various workpieces having various material thicknesses, various coatings, in particular coating thicknesses, and/or with various testing accuracies.

Furthermore, it is conceivable for the apparatus to have various spatial positions with respect to the workpiece, in particular with respect to the surface of a workpiece to be tested.

By virtue of the fact that the test parameters and preferably the programs stored in the program control device are designed to enable the abovementioned magnetic powder testing applications to be implemented, it is possible for an inexperienced or relatively inexperienced user to implement a multiplicity of different workpieces under different conditions.

By way of example, the magnetizing time is increased if a workpiece having a relatively low magnetic permeability is intended to be examined. Correspondingly, a short magnetizing time can be chosen if the workpiece has a high magnetic permeability.

If the workpiece has a relatively high material thickness, the magnetizing time is in turn increased in order that the magnetic field lines penetrate more deeply into the workpiece or, in a relatively deep region of the workpiece, still have a sufficient density to enable optical crack detection by displacement of the field lines. A corresponding situation applies to a relatively low material thickness.

Correspondingly, the post-magnetizing time can be chosen to be longer if a relatively thick workpiece is examined, in order to enable the magnetic powder to accumulate sufficiently above a crack.

Coatings of the workpiece have the effect that magnetic field lines possibly do not emanate from the workpiece, but rather remain in the coating. A material agglomeration of the magnetic powder is made more difficult or impossible as a result. In order to prevent this, a higher magnetizing time and/or a higher post-magnetizing time can be chosen in order to ensure a sufficient material agglomeration.

A corresponding situation applies to the magnetizing intensity, i.e. the intensity of a magnetic field that is generated by the electromagnet provided in the apparatus for magnetic powder testing. Said intensity can be chosen to be higher if a workpiece having low magnetic permeability is intended to be examined or a workpiece having a high material thickness is intended to be examined or a workpiece having a coating, preferably a relatively thick coating, is intended to be examined.

On the other hand, it is conceivable that the testing accuracy can be varied. The term testing accuracy as used herein is taken to mean cracks of what size and/or what depth in the workpiece can be identified. In the case of a relatively low testing accuracy only relatively large cracks at a relatively small depth are detectable, while in the case of a relatively high testing accuracy relatively small cracks at a relatively large depth of the workpiece are detectable.

This means that, for example, the magnetizing time and/or the post-magnetizing time and/or the magnetizing intensity are/is chosen to be relatively short if only a relatively low testing accuracy is intended to be achieved. Correspondingly, the magnetizing time and/or the post-magnetizing time and/or the magnetizing intensity can be chosen to be higher if a high testing accuracy is desired.

It is also conceivable for different alignments of the apparatus for magnetic powder testing with respect to the surface of a workpiece to be taken into account. In this regard, it is conceivable, for example, for the magnetizing device not to be abruptly switched off if the apparatus is used upside down by a user, in order to prevent the apparatus from being able to fall off and injure the user.

All these various magnetic powder testing applications can be mapped by corresponding test parameters and/or corresponding programs which are stored in the program control device.

In accordance with a further aspect of the invention, it is provided that the apparatus has an actuating element, preferably in the form of an actuating button or a trigger, which is designed to initiate and/or to end a magnetic powder testing application.

Said actuating element is preferably designed in such a way that a user can initiate and/or end a magnetic powder testing application. In this case, when and how a user initiates and/or ends the magnetic powder testing application are preferably dependent on the test parameters and/or on the program assigned to the magnetic powder testing application.

In accordance with a further aspect of the invention, it is provided that the actuating element is designed to enable a user to select a program from the program control device.

Advantageously, therefore, by means of the actuating element, a user can select the program and/or the test parameters suitable for a specific magnetic powder testing application. This can take place, for example, by the user actuating the actuating element repeatedly, for example twice, or for a longer or shorter time. Advantageously here the apparatus for magnetic powder testing thus has only one element for initiating/ending the magnetic powder testing application and for selecting a program/test parameter, which reduces the susceptibility to wear.

In accordance with a further aspect of the invention, it is provided that the apparatus also has an input device for the manual selection of a program stored in the program control device, wherein the input device can be designed for example as a keyboard, a selection wheel or a display, preferably a touch-sensitive display. Moreover, it is conceivable for the input device to be connected to the program control device by signaling technology, preferably electrically, by way of an interface device. The term "signaling technology" used herein denotes the transmission of information for example in a cable-based manner but also in a wireless manner such as e.g. by means of a wireless network environment (Wlan), or by other radio technology. It is conceivable for the apparatus for magnetic powder testing to be connected or able to be connected to a computer and a program and/or at least one test parameter to be able to be selected on the computer.

A user can thereby select a program stored in the program control device and/or at least one test parameter stored in the program control device in order thereupon to implement a corresponding magnetic powder testing application. Consequently, different magnetic powder testing applications can be implemented by a relatively inexperienced user by virtue of the user selecting a respectively appropriate program and/or at least one respectively appropriate test parameter.

In accordance with a further aspect of the invention, it is provided that the program control device is programmable for amending, deleting and/or adding test parameters and/or programs.

Advantageously, therefore, different magnetic powder testing applications can be implemented by the corresponding test parameters and/or programs being added and/or modified in the program control device. It is conceivable, for example, that in the context of a test series or in the context of a test suitable test parameters for a specific magnetic powder testing application are determined and they are used to store a user-specific program and/or user-specific test parameters in the program control device.

In accordance with a further aspect of the invention it is provided that the magnetizing device has at least one permanent magnet and/or electromagnet.

A permanent magnet can be used to simplify the handling of the apparatus for magnetic powder testing. It is conceivable in this case, for example, that the permanent magnet is designed to enable the apparatus to be placed onto a workpiece and to adhere to said workpiece on account of an acting magnetic force, in order to relieve the burden on a user. An electromagnet can then be used to generate a magnetization of sufficient intensity in the workpiece.

In accordance with a further aspect of the invention, it is provided that the apparatus also has a display/alarm device, which is connected to the program control device by signal technology, preferably electrically, the display/alarm device being designed to display to the user at least one test parameter stored in the program control device and/or a program stored in the program control device and/or the running of a preselected program or to communicate that/those in some other way, for example acoustically or by vibration.

This advantageously achieves the effect that the user can correctly implement the magnetic powder testing application since the corresponding information is communicated to the user by way of the display device. In other words, the user therefore knows what test parameter is currently selected to implement the magnetic powder testing application and/or what program is currently selected and/or how the selected program is currently running. This enables the user to correctly implement a magnetic powder testing application on the basis of the at least one test parameter or the selected program,

without the user having to have exact knowledge about the characteristics of the present magnetic powder testing application.

In accordance with a further aspect of the invention, it is provided that the display device is designed to display to the user a magnetizing time and/or a post-magnetizing time in the case of a magnetic powder testing application of the apparatus.

Advantageously, the user thereby knows for how long the user must magnetize the workpiece, when the user must thereupon apply the magnetic powder to the workpiece and for how long the user must thereupon implement post-magnetizing.

It is conceivable here for the display device to have a display, preferably a touch-sensitive display, an LED, particularly preferably a three-color LED having the colors red, green and yellow, a vibration element and/or an acoustic element. By way of example, a three-color LED can emit green light in order to signal to the user a readiness mode of the apparatus for magnetic powder testing.

As a result of the actuation of the actuating element, the selected program is started, the magnetizing device switches on and the LED starts to emit yellow light continuously. The application of ferromagnetic powder/magnetic powder suspension can thereupon begin. After the magnetizing time has elapsed, the LED emitting yellow light continuously starts to flash yellow and prepares the user with regard to the ending of the workpiece being sprayed with ferromagnetic material or the workpiece being supplied with ferromagnetic material. The LED thereupon emits red light in order to indicate that the post-magnetizing time is beginning. Finally, after the post-magnetizing time, the LED emits green light in order to indicate to the user that the magnetic powder testing application is concluded and the apparatus for magnetic powder testing is again in a readiness mode. The inspection of the test location can then begin.

In accordance with a further aspect of the invention, it is provided that the apparatus furthermore has an electrical connection designed to electrically connect the program control device and/or the magnetizing device and/or the input device and/or the display device and/or the programming device to a power supply system voltage or supply voltage.

In accordance with a further aspect of the invention, it is provided that the test parameters and/or programs stored in the program control device are selectable according to choice.

This preferably ensures that an experienced user can use the apparatus for magnetic powder testing manually as well and can dispense with predefined or predefinable test parameters and/or programs. Consequently, the apparatus for magnetic powder testing is both suitable for being used by a relatively

experienced user who can dispense with assistance by test parameters and/or programs stored in the program control device, and suitable for being used by a relatively inexperienced user who can have recourse to test parameters and/or programs stored in the test control apparatus.

In the method according to the invention for operating an apparatus for magnetic powder testing as described above, the following method steps are provided: selecting at least one test parameter from the program control device by a user; manually applying the apparatuses to a workpiece; and initiating the magnetic powder testing application. The magnetic powder testing application is carried out on the basis of the at least one selected test parameter that is stored in the program control device.

Preferably, various test parameters are contained in a program, such that the user merely has to select an appropriate program for setting all relevant test parameters.

In accordance with a further aspect of the invention, it is provided that the apparatus for magnetic powder testing has a "learning mode", in which a relatively experienced user carries out a magnetic powder testing application manually and the test parameters used here are stored in the program control device, such that said test parameters and/or a program generated therefrom can be selected in further magnetic powder testing applications. Consequently, a relatively experienced user can define suitable test parameters and relatively inexperienced users can thereupon have recourse to them.

The invention is described in greater detail below on the basis of exemplary embodiments of the apparatus according to the invention for magnetic powder testing, with reference to the accompanying drawings.

In the drawings:

figure 1 shows a schematic illustration of the apparatus according to the invention for magnetic powder testing; and

figure 2 shows a schematic sectional view of the apparatus according to the invention for magnetic powder testing.

Figure 1 shows an apparatus for magnetic powder testing, a housing being provided, in which both a magnetizing device 1 and a program control device 2 are situated (see figure 2).

Furthermore, an input device 3 in the form of a display is shown by way of example in figure 1. This is preferably a touch-sensitive display.

A user can select a program stored in the program control device by way of the input device 3. On the other hand, it is conceivable for an input device to be connected to the program control device 2 by way of an interface device. This can involve a computer or the like, for example. This design of the input device 3 is not shown in figure 1.

At least one test parameter and/or a program of the program control device 2 on the basis of which a magnetic powder testing application is carried out can be selected by means of the input device 3.

Furthermore, figure 1 depicts a display device 4, which enables a user to display a selected test parameter or selected test parameters and/or a selected program and/or the course of a magnetic powder testing application with corresponding test parameter(s)/program. By way of example, the display device 4 can be designed as a display and can display to the user which program is selected.

The display device 4 can also be designed as an LED or additionally comprise an LED which indicates to the user the running of a currently selected program.

Figure 1 furthermore depicts an actuating element 5, which can be used by the user to initiate and/or to end a magnetic powder testing application. Furthermore, the actuating element 5 can be used to select a program stored in the program control device 2 or parameters stored in the program control device 2 for a magnetic powder testing application. For this purpose, the actuating element 5 can be pressed repeatedly or can be pressed for a relatively short or relatively long time, for example.

Figure 1 furthermore shows a connection 6 suitable for supplying the components of the apparatus for magnetic powder testing, in particular the magnetizing device 1, the program control device 2, the input device 3, the display device 4, and/or the actuating element 5, with voltage.

In addition, it is conceivable for the interface device via which the input device 3 is connected to the program control device 2 to be integrated into the connection 6 or to be provided in the region of the connection 6.

Figure 2 shows in a sectional view the apparatus for magnetic powder testing, the magnetizing device 1 being depicted in the form of a yoke magnet.

The magnetizing device 1 is preferably an electromagnet that can be activated in order to generate a magnetic field that generates in a workpiece magnetic field lines running parallel to the surface of the workpiece.

The program control device 2 is also illustrated in figure 2, the program control device 2 in this case adjoining the actuating element 5 by way of example, such that the program control device 2 can be controlled by the actuation of the actuating element 5. It is also conceivable, of course, for the program control device 2 to be provided at a different location within the housing of the apparatus for magnetic powder testing or to be provided outside the housing of the apparatus for magnetic powder testing.

The invention is not restricted to the embodiments of the apparatus for magnetic powder testing as illustrated in the drawings, but rather arises from a joint consideration of all the features disclosed herein.

List of reference signs

1	Magnetizing device
2	Program control device
3	Input device
4	Display device
5	Actuating element
6	Connection

APPARATUS AND METHOD FOR MANUAL MAGNETIC POWDER TESTING

Patent claims

1. An apparatus for manual magnetic powder testing, the apparatus having the following:
   - a magnetizing device (1) for magnetizing a workpiece as and when required; and
   - a program control device (2), in which at least one test parameter for at least one magnetic powder testing application is stored.

2. The apparatus as claimed in claim 1,
a magnetizing time, which is predefined for a predefined magnetic powder testing application and indicates the time period between the beginning of magnetizing a workpiece and the end of applying a magnetic powder to the workpiece, and/or a post-magnetizing time, which is predefined for a predefined magnetic powder testing application and indicates the time period between the end of applying a magnetic powder to the workpiece and the end of magnetizing the workpiece, and/or a magnetizing intensity, which is predefined for a predefined magnetic powder testing application and indicates the intensity of the magnetic field that is generated by the magnetizing device, being stored as test parameters in the program control device (2).

3. The apparatus as claimed in claim 1 or 2,
at least one predefined program, which, depending on the predefined magnetic powder testing application, defines at least one test parameter, being stored in the program control device (2).

4. The apparatus as claimed in one of claims 1 to 3,
a magnetic powder testing application being characterized by a material thickness of a workpiece, a coating thickness of a coating applied to a workpiece, a testing accuracy of a workpiece, and/or various workpiece materials.

5. The apparatus as claimed in one of claims 1 to 4,
a magnetic powder testing application being characterized by various spatial alignments of the apparatus with respect to a surface of the workpiece to be tested.

6. The apparatus as claimed in one of claims 1 to 5,
the apparatus also having an actuating element (5), preferably in the form of an actuating button or a trigger,
the actuating element (5) being designed to initiate and/or to end a magnetic powder testing application when it is actuated.

7. The apparatus as claimed in claim 6, the actuating element (5) being designed for the selection of at least one test parameter and/or at least one program from the program control device (2) by a user.

8. The apparatus as claimed in one of claims 1 to 6,
the apparatus also having an input device (3) for the manual selection of at least one test parameter and/or program stored in the program control device (2), the input device (3) being connected or able to be connected to the program control device (2) by signalling technology for the transmission of signals, preferably electrically, preferably by way of an interface device.

9. The apparatus as claimed in one of claims 1 to 7,
the program control device (2) being programmable for amending, deleting and/or adding at least one test parameter and/or at least one program.

10. The apparatus as claimed in one of claims 1 to 9,
the magnetizing device (1) having at least one permanent magnet and/or electromagnet.

11. The apparatus as claimed in one of claims 1 to 10,
the apparatus also having a display/alarm device (4), which is connected to the program control device (2) by signal technology for the transmission of signals, preferably electrically, the display/alarm device (4) being designed to display to the user at least one test parameter stored in the program control device (2) and/or a program stored in the program control device (2) and/or the running of a preselected program.

12. The apparatus as claimed in claim 11,
the display/alarm device (4) being designed to display to the user a magnetizing time and/or a post-magnetizing time in the case of a magnetic powder testing application of the apparatus.

13. The apparatus as claimed in one of claims 1 to 12,
the test parameters and/or programs stored in the program control device (2) being selectable according to choice.

14. A method for operating an apparatus as claimed in one of the preceding claims, the following method steps being provided:

i) selecting at least one test parameter from the program control device (2), preferably by a user;

ii) manually applying the apparatus to a workpiece; and

iii) initiating the magnetic powder testing application,

the magnetic powder testing application being carried out on the basis of the at least one selected test parameter that is stored in the program control device (2) and has been selected.

15. The method as claimed in claim 14,
the user selecting a program that is stored in the program control device (2) and that selects at least one test parameter in method step i).

16. The method as claimed in claim 14 or 15,
a method step in which a magnetic powder testing application is carried out manually and at least one parameter used thereby is stored in the program control device (2) as a test parameter also being provided.

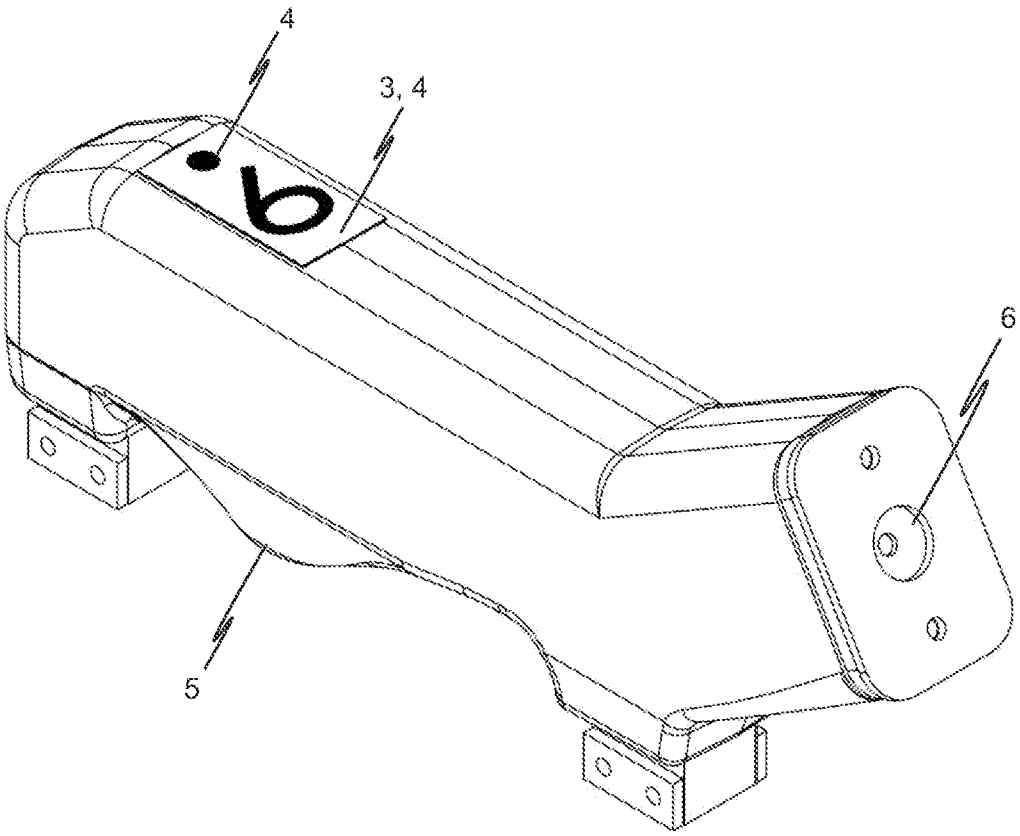

Fig. 1

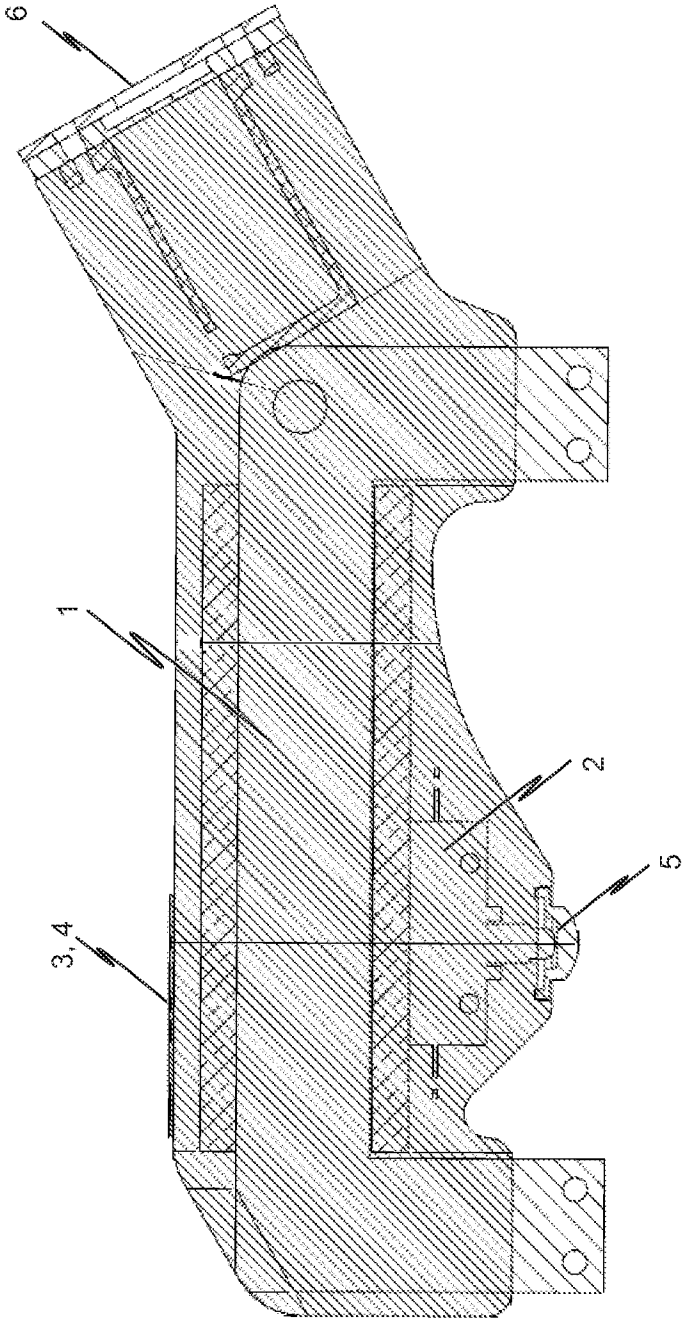

Fig. 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/064450

A. CLASSIFICATION OF SUBJECT MATTER
INV. G01N27/84
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G01N G01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 10 2008 048592 A1 (MR CHEMIE GMBH [DE]) 16 July 2009 (2009-07-16) paragraphs [0007], [0020], [0044], [0045], [0049], [0051], [0052], [0054]; figures 1,2	1,2,5-7, 9-16
X	DE 196 33 772 A1 (KARL DEUTSCH PRUEF UND MESGERA [DE]) 26 February 1998 (1998-02-26) column 1, lines 20-26,; figure 1 column 3, lines 46-49 column 4, lines 25-36	1-4,8, 10,13

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 February 2016	14/03/2016

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Ehmer, Dorothee

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/064450

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 41 22 328 A1 (TIEDE GMBH & CO RISSPRUEFANLAG [DE]) 7 January 1993 (1993-01-07) column 1, lines 3-6,18-19; figure 1 column 3, lines 8-10 column 10, lines 16-21 -----	1,9,10, 13,14
X	US 2010/142753 A1 (VETTERLEIN THOMAS [DE]) 10 June 2010 (2010-06-10) paragraphs [0001], [0002], [0015], [0016]; figures 1,2 -----	1,2,10
A	GB 1 172 253 A (MAGNAFLUX CORP [US]) 26 November 1969 (1969-11-26) the whole document -----	1-13

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2015/064450

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102008048592 A1	16-07-2009	NONE	
DE 19633772 A1	26-02-1998	DE 19508020 A1	12-09-1996
		DE 19633772 A1	26-02-1998
DE 4122328 A1	07-01-1993	NONE	
US 2010142753 A1	10-06-2010	DE 102007024060 A1	27-11-2008
		EP 2149046 A1	03-02-2010
		US 2010142753 A1	10-06-2010
		WO 2008144679 A1	27-11-2008
GB 1172253 A	26-11-1969	NONE	