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(54) Method and system for identifying packaging material on a packaging machine

(57) A system for identifying packaging material on a machine (1) for packaging pourable food products and supplied with a packaging material web (6) wound into a reel (25); the system including a transponder (28) fixed to the reel, and an aerial (30) fixed to the machine (2), and which together form a radiofrequency communication system (28, 30). When the reel (25) is loaded onto the machine (1), the data identifying the packaging material used is read automatically in the memory of the transponder and supplied to a control unit, which sets the various machine members; and updated data relative to the packaging material and packaging operations may also be transmitted from the control unit (16) to the transponder (28) and stored for centralized use.

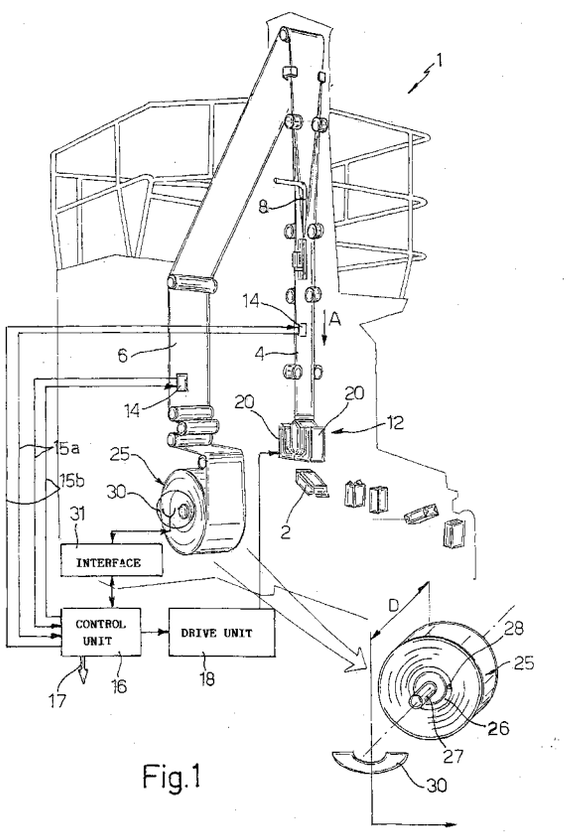

Fig.1

EP 1 266 830 A1

Description

[0001] The present invention relates to a method and system for identifying packaging material on a machine for packaging pourable food products.

[0002] Machines for packaging pourable food products, such as fruit juice, wine, tomato sauce, pasteurized or long-storage (UHT) milk, etc., are known, in which the packages are formed from a continuous tube of packaging material defined by a longitudinally sealed web.

[0003] The packaging material has a multilayer structure comprising a layer of paper material covered on both sides with layers of heat-seal material, e.g. polyethylene, and, in the case of aseptic packages for long-storage products, such as UHT milk, also comprises a layer of barrier material defined, for example, by an aluminum film, which is superimposed on a layer of heat-seal plastic material and is in turn covered with another layer of heat-seal plastic material eventually defining the inner face of the package contacting the food product.

[0004] To produce aseptic packages, the web of packaging material is unwound off a reel and fed through an aseptic chamber, in which it is sterilized, and the sterilized web is folded into a cylinder and sealed longitudinally to form, in known manner, a continuous vertical longitudinally sealed tube. The tube of packaging material is filled continuously with the pourable food product and then sent to a forming and (transverse) sealing unit where it is gripped between pairs of jaws to seal it transversely and form pillow packs.

[0005] The pillow packs are separated by cutting the sealed portions between the packs, and are then sent to a finish folding station where they are folded mechanically into the finished shape.

[0006] The forming process comprises folding the packaging material along crease lines formed during the material production process.

[0007] The production process typically comprises laminating steps to produce the various layers of the packaging material; a number of printing steps to print a graphic pattern or decoration, which is repeated on the material at intervals equal to the length of material used to produce each package; and a creasing step performed on the finished material or only on a subset of material layers comprising at least the paper layer.

[0008] The various operations in the packaging material production process are performed using, as a register mark, an optical register code (typically a bar code) printed on the material at the first printing step.

[0009] Due to tolerances in the material production process, errors may occur in the relative positions of the optical register codes and crease lines, so that the decoration correction device (based on the optical register code) must frequently be adjusted manually to prevent the forming members from interacting incorrectly with the material with respect to the crease lines.

[0010] The optical register code is normally also used on the forming machine to control material feed through the various operating stations. In particular, as is known, when forming the packages, a so-called "decoration correction" device, operating independently or associated with the sealing jaws, acts on the packages being formed to variously "pull" the material in the feed direction to ensure the mechanical forming operations coincide with the decorations on the packages.

[0011] The packaging machine therefore comprises a number of photocells located along the path of, and facing, the packaging material web, to detect passage of the optical register codes.

[0012] The photocells are connected to a control unit for controlling the packaging machine, which acquires the photocell-generated signals and accordingly enables decoration correction in known manner.

[0013] To adapt to specific operating conditions, currently marketed photocells are designed to automatically set their own operating parameters by implementing a self-learning procedure, which can be enabled either locally, i.e. by the operator pressing a button on the photocell, or in centralized or remote manner, i.e. by means of an enabling signal sent by the control unit to an input on the photocell.

[0014] The self-learning procedure requires that the register code be passed in front of each photocell, which is done manually by the operator moving the packaging material web past each photocell, or using another code impressed on a separate sheet.

[0015] The self-learning procedure thus provides for automatically setting photocell operating parameters such as the color of the light (red, green, blue) used to detect passage of the register code on the packaging material web, and the static intervention threshold.

[0016] All the above operations -decoration correction, position correction with respect to the crease lines, paper color setting, and other settings (such as the repeat length of the paper) to ensure correct operation of the packaging machine- therefore involve dedicated operations to read the necessary setting information by means of the optical codes. Moreover, the reading of the optical bar code on the reel of packaging material is highly sensitive to any damage to the optical code caused by handling of the reel or printing problems, and to environmental conditions (dirt, humidity, light conditions). Moreover, any changes to existing conditions or packaging step data (such as the amount of paper used or left on a reel of packaging material) cannot be stored easily and associated with the reel.

[0017] It is an object of the invention to simplify acquisition of the information required to ensure correct operation of the packaging machine, by eliminating the need for manual intervention, so that the characteristics of the packaging material loaded onto the packaging machine can be identified easily. Also desirable is a system allowing the recording of further information acquired during package production.

[0018] According to the present invention, there are provided a system and a method of identifying packag-

ing material on a machine for packaging pourable food products, as claimed in Claims 1 and 9 respectively. According to the invention, there are also provided a method of setting operating parameters on a machine for forming and sealing sealed packages of a pourable food product, as claimed in Claim 15, and a reel of packaging material for producing sealed packages of a pourable food product, as claimed in Claim 16.

[0019] A preferred, non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a perspective view, with parts removed for clarity, of a packaging machine for continuously producing aseptic sealed packages of pourable food products, and implementing an information identification system in accordance with the invention;

Figure 2 shows two possible locations of an information storage device in accordance with the invention;

Figure 3 shows a simplified diagram of the Figure 2 storage device.

[0020] Number 1 in Figure 1 indicates as a whole a packaging machine for continuously producing sealed packages 2 of a pourable food product, such as pasteurized or UHT milk, fruit juice, wine, etc., from a tube 4 of packaging material.

[0021] The packaging material has a multilayer structure, and comprises a layer of fibrous material, normally paper, covered on both sides with respective layers of heat-seal plastic material, e.g. polyethylene.

[0022] Tube 4 is formed, in known manner not described in detail, by longitudinally folding and sealing a web 6 of heat-seal sheet packaging material; is filled with the sterilized or sterile-processed food product by means of a fill conduit 8 extending inside tube 4; and is fed by known devices along a vertical path A to a forming station 12 with jaws 20, where it is cut transversely and folded mechanically to form packages 2.

[0023] Packaging machine 1 also comprises a number of photocells 14, which are located along the path of web 6 of packaging material, are positioned facing web 6, are held in position by respective supporting members not shown, and are connected over lines 15a, 15b to a control unit 16 for controlling packaging machine 1.

[0024] More specifically, photocells 14 are arranged in pairs along web 6 of packaging material to read pairs of side by side register codes on web 6. For the sake of simplicity, however, Figure 1 shows only two photocells 14 forming part of different pairs.

[0025] The web 6 of packaging material is unwound off a reel 25 wound about a core 26 normally made of cardboard and supported on a supporting shaft 27, preferably of plastics.

[0026] Core 26 houses a transponder 28, which, as it rotates with the unwinding of web 6 of packaging material, travels past a fixed, e.g. semicircular, aerial 30 connected to an interface unit 31 in turn connected to control unit 16.

[0027] That is, transponder 28 and fixed aerial 30 together form a two-way radio communication system by which the data memorized in transponder 28 can be read and transmitted to control unit 16, and updated data can be transmitted from control unit 16 to transponder 28 and written in transponder 28 as described in detail later on.

[0028] As shown in the larger-scale view in Figure 2, transponder 28 is preferably inserted inside a hole 32 in core 26, as shown by the continuous line; or may be fixed, as shown by the dash line, to the inner wall of core 26, in such a position as not to interfere with the fastening members (not shown) on supporting shaft 27.

[0029] As shown in Figure 3, transponder 28 is advantageously housed in a plastic casing 35 for protection against shock and accidental damage, and comprises an RX/TX aerial 36, an integrated circuit 37, and a capacitor 38.

[0030] RX/TX aerial 36 is preferably defined by a ferrite rod 36a inside a winding 36b.

[0031] Capacitor 38 is interposed between the two ends of winding 36b and acts as an energy storage element (so that transponder 28 needs no supply batteries). Capacitor 38 also forms a resonant circuit with winding 36b. In order to optimize signal exchange between transponder 28 and fixed aerial 30 and adapt to different operating conditions and/or to the actual distance between transponder 28 and fixed aerial 30, the transmission system and more particularly the RX/TX aerial 36 may comprise self-tuning means not shown.

[0032] Integrated circuit 37 comprises an interface stage 40 connected to winding 36b; a control stage 41 connected to interface stage 40; and a memory 42, e.g. an EEPROM (Electrically Erasable Programmable Read Only Memory) or flash memory, connected to interface stage 41. More specifically, control stage 41 comprises the circuitry required to decode the data received from RX/TX aerial 36 and the data read from memory 42; and the stages required to read and write memory 42 in known manner not described in detail.

[0033] The RX/TX aerial 36 provides for transmitting/receiving data to/from interface unit 31 via fixed aerial 30. More specifically, packaging material data may initially be written in memory 42 by means of a transmission system in the packaging material production plant, and may comprise general information concerning the reel (identification number, factory, date of fabrication, customer code, etc.); information concerning the type of packaging material, useful to set packaging machine parameters such as longitudinal heat-seal power (to form tube 4) and transverse heat-seal power (to form the individual packages 2); the amount of packaging material available (reel length and/or number of packages that can be produced); the actual repeat length of

the paper to minimize decoration correction; the distance between the register code and the crease lines to set decoration correction automatically; and paper color data to calibrate the photocells automatically according to the color of the packaging material.

[0034] The above data is read automatically by fixed aerial 30, with no operator intervention required, when reel 25 is loaded onto packaging machine 1; and control unit 16 provides for accordingly adjusting the settings of packaging machine 1. More specifically, control unit 16 controls the movement of jaws 20 by means of a drive unit 18, and supplies the setting data to photocells 14 over lines 15b. Furthermore, the data may be used for other settings such as, for example, settings for welding parameters (temperature, time) of the material, settings for applying pull tabs, and parameters for tensioning the material, etc. In the event photocells 14 detect any deviation with respect to the previously memorized data, control unit 16 may also enter updated data over the data in memory 42. Control unit 16 may also write further data in memory 42 (such as the amount of packaging material left, in the case of a partially used reel 25; the packaging date; and the specific packaging machine used).

[0035] The data exchanged between transponder 28 and aerial 30 may also be supplied to a centralized logistic control unit, as shown by line 17 in Figure 1, for customer control and to correlate packaging machine production and packaging material data. The stored data may also be used for statistical purposes.

[0036] The data may also be protected by passwords or encryption procedures to permit reading and handling by authorized personnel only.

[0037] The advantages of the method and system described are as follows. In particular, by transmitting reel identification data by radio, data exchange is far less sensitive to environmental conditions, light, humidity or dirt; and the transponder, being housed inside reel 25, is better protected against damage caused by automatic handling of the reel.

[0038] Moreover, the operator is no more required to manually intervene to bring the identification code or other codes to the read position, since the reading occurs in a completely automatic way.

[0039] Manual correction of the packaging machine settings is also eliminated, since any decoration or creasing deviations are detected beforehand and communicated directly on first reading the information stored in memory 42. This information is then used directly by control unit 16 to make the required settings (for example, welding temperature, welding time, etc.) to ensure correct operation of the packaging machine.

[0040] The identification system described provides for storing and retrieving data relative to the type of material used on the packaging machine, and for subsequently relating packaging efficiency and quality to the packaging material used and relative conditions.

[0041] Clearly, changes may be made to the system and method as described and illustrated herein without, however, departing from the scope of the accompanying Claims.

Claims

1. A system for identifying packaging material on a machine (1) for packaging pourable food products and supplied with a packaging material web (6); the system including packaging material identification means (28) associated with said packaging material web, **characterized by** a radiofrequency communication system (28, 30) between said packaging material web (6) and said machine (1).

2. A system as claimed in Claim 1, **characterized in that** said radiofrequency communication system (28, 30) comprises a transponder (28), which is fixed to a reel (25) formed by said packaging material web (6), and memorizes identification data identifying the packaging material; and aerial means (30) located on said machine (1) to read said identification data.

3. A system as claimed in Claim 2, **characterized in that** said reel (25) comprises a core (26); and said transponder (28) is housed in a cavity (32) in said core.

4. A system as claimed in Claim 2 or 3, **characterized in that** said transponder (28) comprises a transmitter-receiver aerial (36), a control unit (37) and a memory (42).

5. A system as claimed in Claim 4, **characterized in that** said transmitter-receiver aerial (36) comprises a rod of ferromagnetic material (36a) and a winding (36b).

6. A system as claimed in Claim 5, **characterized in that** said transponder (28) also comprises a capacitive element (38) forming a resonant circuit with said winding (36b).

7. A system as claimed in any one of Claims 4 to 6, **characterized in that** said memory (42) is electrically programmable.

8. A system as claimed in any one of Claims 2 to 7, **characterized in that** said machine (1) comprises drawing and forming members (20) for producing sealed packages from said reel (25), and photocells (14) for reading optical register codes; and **in that** said system comprises a control unit (16) connected to said aerial means (30) to acquire information from said transponder (28); a setting unit (18) for setting said drawing and forming members and con-

trolled by said control unit; and setting means (15b) for setting said photocells.

9. A method of identifying packaging material on a machine (1) for packaging pourable food products; the method comprising the step of loading a reel (25) of packaging material and reading identification data identifying the packaging material off said reel; **characterized in that** said reading step comprises receiving a radio signal from said reel.

10. A method as claimed in Claim 9, **characterized by** comprising the step of memorizing identification data identifying the packaging material in a transponder (28) fixed to a reel (25) of said reel (25) during fabrication of said reel.

11. A method as claimed in Claim 10, **characterized in that** said reading step comprises picking up said radio signal by aerial means (30) located on said machine (1).

12. A method as claimed in Claim 11, **characterized by** the step of automatically tuning said transponder 828) and said aerial means (30).

13. A method as claimed in any one of Claims 9 to 12, **characterized by** comprising the step of setting operating parameters of said machine (1) on the basis of the read said identification data.

14. A method as claimed in any one of Claims 9 to 13, **characterized by** comprising the step of transmitting to said reel (25) a radio signal coding updated data relative to operating parameters of said packaging material and to packaging operating conditions, and of storing said updated operating data in said reel (25).

15. A method of setting operating parameters on a machine (1) for packaging pourable food products from a packaging material reel (25); **characterized by** the steps of reading operating data of said packaging material reel (25) through a radio connection, and automatically modifying operating parameters of said machine (1).

16. A reel (25) of packaging material for producing sealed packages of a pourable food product, the reel comprising a packaging material web (6) and supporting a memory element (42) for storing identification data identifying said packaging material; **characterized by** radio transmission means (36) generating a radio signal coding said identification data.

17. A reel as claimed in Claim 16, **characterized in that** said packaging material web (6) is wound about a core (26) supporting a transponder (28) comprising said memory element (42) and said radio transmission means (36).

18. A reel as claimed in Claim 17, **characterized in that** said core (26) comprises a cavity (32) housing said transponder (28).

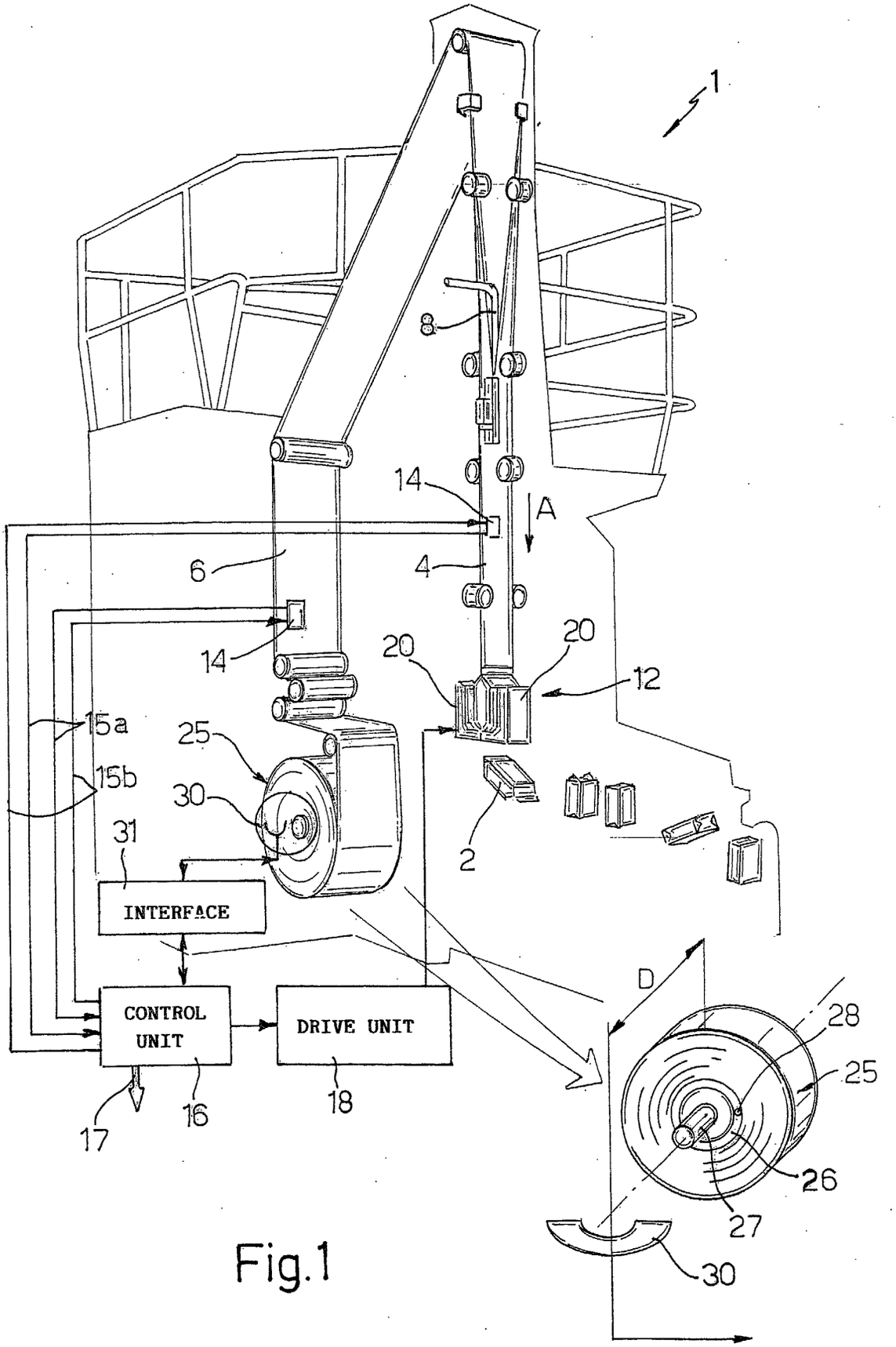
1
8
14
A
6
4
14
20
20
12
15a
25
15b
30
31
2
INTERFACE
CONTROL UNIT
DRIVE UNIT
17
16
18
D
28
25
26
27
30

Fig.1

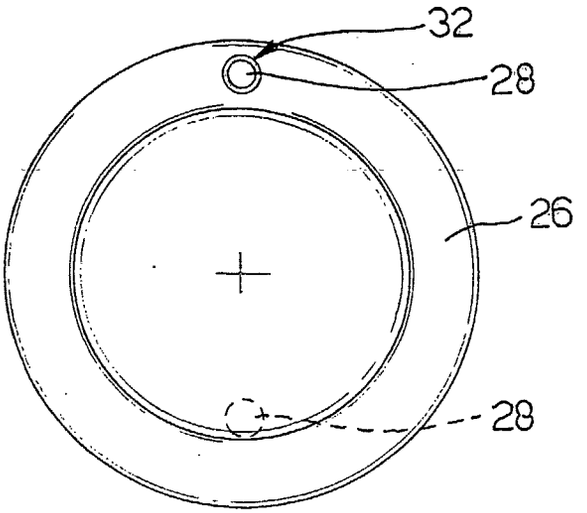
32
28
26
28

Fig. 2

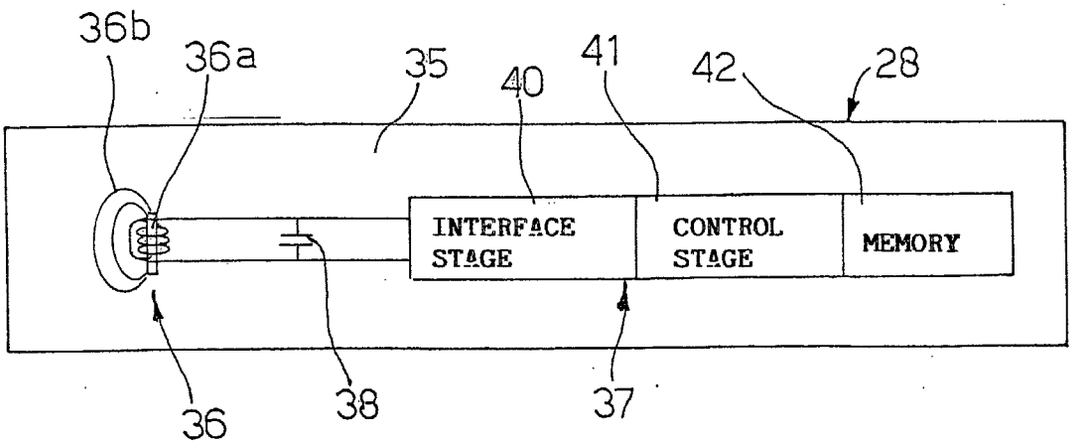
36b
36a
35
40
41
42
28
INTERFACE STAGE
CONTROL STAGE
MEMORY
36
38
37

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 01 83 0393

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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B65B
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 November 2001	Farizon, P

CATEGORY OF CITED DOCUMENTS

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