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(54) **BANK NOTE RECYCLING MACHINE WITH AN UPPER OPENING, FOR CASH DISPENSERS AND SELF-SERVICE OUTLETS**

(57) The invention proposed refers to an Apparatus with an upper opening for recycling banknotes which is adaptable for ATMS and self-service, characterised by the banknotes introduced through the input groove (6) at the entrance (14) where they are taken by the belts (12) through the sensors (13) and are finally rolled up for storage on the roller drum (20), preferably rolled up along their longer side and where the belts (12) are rolled on to the reels (18) and guided by the step pulleys (31) and the guide rollers (34) surrounding the roller drum (20), where banknotes are stored against the belts which are always tight thanks to the friction clutches (45), the anti-rotation bushes (39) and the radial springs (19).

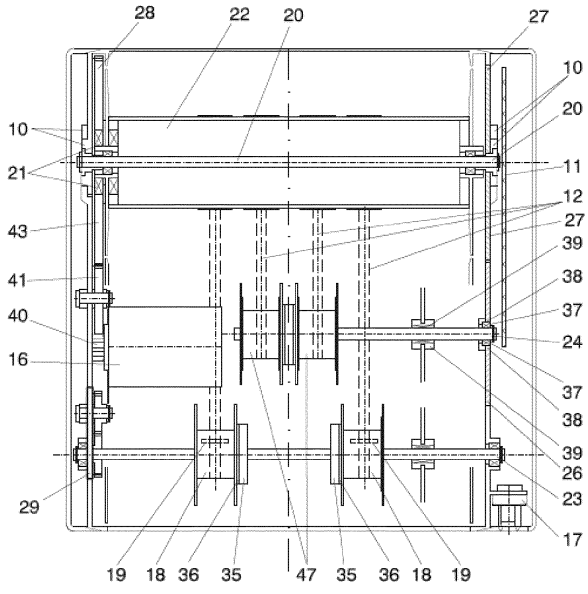

FIG. 3

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Description

OBJECT OF THE INVENTION

[0001] A banknote recycling apparatus with an upper opening adaptable to ATMS and self-service and designed to facilitate the handling of the storage of banknotes deposited in an ATM or self-service installation, and dispensing them in the processes which occur in the self-service machines and at Banking Institution Cash points.

FIELD OF THE INVENTION

[0002] The field of the invention is the industrial sector involved in the manufacture of numeric machines and devices aiding the banknote handling industry.

BACKGROUND OF THE INVENTION

[0003] Three types of banknote storage modules are known:

- those for final storage pending transport,
- those which allow banknotes received to be dispensed once more, normally referred to as recycling,
- and those whose mission is either to dispense banknotes or reload internal recycling cartridges.

[0004] The first may be considered to include those involving bags made of plastic or some other material normally fitted with security closing systems to ensure their integrity during transport, and then broken to remove the banknotes in secure zones.

[0005] Another design refers to cartridges where the banknotes are stacked and held under pressure so that they do not become disordered while being transported. Any modules of this type are designed to receive banknotes in the equipment which is the subject of this invention although they are not in themselves the subject of the patent as they are elements which are generally known.

[0006] In connection with the second, the recycling cartridges, two technologies have been developed:

- that for stacked banknotes and
- that for rolled-up banknotes.

[0007] Although both types may be used in the equipment which is the subject of this invention, it is those of the second type, which use the roll-up technique, which constitute the subject of this patent.

[0008] The inventor is unaware of anything previous which incorporates the arrangements in this invention or of the benefits inherent to such arrangement.

DESCRIPTION OF THE INVENTION

[0009] The invention proposed refers to an Apparatus for recycling banknotes with an upper opening adaptable for ATMs and self-service installations, characterised by being based on a container or cartridge of suitable material, preferably plastic where, if the back of the container is removed, along with the side covers, the upper cover can be opened approximately 90 degrees with the aid of the plastic pressure hinges to allow internal handling, for repair, to fix blockages or for maintenance.

[0010] On the outside of the container a connector can be seen, on the front face, a groove along that front face for the insertion/extraction of banknotes and, on the upper face, one or more control monitors.

[0011] Plastic pressure hinges are found on each side cover.

[0012] At least the following elements are seen inside the container:

> An electronic control plate, a current connector, an electric motor with an output shaft and transmission gearing.

[0013] There are also at least four shafts, with their associated complements:

> A shaft carrying a banknote roller drum, a second shaft carrying the upper reels, a third shaft carrying the lower reels and a fourth shaft comprising a set of step pulleys on the belts which drive the belt rollers when banknotes enter or leave the apparatus.

[0014] All the shafts have their respective silentblocks carried in housings and operated by gears, and a friction clutch is seen on all, with its fixed part and rotating part and an anti-rotation bush.

[0015] Inside each reel there are radial springs to ensure that the pressure belts which transport the banknotes are maintained tight at all times.

[0016] The apparatus in the first part, where the banknotes are received, has sensors to fix all their technical characteristics such as centring, quantity, face value, wear due to thickness, legality, etc.

[0017] The banknotes are moved by four plastic belts of thickness between 13 and 25 microns and between 15 and 25 mm wide, arranged alternately and symmetrically, and which do not touch.

[0018] The belts are rolled onto the reels and guided by the step pulleys and guide rollers and surround the roller drum where the banknotes are stored against the belts, which are always tight thanks to the common action of the friction clutches, the anti-rotation bushes and the radial springs, irrespective of the direction of rotation.

[0019] Banknotes entering through the input groove are taken up by the belts and pass through the sensors which centre them and determine all their characteristics, and are finally rolled up for storage on the roller drum,

preferably rolled along their longer side.

[0020] Given that the banknotes are rolled onto the main drum up to a diameter varying between 120/200 mm, the device allows for capacities of between 500 and 2,000 banknotes.

[0021] For the belts to maintain their tension and so that the banknotes rolled on to the storage drum do not move, the unit has a pressure tensor arm operated by a tension spring which turns at a speed controlled by a sensor so that, irrespective of the tensor angle arising from the accumulation of banknotes, the linear displacement speed remains unchanged.

DESCRIPTION OF THE DRAWINGS.

[0022] For a better understanding of the invention, four pages of plans are attached, which distinguish the following:

FIGURE 1.- A perspective view of the apparatus container.

FIGURE 2.- A right-side cross-section view of the apparatus.

FIGURE 3.- A front elevation cross-section view of the apparatus.

FIGURE 4.- A cross-section view of the lower shaft and its accessories.

[0023] Said figures use the same reference to name identical elements, among which the following may be distinguished:

1. The apparatus container.
2. The rear of the container.
3. The left side of the container.
4. The right side of the container.
5. The lower part and fixed side of the container.
6. The banknote entrance/exit groove.
7. Pin connector.
8. Control monitor.
9. The upper cover (movable 90°).
10. Plastic pressure hinge to open the cover.
11. The electronic control plate for all the apparatus functions.
12. The belts.
13. The sensors.
14. The banknote entrance.
15. A flat, flexible arm in permanent contact with the banknotes under a spring.
16. The electric motor.
17. The electric connector.
18. Upper shaft belt reels.
19. The drum radial spring.
20. The banknote roller drum shaft.
21. Silentblocks.
22. The banknote roller drum.
23. The upper reel shaft.
24. The lower reel shaft.
25. The motor shaft.
26. The lower shaft transmission gear.
27. The right drum transmission gear.
28. The left drum transmission gear.
29. The upper reel transmission gear.
30. The shaft of the belt step pulleys.
31. The belt step pulleys.
32. The gear.
33. The angular transducer.
34. The belt and banknote movement guide roller.
35. The clutch rotary part.
36. The clutch fixed part.
37. Silentblocks.
38. The silentblock housings.
39. The anti-rotation bush.
40. The motor pinion.
41. The intermediate pulley.
42. Bearing.
43. The motor shaft pinion.
44. The lower shaft bearing.
45. The magnetically operated friction clutch.
46. The lower shaft gear.
47. The lower shaft reel.
48. The tensor shaft.
49. The arm tensor (15).

A PREFERENTIAL EMBODIMENT OF THE INVENTION.

[0024] The invention proposed refers to an Apparatus for recycling banknotes with an upper opening, adaptable for ATMs and self-service installations characterised by being based on:

- a container or cartridge (1) of suitable material preferably plastic, comprising the following:
- a lower level with fixed half-sides (5),
- a removable left side cover (3),
- a removable right side cover (4),
- a movable top cover (9) with upper opening.

[0025] If the back (2) of the container (1) is removed, along with the side covers (3), the upper cover (9) can be opened approximately 90 degrees with the aid of the plastic pressure hinge (10) to allow internal handling, for repair, to fix blockages or for maintenance.

[0026] The following elements are also seen on the outside of the container (1):

- on the front face, a connector (7) preferably of the pin type,

- along said front face, a groove (6) to introduce/extract banknotes,

- On the upper face, one or more control monitors (8),

- On each side cover (3) and (4) plastic pressure hinges (10).

[0027] Within the container (1), at least the following elements are seen:

- Electronic control plate (11)

- Current connector (17)

- Electric motor (16) with its motor transmission shaft (25)

- Banknote roller drum shaft (20), supported on the silentblocks (21), with the associated banknote roller drum (22), shaft (20) driven by the left transmission gear (28), with the aid of the intermediate gear (32).

- The shaft (23) of the upper reels (18), with their silentblocks (37) carried in the housings (38) and driven by gear (29), showing the friction clutch (45) with its fixed (36) and rotary (35) sections

- Inside each upper reel (18) there are radial springs (19) intended to keep the belts (12) tight at all times.

- The lower shaft (24) of the lower reels (47), with the associated silentblocks (37) carried in the housings (38) and which have in the middle section an anti-rotation bush (39), then showing the friction clutch (45) with its fixed (36) and rotary (35) sections

- This shaft (24) comprises the reels (47) of the belts (12) and at their end is the gear (26) which is operated by the right gear (27) on shaft (20) and where the silentblock (37) and bearing (44) are shown.

- Shafts (30) comprising the step pulleys (31) of the belts (12) which operate the rollers (34) for the movement of the belts (12) when banknotes are introduced/withdrawn through the entrance (14).

- Sensors (13) located at the entrance (14) which determine all technical characteristics such as centring, quantity, face value, thickness wear, legality, etc.

- Shaft (49) of the pressure tensor (48) which acts on the arm of the tensor (15), its rotation controlled by an angular transducer (33) which allows the linear speed of the assembly to remain the same whatever the angle of the arm (15) pressing the belts (12) on the banknotes, and the banknotes on their roller drum (20).

- Four plastic belts (12) between 13 and 25 microns thick and 15-25 mm wide, arranged alternately and symmetrically, without touching.

[0028] The belts (12) are rolled on the reels (18) and guided by the step pulleys (31) and the guide rollers (34) surrounding the roller drum (20) where the banknotes are stored against the belts which are kept permanently tight by the friction clutches (45), the anti-rotation bushes (39) and the radial springs (19).

[0029] Banknotes are introduced through the entrance groove (6) to the input (14) where they are caught by the belts (12) and run through the sensors (13), and are finally rolled up for storage on the roller drum (20), preferably rolled up along their longer side.

[0030] Given that the banknotes are rolled onto the main drum up to a diameter varying between 120/200 mm, the device allows for capacities of between 500 and 2,000 banknotes.

[0031] Having sufficiently described the nature of the invention and its practical implementation, it must be recorded that the above provisions, also shown in the attached drawings, may be modified in detail as long as that does not alter their fundamental principles established in the previous paragraphs and summarised in the following claims.

Claims

1. **A banknote recycling apparatus with an upper opening adaptable for ATMS and self-service** characterised essentially because it is based on a container, preferably parallelepiped, made up of least the following elements:

    - a lower level with fixed half-sides (5),
    - a removable left side cover (3),
    - a removable right side cover (4),
    - a movable top cover (9) with an upper opening.

    And where at least the following elements are seen on the outside of said container:

    - on the inside face, a connector (7),
    - along that same inside face, a groove (6) for the input/output of banknotes,
    - On its upper face, one or more control monitors 8),
    - On each side cover (3) and (4) plastic pressure hinges (10).

    And where, on the inside, at least the following elements are made out.

    - An electronic control plate (11),
    - A current connector (17),
    - An electric motor (16) with its output and pinion

(40),
- A shaft (20) carrying the banknote roller drum 22),
- A second shaft (23) supporting the upper reels (29),
- A third shaft (24) carrying the lower reels 47),
- A fourth shaft (30) comprising a set of step pulleys (31),
- A set of rollers (34) for movement of the belts (12).
- A set of belts (12), preferably four.
- A tensor (48) controlled by a sensor (33) which operate a pressure arm (15).

2. **A banknote recycling apparatus with an upper opening adaptable for ATMS and self-service** according to claim 1 and characterised because if the rear (2) is removed from the container (1) along with the side covers (3) and (4), the upper cover (9) can be opened approximately 90 degrees with the aid of the plastic pressure hinge (10).

3. **A banknote recycling apparatus with an upper opening adaptable for ATMS and self-service** according to claim 1 and characterised because the shaft of the banknote roller drum (20) is supported on silentblocks (21), and has its associated banknote roller drum (22), and shaft (20) is moved by the left transmission gear (28) activated by the gear (29) of the motor (16).

4. **A banknote recycling apparatus with an upper opening adaptable for ATMS and self-service** according to claim 1 and characterised because the shaft (23) of the upper reels (18) is supported on its silentblocks (37) carried in the housings (38) and, at its left end, is the gear (29) driven by the intermediate gear (32) in turn moved by the gear (28) of the drum (20) and where the friction clutch (45) is also seen, with its fixed part (36) and its rotating part (35).

5. **A banknote recycling apparatus with an upper opening adaptable for ATMS and self-service** according to claim 1 and characterised because the lower shaft (24) of the lower reels (47) is supported on its associated silentblocks (37) carried in the housings (38) and which has an anti-rotation bush (39) in its middle and where the friction clutch (45) is seen next with its fixed part (36) and rotating part (35) and where this lower shaft (24) incorporates the reels (47) of the belts (12) and, at its right end, there is the gear (26) directly activated by the right gear (27) of the shaft for the drum (20).

6. **A banknote recycling apparatus with an upper opening adaptable for ATMS and self-service** according to claim 1 and characterised because the shafts (30) incorporating the step pulleys (31) of the belts (12) drive the rollers (34) for moving the belts (12) when banknotes enter/exit through the entrance (14).

7. **A banknote recycling apparatus with an upper opening adaptable for ATMS and self-service** according to claim 1 and characterised because the sensors (13) are located alongside the entrance (14).

8. **A banknote recycling apparatus with an upper opening adaptable for ATMS and self-service** according to claim 1 and characterised because displacement speed and the tension of the belts (12) on the rolled-up banknotes remains the same thanks to the shaft (49) supporting the pressure tensor (48) acting on the arm of the tensor (15), its rotation controlled by an angular transducer (33).

9. **A banknote recycling apparatus with an upper opening adaptable for ATMS and self-service** according to claim 1 and characterised because the four plastic belts (12) between 13 and 25 microns thick and 15-25 mm wide are arranged alternately and symmetrically and do not touch, in such a way as to be rolled on to the reels (18) and guided by the step pulleys (31) and the guide rollers (34) and surrounding the roller drum (20) where the banknotes are stored against the belts which are always tight thanks to the friction clutches (45), the anti-rotation bushes (39) and the radial springs (19).

10. **A banknote recycling apparatus with an upper opening adaptable for ATMS and self-service** according to the previous claims and characterised because the banknotes which enter through the input groove (6) at the entrance (14) where they are displaced by the belts (12), move through the sensors (13) and are finally rolled up, preferably along their longer side, for storage on the roller drum (20).

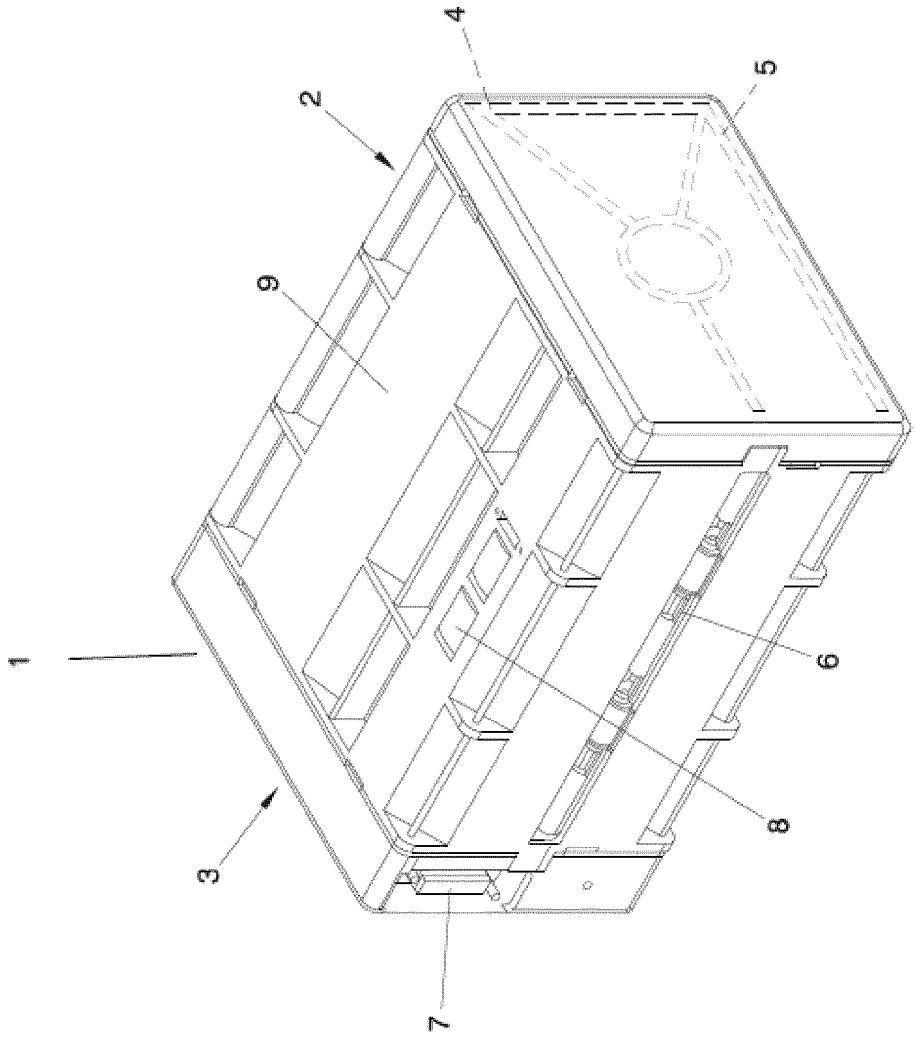

FIG. 1

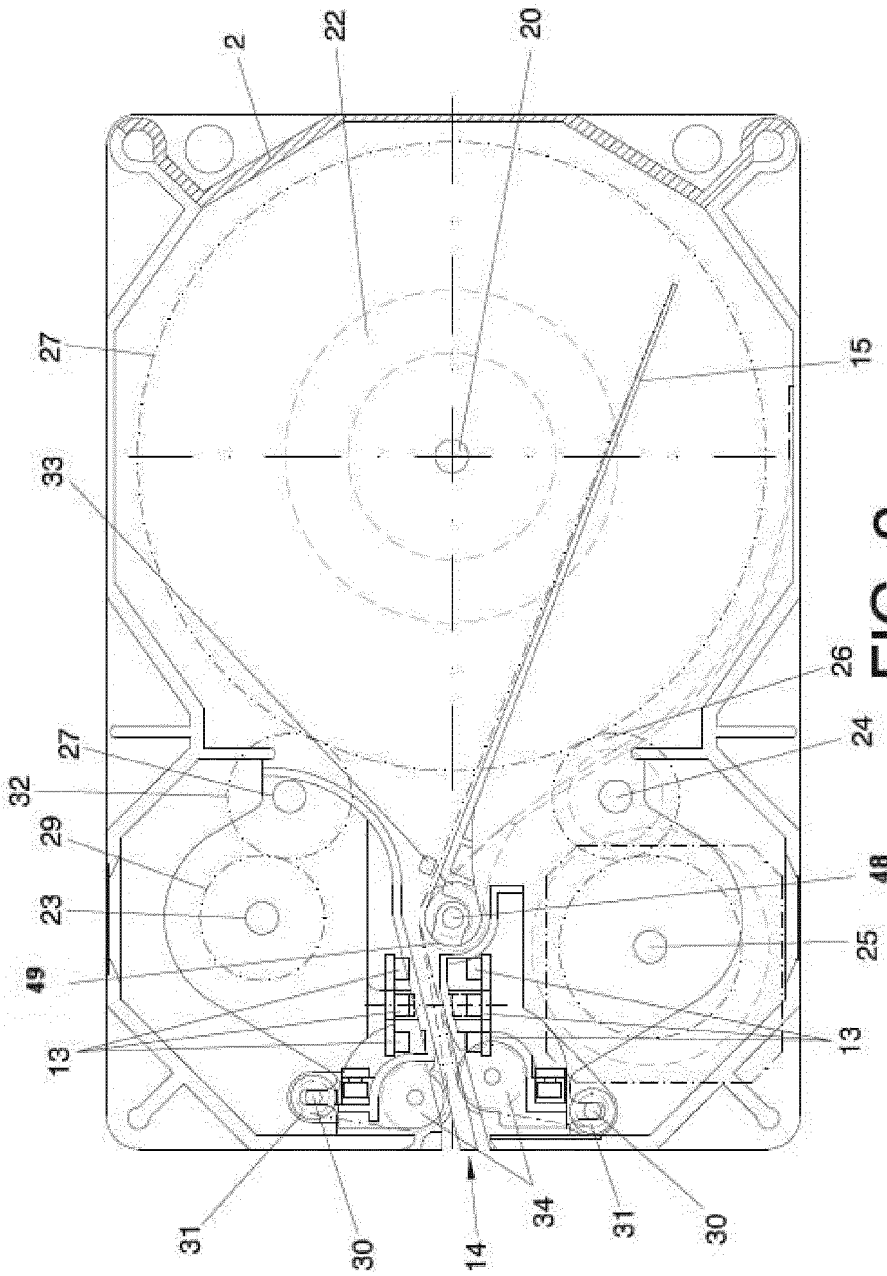

FIG. 2

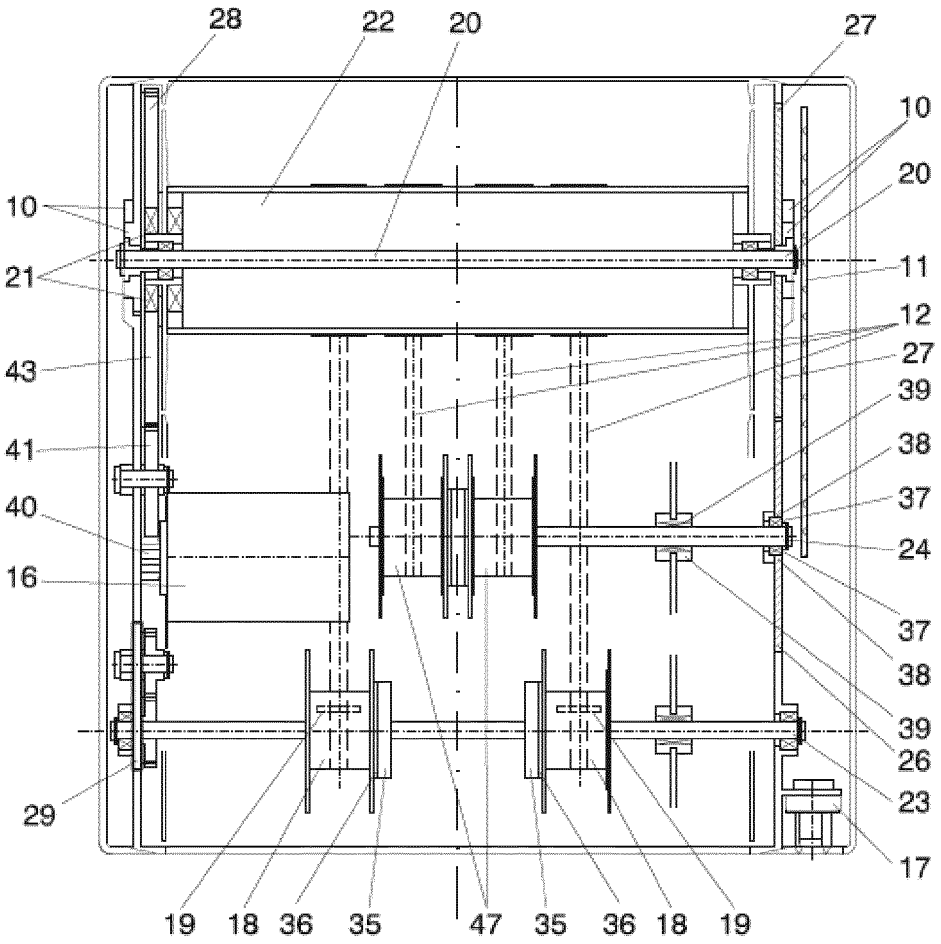
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FIG. 3

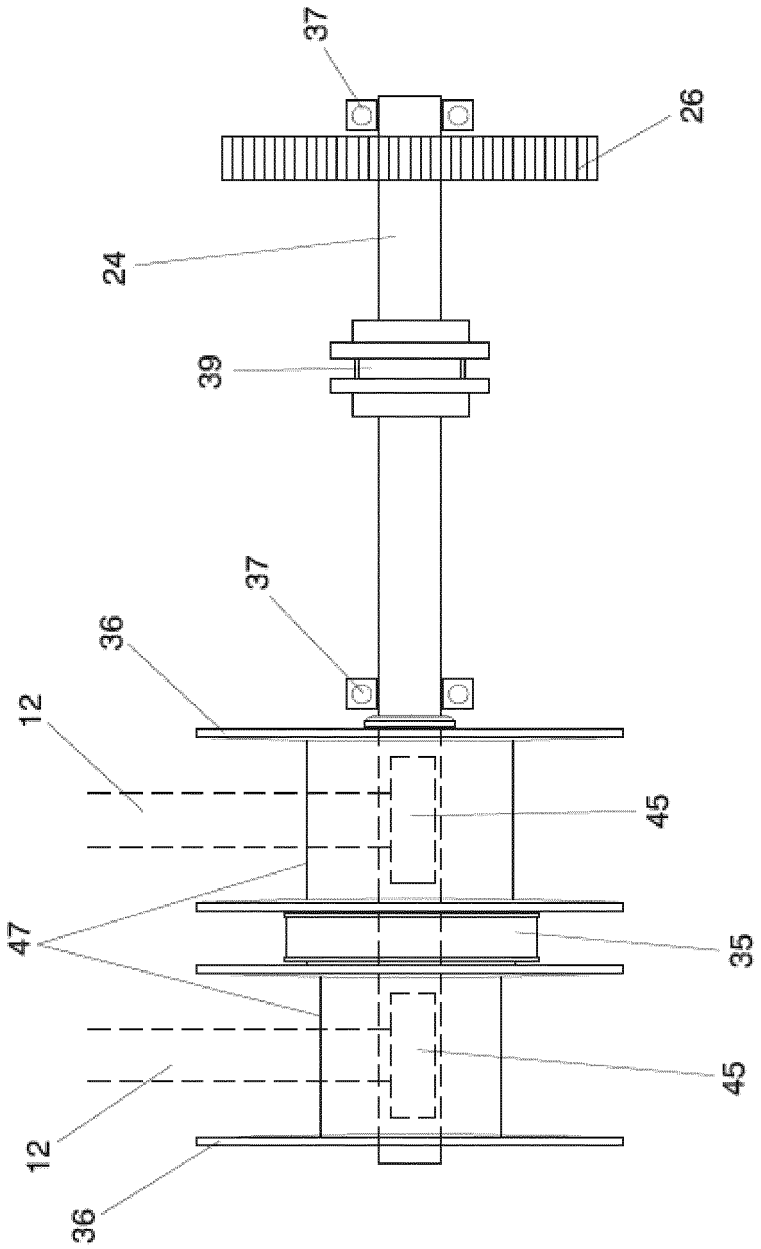

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2011/070576

A. CLASSIFICATION OF SUBJECT MATTER

G07D11/00 (2006.01)

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)
G07D11

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)

EPODOC, INVENES

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	US 5735516 A (GERLIER ANDRE ET AL.) 07/04/1998, the whole document.	1-10
A	US 4871125 A (HAUETER ERNST) 03/10/1989, the whole document.	1-10
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☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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"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
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19/01/2012	**(23/01/2012)**
Name and mailing address of the ISA/ OFICINA ESPAÑOLA DE PATENTES Y MARCAS Paseo de la Castellana, 75 - 28071 Madrid (España) Facsimile No.: 91 349 53 04	Authorized officer F. Olalde Sánchez Telephone No. 91 3498469

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2011/070576

C (continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of documents, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2003116400 A1 (SALTSOV LEON ET AL.) 26/06/2003, the whole document.	1-10

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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