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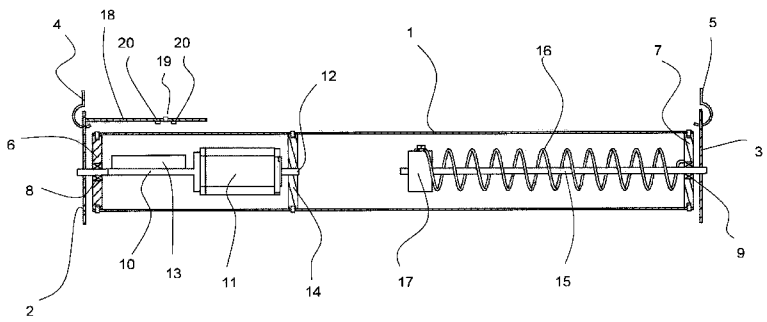
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(54) Title: DEVICE AND METHOD FOR CHANGING ELONGATED OBJECTS

FIG. 1



(57) Abstract: The present invention relates to a device for successively changing elongated flexible objects (100-400) from an active viewable position to a non-active, non- viewable position. The device comprises a rotatable drum (1) to which the flexible objects (100-400) are attached, a motor (11) arranged for driving the rotatable drum (1) in two opposing rotational directions, and a controller unit (13) for controlling the rotational speed and direction of the motor (11). **A** balancing spring (16) is arranged to be preloaded when the flexible objects (100-400) are unwound from the drum (1) and to provide a lifting force when the flexible objects (100-400) are wound up on the drum (1). By arranging the balancing spring (16) with a freewheeling clutch (17) this preloading can only occur in one rotational direction whereas the balancing spring (16) is allowed to freewheel in the other direction, taking no load. By providing the elongated flexible objects (100-400) with a magnetically interactive identification strip (110) the device is able to gain highly accurate information on the position of the flexible elongated objects (100-400). By pre-attaching the flexible elongated objects (100-400) on each other and provide the identification strip (110) on the designated carrier flexible object (100) exchanging the set of flexible elongated objects is made very simple.

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TITLE: DEVICE AND METHOD FOR CHANGING ELONGATED OBJECTS

Technical Field

The present invention relates to a device and a method for successively changing elongated sheets or similar flexible objects from an active viewable position to a non-active, non-viewable position, said device comprising a rotatable drum to which the flexible objects are attached, a motor arranged for driving the rotatable drum in two opposing rotational directions, and a controller unit for controlling the rotational speed and direction of the motor.

Background Art

In the commercial world of today more and more advertising is made. Stores are using advertisement posters to communicate their messages to the public. However, space is sometimes a limiting factor when it comes to exposing posters. To solve this problem it is known to use devices, which are capable of changing posters, by for instance rotating an "endless" belt or band consisting of many individual posters through a cylinder arrangement. In this fashion one surface may be used to display several different messages or advertisements.

However many of the known devices are usually complicated to handle, because of their complex design. For instance it might take a long time and be complicated to change a set of posters for new ones. The complexity with many different parts also contributes to the high cost for such devices.

One improved device is described in EP 883 875. This device comprises a drum on which different posters can be wound up and unwound. The posters are attached to the drum with the same distance therein between and by rotating the drum in a certain way and in different directions it is possible to show one poster at a time. A mechanical circuit controls the timing of the drums rotation, even if it is mentioned that it would be possible to use an electrical circuit. However, it is not further described how the electrical circuit could be realised. The mechanical circuit is complex and consists of a lot of different parts. One other aspect of the mechanical circuit is that it is noisy and different timing aspects have to be set in a mechanical way, which make it limited when it comes to set different time intervals.

A drawback with the device according to EP 883 875 is that it requires a strong motor when the posters or any other flexible objects become large and thereby heavy. Thus, it is important with a sufficient power supply. A large motor is of course also noisier than a small one.

Summary of the Invention

One object of the present invention is to provide a device for changing elongated flexible objects, which is much more energy efficient, silent, user friendly and reliable than today's devices.

The above object is according to the present invention solved by that the drum of the device comprises a balancing spring that is arranged to be preloaded during the unwinding of the flexible objects and providing a lifting force when the flexible objects are wound up whilst still allowing the device to retain the functionality of previous devices.

The present invention also describes a method for user-friendly attachment of the flexible objects as well as a method for self-calibration .

Brief description of the drawings

The present invention will now be described in more detail in relation to the enclosed drawings, in which:

Figure 1 schematically shows the device for changing elongated flexible objects, partly in cross section.

Figure 2 shows the device according to FIG 1, having posters attached to it. The arrow indicates the preferred direction of a spectator.

Figure 3 shows the device according to FIG 1 and FIG 2, but looking at the preferred back side of the posters.

Figure 4 shows a perspective view of the freewheeling balancing spring assembly. One end of the balancing spring **16** is fixed to the end cover **7** . The other end of the balancing spring **16** is connected to the journal **15** via a freewheeling clutch **17.**

Figure 4A shows a perspective view of the structural design of the freewheeling clutch **17.**

Figure 4B shows a cross section of the structural design of the freewheeling clutch **17.**

Figure 4C shows a perspective view of an alternative embodiment of a freewheeling clutch **117.**

Figures 5 to 10 depict in sequence the process by which the device changes the exposed poster.

Figure 11 shows in detail how the posters may be attached according to the present invention.

Detailed description of the preferred embodiments

The embodiment of the present invention will now be described. First of all the parts comprising the device will be described as depicted in the partly cross sectional view of FIG. 1.

The device comprises a drum **1** with rotational freedom between two end holding means **2**, **3**, preferably in the shape of discs. At each end the drum **1** is fitted with end covers **6** and **7** respectively. From a first end holding means **2** a motor holding bar **10** protrudes through the end cover **6**. A motor **11** for rotating the drum **1** of the device is provided inside the drum **1** and is held in place by the motor holding bar **10**. A controller unit **13** for controlling the speed and direction of the motor **11** as well as other aspects of the operation of the device is mounted on the motor holding bar **10**. The motor **11** exerts its torque to the drum **1** via a driving disc **14**. An output shaft **12** from the motor **11** is connected to the driving disc **14** in such a way that when the shaft **12** rotates the driving disc **14** also rotates. At the opposite end of the drum **1** a journal **15** protrudes from a second end holding means **3** through the end cover **7**. The journal **15** is rigidly connected to the second end holding means **3**. A freewheeling clutch **17** is provided towards the end of the journal **15**. A balancing spring **16** is connected to the end cover **7** at one end and to the freewheeling clutch **17** at the other end.

The motor holding bar **10** and the first end holding means **2** are fixed connected and may be produced as a single part, e.g. welded. The same applies to the second end holding means **3**, which may be combined with the journal **15** into a

single part. In order to minimize friction as the drum **1** rotates bearings **8** and **9** are housed in the end covers **6** and **7**. The end holding means **2** and **3** must not be allowed to rotate more than a small distance with reference to each other and may therefore be directly locked to each other or even produced as a single part.

Protruding from the first end holding means **2** is a girder **18** containing a magnet **19** and identifying means **20**.

Suspension means **4** and **5**, e.g. in the shape of hooks, may be added to the device in order to facilitate installation from ceiling, wall or a particular stand. The suspension means **4** and **5** engage the holding means **2** and **3**.

In order to use the device for its main purpose, flexible elongated objects **100-400**, referred to as posters, are attached to the drum **1**, as depicted in FIGS. 2 and 3. Expecting that the posters **100-400** are fully wound out, one of them will be exposed to a viewer in front of the device. Arrow **80** in FIG. 2 indicates this viewable direction. In order to provide a means for the controller unit **13** to calibrate the position of the posters or derive other necessary information about the system, an identifiable magnetically attractable object **110**, referred to as identification strip, is attached to at least one of the posters, e.g. the poster **100** as depicted in FIGS. 3,5,6,7,8 and 10. The identification strip **110** may however be integrated into the very fabric of the poster **100**, e.g. by use of special thread or printing ink.

The principle of operation will be described below.

In order to describe the new functionality introduced by the present invention it is necessary to summarize the main function of changing and displaying posters. This function is in itself not unique to the present invention and can be found in the existing invention, EP 883 875. However the

additional new functionality added by the present invention is clearly described below.

According to FIG. 5 poster **400** is in an exposed state. The device is depicted with 4 posters, but the device can easily be used with other numbers of posters attached to the drum **1**. In order to display another poster the device will start to turn the drum **1** counterclockwise around its axis according to the arrow **90** in FIG. 6 thus winding up the attached posters **100-400.** Eventually, as the objects are fully wound up, the one object that was furthest back when starting to wind up, in this case poster **100,** will fall over the top as depicted by arrow **94** in FIG. 9 and thereby become the front object. As this happens the device reverses the rotation of the drum **1**, winding the posters **100-400** down clockwise which is indicated by the arrow **95** seen in FIG. 10. This motion continues until the newly exposed poster **100** is fully exposed. The device then stops, exposing the object for an arbitrarily set amount of time after which the cycle repeats for the next poster to be shown and so on. The device can however be interrupted at any time, during any part of the cycle, without affecting the function of the device as long as this does not cause any loss of information regarding the exact position of the posters. For instance it may be preferred to halt the device as the newly exposed poster falls over the top of the drum **1** or pause the unwinding midways. This can be achieved either by direct input from the user or as part of a pre-programmed procedure, but it is outside the scope of this text to describe this any further as it is easily realized by a person skilled in the art.

It should be noted that even though the motion consists of both clockwise and counterclockwise rotation the total sum of all rotation has to be counterclockwise with reference to FIG. 5 to 10. In order to successively change the posters the drum **1** is turned a certain amount more

counterclockwise than clockwise for every object. For a set of two posters that amount is 1/2 of a revolution, for a set of three it is 1/3 of a revolution and so on. A prerequisite for this is that the elongated flexible objects **200-400** are attached to the carrier flexible object **100** at distances of 1/2 the drum circumference for a number of two posters, 1/3 the drum circumference for a number of three posters, 1/4 for a number of four posters and so on.

Below the function of the balancing spring assembly is described in detail. In order to wind up the posters **100-400** it is necessary that the motor **11** driving the system produces a lifting force to overcome the weight of the poster **100-400.** By introducing a spring **16** that is connected to the drum **1**, via the end cover **7**, at one end and to the journal **15**, via the freewheeling clutch **17**, at the other end it is possible to preload the device in such a way that the force of the spring **16** balances the weight of the posters **100-400** to a high degree. The spring **16** is therefore referred to as a balancing spring.
When the posters **100-400** are completely wound up the balancing spring **16** is not loaded at all, i.e. has no inherent load. As the posters **100-400** are wound down the balancing spring **16** is spun and thereby continuously gets preloaded enough to balance the weight of the posters **100-400**. Similarly as the posters **100-400** are wound up the balancing spring **16** continues to provide this lifting force .

This means that instead of having to lift the entire weight of the objects the motor only has to provide enough force for acceleration. Thereby the physical requirements of the motor are reduced significantly, indirectly reducing noise and power consumption as well.

The balancing spring **16** is fixed connected to the drum **1** via end cover **7**. At the start of winding down a poster the

balancing spring **16** is supposed to provide no lifting force. This also has to comply with the inherent function of the device to successively rotate the drum **1** slightly more counterclockwise than clockwise for every poster changed. Therefore the balancing spring **16** is connected via a freewheeling clutch **17** to the journal **15**. This allows the balancing spring, end cover, drum -package to freewheel counterclockwise without preloading the balancing spring **16** whereas clockwise rotation is clutched meaning that the balancing spring **16** is preloaded. In this way the device is allowed continuous counterclockwise motion whilst still benefiting from having the weight of the posters **100-400** balanced. In FIG. 4 the balancing spring **16** is depicted as a torsion spring as this is the preferred embodiment, but it should be realized that other types of springs may be used to achieve the objective of balancing the weight of the posters.

In FIGS. 4A and 4B the structural design of the freewheeling clutch **17** is shown schematically. The freewheeling clutch **17** thus constitutes of a so called one way needle clutch. The outer ring **21** is provided with a number of segments **22** on its inner side, said segments **22** defining rolling surfaces for a number of rollers/needles **23** that are included in the one way needle clutch **17**. The segments **22** have a varying distance in relation to the center of the one way needle clutch **17** in the circumferential direction of the outer ring **21**. Therefore, adjacent segments **22** are connected by radial steps **24**. By studying Fig. 4B it is realized that when the outer ring **21** is rotated in counter clockwise direction/CCW the rollers **23** abut the steps **24** and the rotation is permitted. If the outer ring **21** is rotated in a direction opposite to CCW the rollers **23** will be jammed between the outer ring **21** and a central cylindrical body **25** of the one way needle clutch **17**. Thus rotation is prohibited.

If the balancing spring 16 was directly fixed to both the journal 15 and drum 1, i.e. no freewheeling clutch was present, it would in order to comply with the incremental counterclockwise rotation be increasingly preloaded in the wrong direction and the device would eventually either break down from destroying the balancing spring 16 or stall due to insufficient motor torque.

In Fig. 4C an alternative design of a freewheeling clutch 117 is shown. In this connection it should be pointed out that the arrangement shown in FIG.4C is reversed compared to the arrangement shown in Fig. 4. Thus, the freewheeling clutch 117 is integrated with the end cover 107 and one end of the balancing spring 116 is in engagement with said freewheeling clutch 117. The other end of the balancing spring 116 is fixedly connected to the journal 115 at a distance from the end cover 107 that generally corresponds to the length of the balancing spring 116. The freewheeling clutch 117 comprises a number of bosses 140 distributed around the journal 115. The bosses 140 comprise an end surface 141 and a sloping surface 142 that extends from the end surface 141 to the inner surface of the end cover 107. As the posters are unwound from the drum the balancing spring 116 will abut against the end surface 141 of the bosses 140 of the end cover 107 and thereby taking load, contributing a lifting force countering some or all of the weight of the posters. Then as the posters are wound up on the drum this abutment will still be in effect and the balancing spring 116 will continue to provide a lifting force. When the posters are once again fully wound up the balancing spring 116 will reach an unloaded state. Continuing in this winding up direction there are however no bosses to obstruct the movement of the balancing spring 116. Hence during any further movement in the winding up direction the balancing spring 116 will be free to slide on the sloping surfaces 142 of the bosses 140 and no preloading of the balancing spring 116 will be effected.

In order to accomplish the proper function of the device according to the preferred embodiment described earlier we may define the degrees of freedom of the internal parts as follows .

- The end covers 6 and 7 are provided freely rotatable with reference to journal 15 and motor holding bar 10 allowing the integration of ball bearings 8, 9 for lower friction or simply relying on sleeve bearings.

- The end covers 6 and 7 as well as the driving disc 14 are all fixed connected to the drum 1. The motor axis 12 is also fixed connected to the drum 1 via the driving disc 14.

- The motor 11 is fixed connected to the first end holding means 2 via the motor holding bar 10 to which also the controller unit 13 may be attached.

- The journal 15 and motor holding bar 10 are fixed connected to the first and second end holding means 2 and 3 respectively.

- The end holding means 2 and 3 need with reference to each other to allow no more than a few degrees of rotational freedom. This can either be achieved by providing the device with a crossbar or relying on the mounting of the device, i.e. letting the wall, ceiling or other device support restrict the rotation of the end holding means 2 and 3.

- The balancing spring 16 is fixed connected to the end cover 7. The other end of the balancing spring 16 is via the freewheeling clutch 17 allowed free rotation around the axis of the journal 15 in only one direction .

The function of the magnet assembly will be described below.

In order to successively change the posters **100-400** in a correct manner it is of utmost importance that the reversal of the rotation of the drum **1** occurs at the right position according to FIGS. 9 and 10. The posters **100-400** can be pre-arranged on the drum **1** for this to be accomplished and the controller unit **13** can be programmed to function according to these fixed positions. This does however require the user of the device to manually calibrate the device to the posters **100-400** and leaves the device completely unable to self-correct any shift from this calibration .

According to the function of the device, as the end of the poster to be exposed reaches the position on the drum **1** where it will fall over, the rotational direction of the drum **1** is reversed in order to expose this poster. It is necessary that this reversal occurs at a specific point in order to guarantee the function of the device. If the reversal is performed too early the next poster will not fall over and be exposed. If the reversal is too late there is a risk that the succeeding poster will also fall over, compromising the function of the device. The device therefore needs to be calibrated with the posters. The calibration signal can also be used by the controller unit **13** to determine whether the device is functioning properly and take care of any such detected problems should they arise .

One such means of calibration is depicted in FIGS. 3, 5, 6, 7, 8 and 10. An identification strip **110** is attached to one of the posters near or at the end of the poster. The device is fitted with a magnet **19** on the protruding girder **18**. On

this girder 18 close to the magnet 19 are means for identifying the end of the poster, referred to as identifying means 20. As the magnetically attractable identification strip 110 comes into proximity of the magnet 19 it is pulled towards the magnet and the accompanying identifying means 20 as depicted by arrow 91 in FIG. 6 whereby a signal is sent to the controller unit 13, indicating that one of the posters is near the top of the drum 1. There are several different techniques available for constructing the identifying means 20. They may for instance comprise an inductive sensor or one or more electric contact points, integrate an optic sensor device etc. but by bringing the end of the poster so close to the identifying means 20, precision and functionality is increased regardless of the method used for identification.

As the drum 1 is turning counterclockwise/CCW winding up the posters it will stretch the end of the poster 100 as the identification strip 110 is held back by the magnet 19. Eventually the poster 100 cannot be stretched any further and is released from the magnet 19 as depicted in FIG. 8. This point of release is of very high accuracy and is preferably the one used for calibrating the position of the posters .

Both of the signals mentioned above can be used as information for the controller unit 13 to determine the exact position of the posters. However, preferably the latter signal is used since the disengagement point of the identification strip 110 and the magnet 19 can easily achieve far greater accuracy than the engagement point. This is due to the very controlled nature of a stretched poster compared to the uncontrolled nature of an un-stretched poster.

The device will in this way use the signal in order to determine the correct position at which to reverse the

direction of the drum **1**. Preferably this position is slightly after the identification strip **110** has disengaged the magnet **19** in order to ensure that the identification strip **110** is no longer influenced by the magnet and there is no chance of it being pulled back towards the magnet **19** as the rotation of the drum **1** is reversed.

For the next poster the position of reversal can easily be calculated by the controller unit **13** by adding 1/3, 1/4 drum revolution etc. counterclockwise rotation according to the method described earlier. An identification strip **110** is therefore only necessary on one of the posters. It should however be understood that an identification strip can be attached to each and every of the posters e.g. in order to further enhance reliability of the device.

Although the most likely setup is having the identification strip **110** made of a passive material that will interact with the magnetic field of a magnet **19** it is also possible to make an identification strip **110** that is permanently magnetic whereby the magnet **19** can be replaced with a magnetically attractable material, e.g. soft iron. It is also possible to make the entire fabric of a poster or a part of it magnetic by use of special thread or printing ink. Furthermore the magnetic field provided either by the magnet **19** or by the identification strip **110** can be produced by means of an electro magnet having the benefit of being possible to turn on and off.

The advantages given to the device by magnetically attracting the posters towards the identifying means **20** can be summarized as improving the cost-efficiency, accuracy and reliability of calibration. It also has a self-cleaning effect as the identification strip **110** is forced to slide across the surface of the girder **18** thereby keeping surfaces free from corrosion or dust.

A method for attaching the posters to the device will be described below.

The posters **100-400** can be attached to the drum **1** in a variety of ways. In one preferred embodiment of the present invention the posters **100-400** are attached to each other as a separate package as depicted in FIG. 11 before being fixed to the drum **1**. The first poster **100** being the carrier for the other posters needs to be a certain amount longer than the other posters in order to achieve proper exposure. The other posters are then attached to this carrier poster **100** at certain distances determined by the diameter of the drum **1** and the total number of posters.

Preferably, the posters are attached at the same mutual distance around the drum **1** in order to make it easier to program the controller unit **13** and also enhance the changing of the posters. However, it is also possible to provide the posters at different mutual distances to each other. The posters themselves might also be provided, if necessary, with weights such that the posters always appear in a stretched state.

When using a single identification strip **110** it can be provided on any of the posters **100-400** in order to achieve calibration of the poster position. By placing it on the carrier poster **100** as depicted in FIG. 11 it can however fulfill yet another objective. When a user wishes to switch the set of posters **100-400** for another set of posters and the principle of a carrier poster **100** is applied it is necessary that the carrier poster **100** is the front-most poster being exposed. The particular carrier poster **100** can be sorted out by the device given that the identification strip **110** is attached to said poster **100**. During calibration as the identification strip **110** is recognized by the device and the poster **100** subsequently is changed to being the front-most poster the user can easily stop the

device and efficiently make the desired switch of poster sets .

It should be understood that the design of the device can differ from the schematic view of FIG. 1. The drum **1** may for instance be made very narrow or even solid forcing the motor and balancing spring mechanisms to be outside the drum **1**. It is however believed to be very advantageous both in a practical, economical and design sense to use the drum **1** as a housing for motor, balancing mechanisms, controller units etc. The balancing spring **16** and freewheeling clutch **17** as well as identifying means **20** and the identification strip **110** can be physically realized in a number of ways but in order to be utilized properly by the device they need to interact with each other in the ways described earlier. It shall be understood that even if the invention has been described with reference to preferred embodiments the invention is not limited thereto. Features from one embodiment may for example be used together with other embodiments. Thus, the features described above may be combined in any desired combination. There are many embodiments and variations that are within the scope of the invention, which are best defined by the accompanying claims .

Feasible modifications of the invention

In the embodiment described above the girder **18** is provided with one magnet **19**. However, within the scope of the present invention it is feasible to have more than one magnet .

CLAIMS

1. Device for successively changing elongated flexible objects **(100-400)** from an active viewable position to a non-active, non-viewable position, said device comprising a rotatable drum **(1)** to which the flexible objects **(100-400)** are attached, a motor **(11)** arranged for driving the rotatable drum **(1)** in two opposing rotational directions, and a controller unit **(13)** for controlling the rotational speed and direction of the motor **(11)**, **characterized by** a balancing spring **(16; 116)** and a freewheeling clutch **(17; 117)** mechanism being arranged in such a way that when the drum **(1)** is being rotated in one direction, i.e. the direction where the flexible objects **(100-400)** are unwound from the drum **(1)**, the freewheeling clutch **(17; 117)** will engage with the balancing spring **(16; 116)** forcing the balancing spring **(16; 116)** to take increasing load, and as the drum **(1)** is being rotated in the other direction, i.e. the direction where the flexible objects **(100-400)** are wound up on the drum **(1)**, the balancing spring **(16; 116)** assists in rotating the drum **(1)** until the balancing spring **(16; 116)** has no inherent load, and if the rotation of the drum **(1)** in the other direction proceeds further no preloading of the balancing spring **(16; 116)** occurs.

2. Device according to claim 1, **characterized by** that the freewheeling clutch **(17)** is arranged at the end of the balancing spring **(16)** that is remote from an end cover **(7)** of the drum **(1)**.

3. Device according to claim 1, **characterized by** that the freewheeling clutch **(117)** is arranged at the end of the

balancing spring **(116)** that is adjacent to an end cover **(107)** of the drum **(1)** .

4. Device according to any of claims 1-3, **characterized by** that the device further utilizes a magnetic force for attracting at least one of the flexible elongated objects **(100-400)** in order to improve the interaction with identifying means **(20)** responsible for determining the position of the flexible elongated objects **(100-400)** and retrieving other information about the system.

5. Device according to claim 4, **characterized by** that the magnetic force is present between a magnet **(19)** and a magnetically attractable material **(110)** .

6. Device according to claim 5, **characterized by** that the magnet **(19)** is provided on a girder **(18)** that is attached to an end holding means **(2)** that carries one end of the drum **(1)** , that the magnetically attractable material **(110)** is provided on at least one of the posters **(100-400)** , and that the identification means **(20)** are provided on the girder **(18)** .

7. Device according to any of the previous claims, **characterized by** that the motor **(11)** is located inside the drum **(1)** .

8. Device according to claim 7, **characterized by** that an output shaft **(12)** of the motor **(11)** is drivingly connected

to a driving disc **(14)** inside the drum **(1)** , and that the driving disc **(14)** is rigidly connected to the drum **(1)** .

9. Method for mounting elongated flexible objects **(100-400)** on a drum (1), the elongated flexible objects **(100-400)** being attached on each other before attachment to the drum **(1)** , **characterized by** that one of the elongated flexible objects, defined as the carrier flexible object **(100)** is long enough to cover the other elongated flexible objects **(200-400)** , and still allows for attachment to the drum **(1)** without interfering with the exposable surface of the elongated flexible objects **(100-400)** .

10. Method according to claim 9, **characterized by** that the elongated flexible objects **(200-400)** are attached to the carrier flexible object **(100)** at distances of 1/2 the drum circumference for a number of two posters, 1/3 the drum circumference for a number of three posters, 1/4 for a number of four posters and so on.

11. Method according to claim 9 or 10, **characterized by** that an identification strip **(110)** is attached to the carrier flexible object **(100)** .

FIG. 1

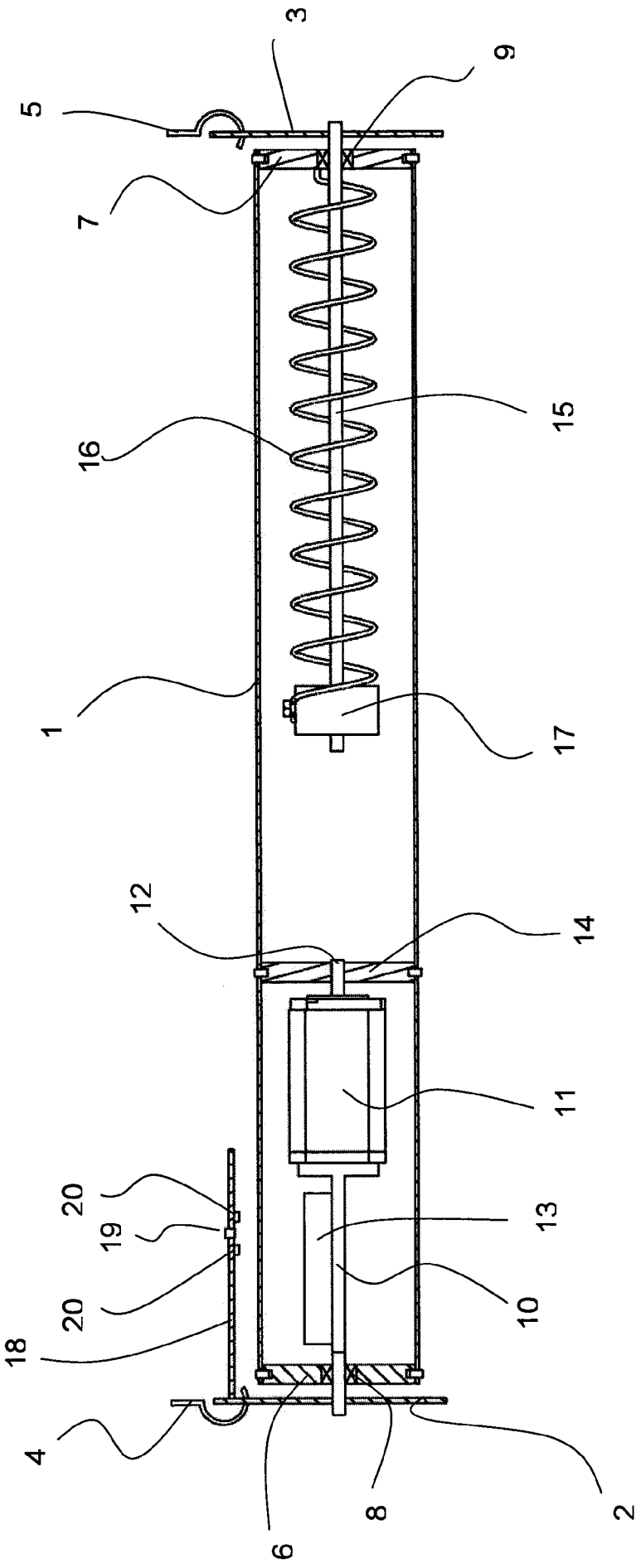


FIG. 2

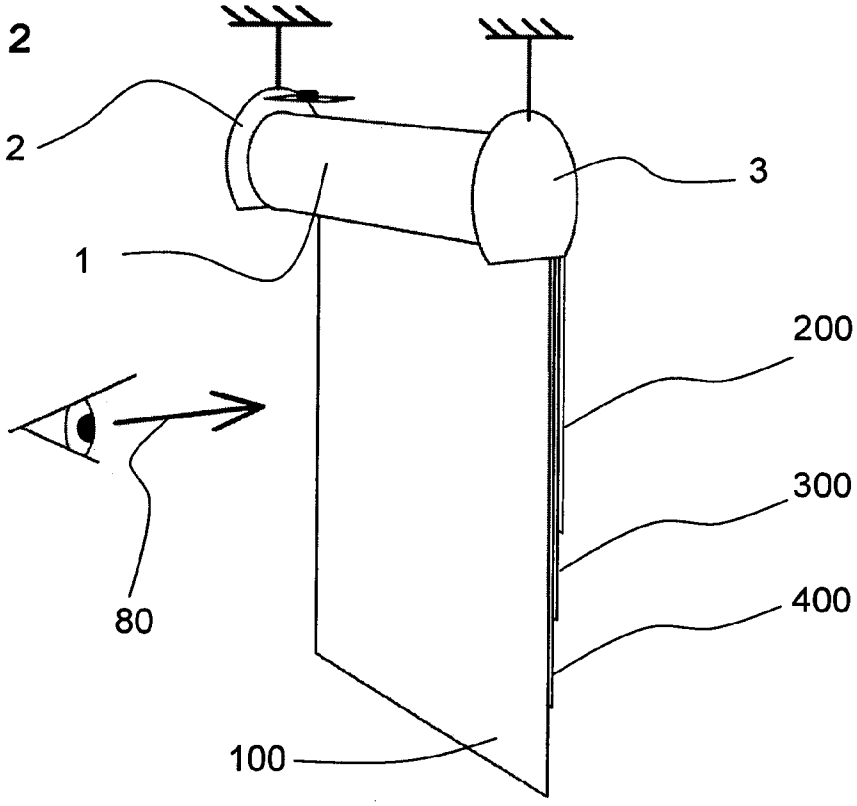


FIG. 3

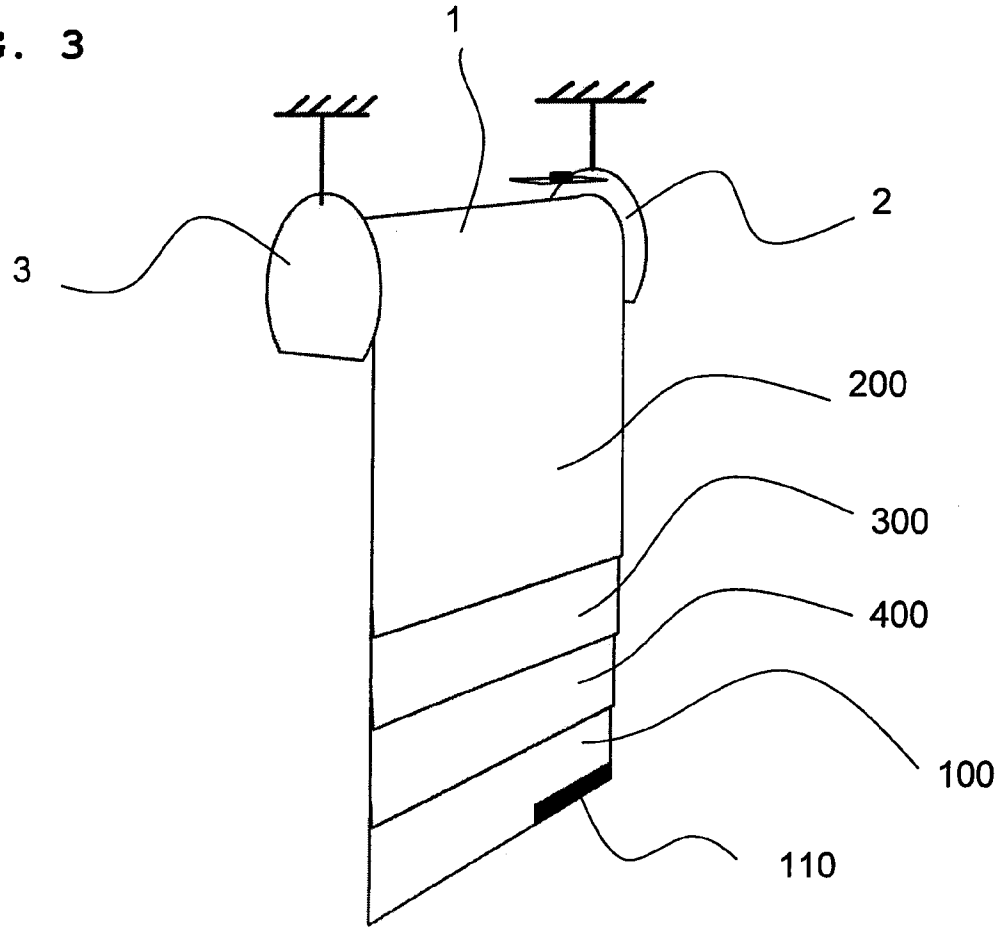


FIG. 4

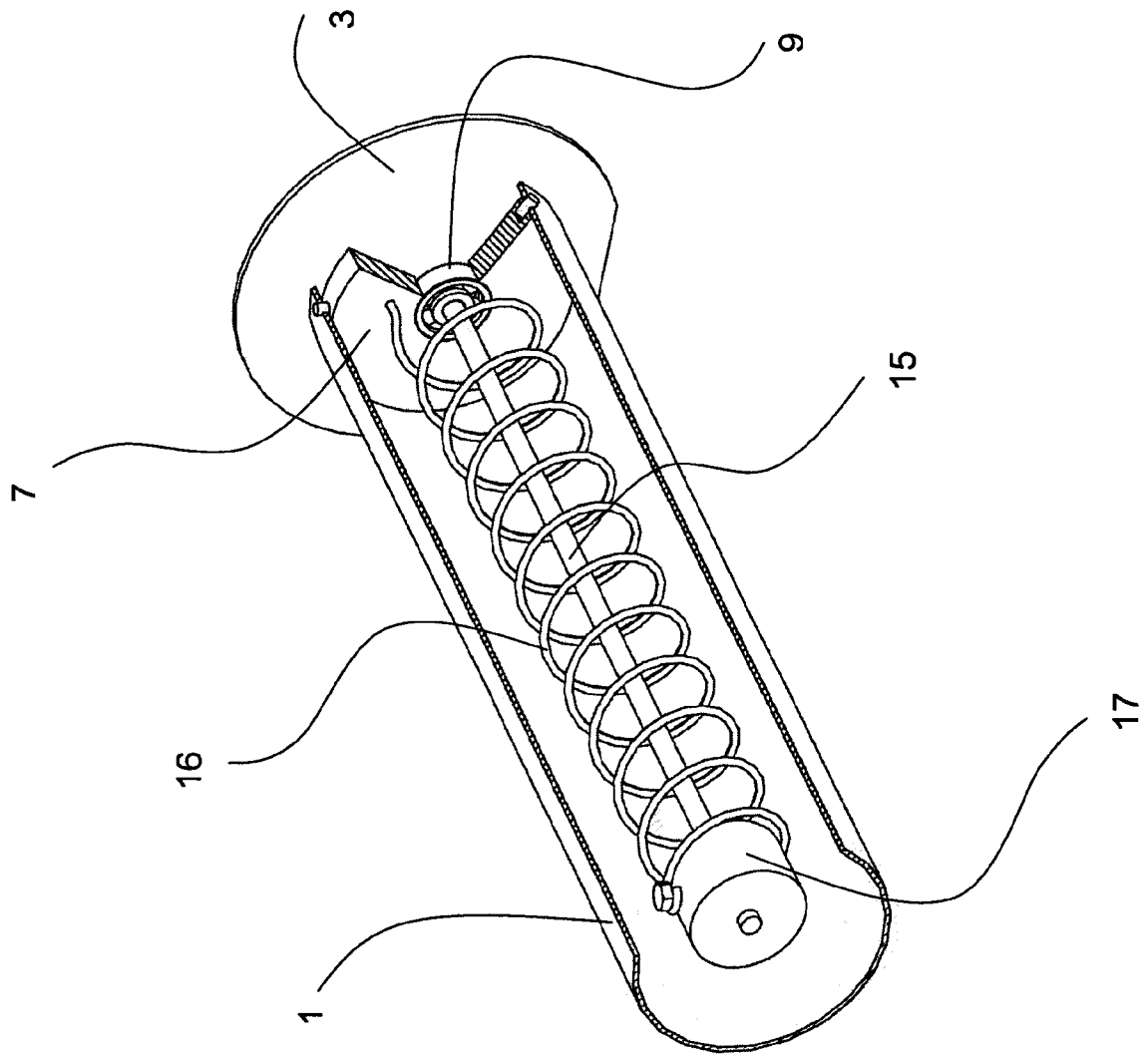


FIG. 4A

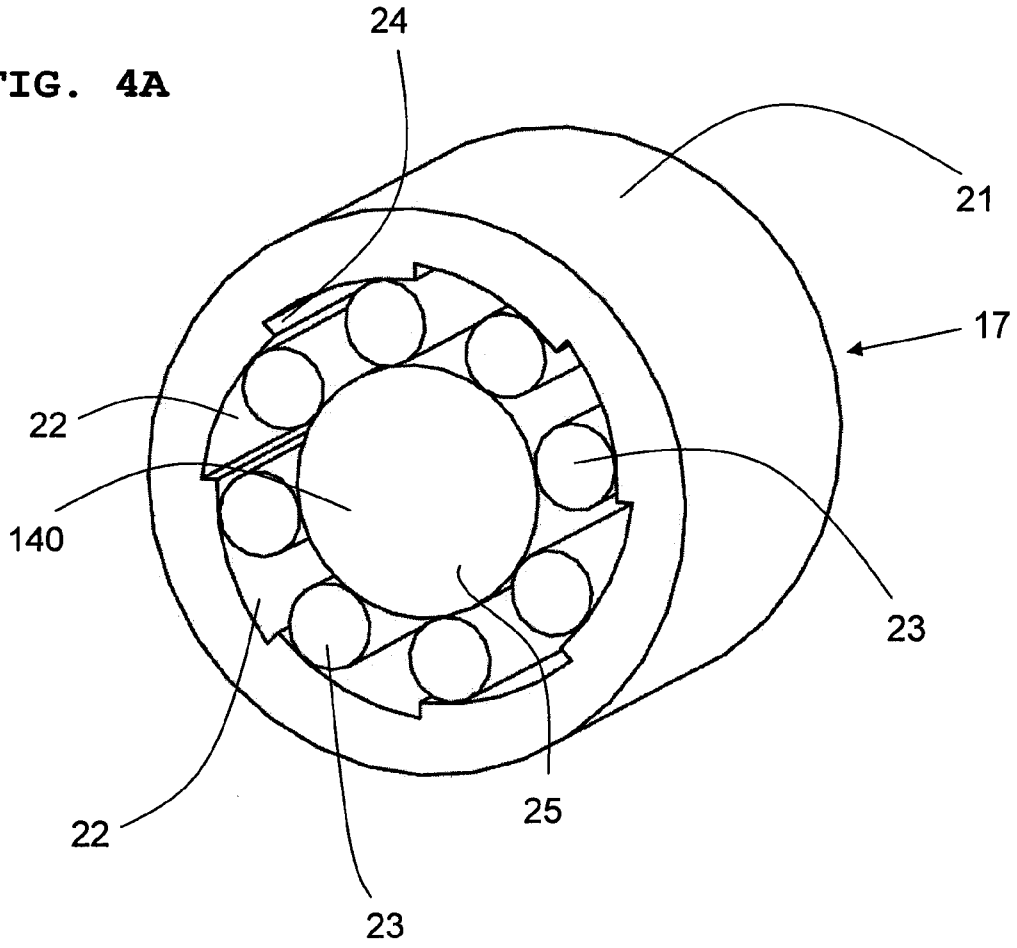


FIG. 4B

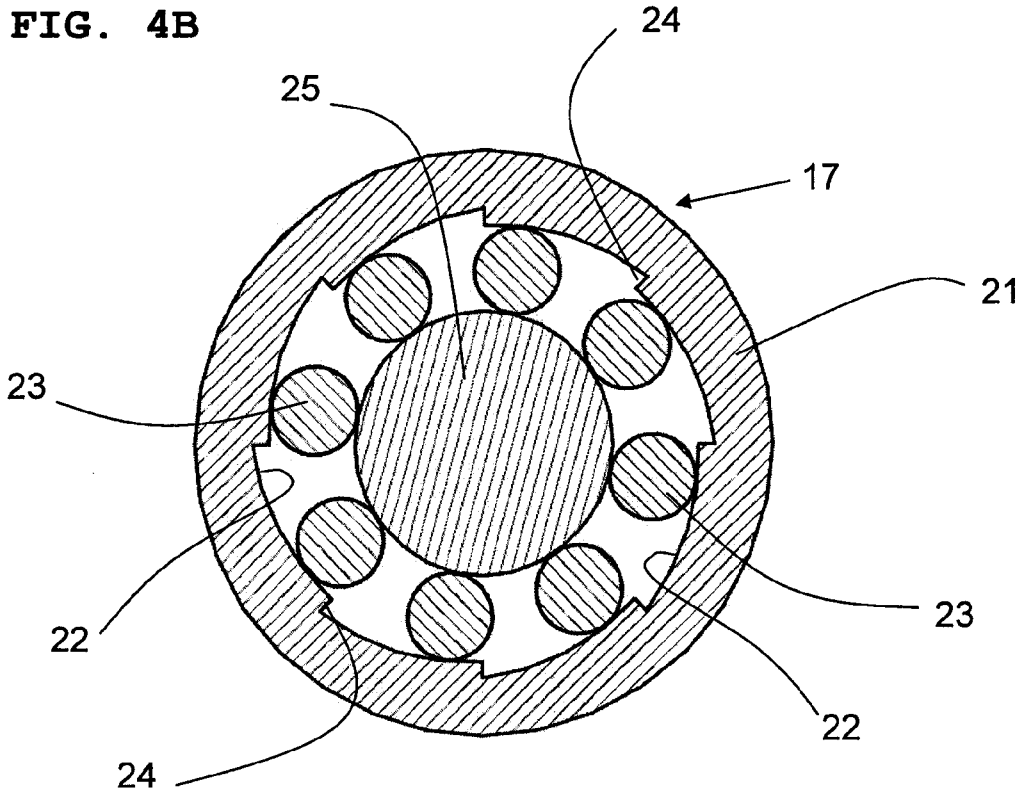


FIG. 4C

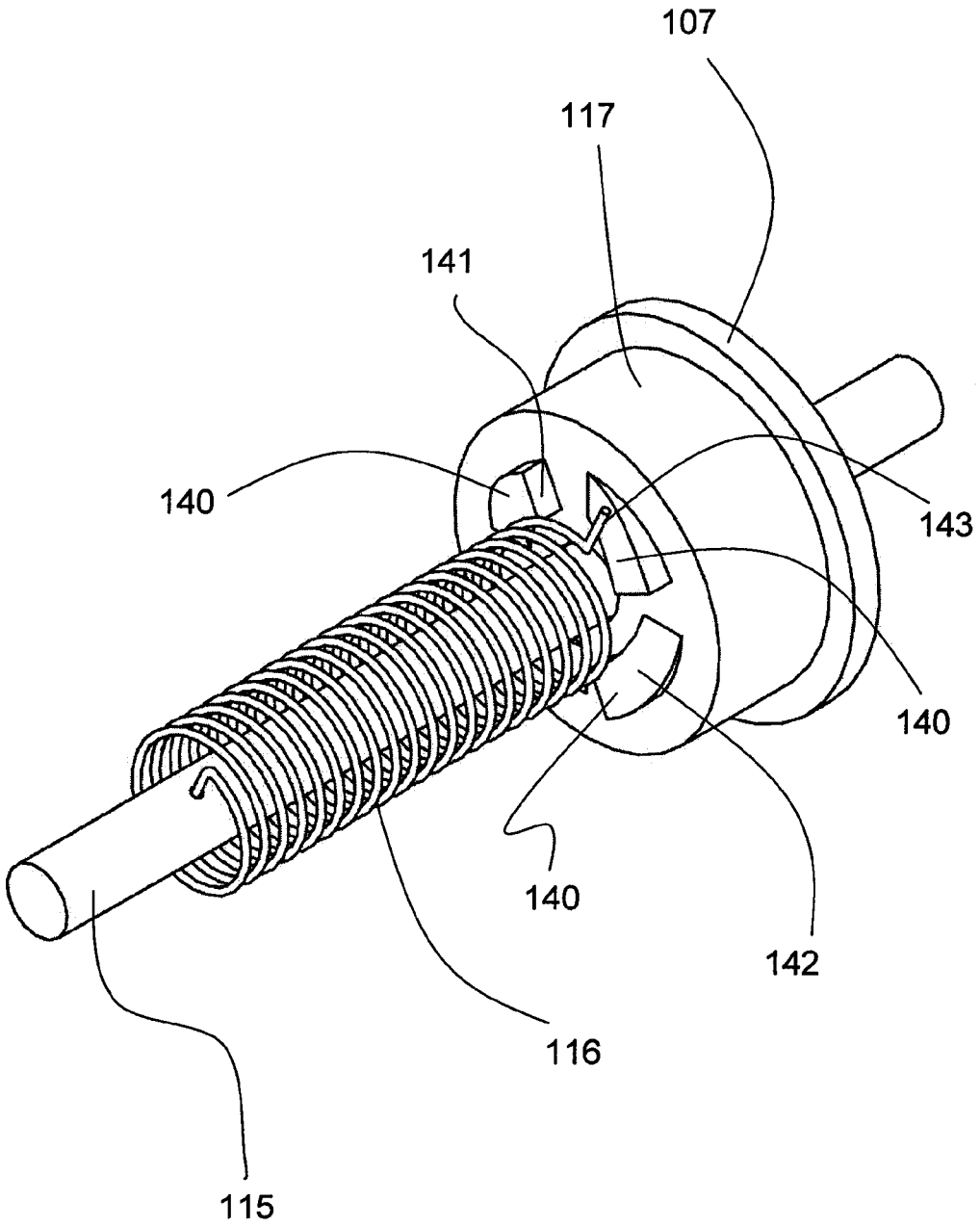


FIG. 5

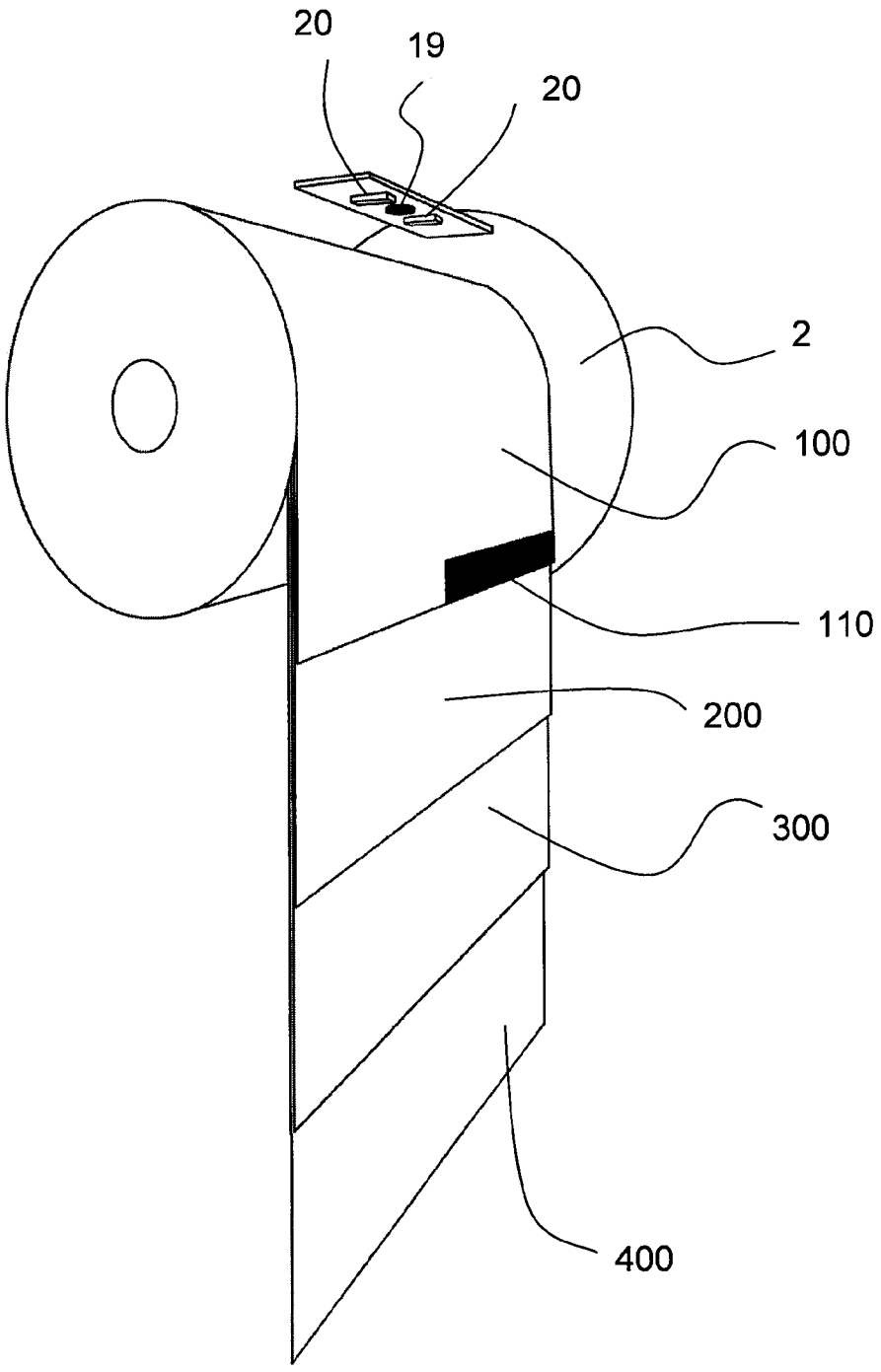


FIG. 6

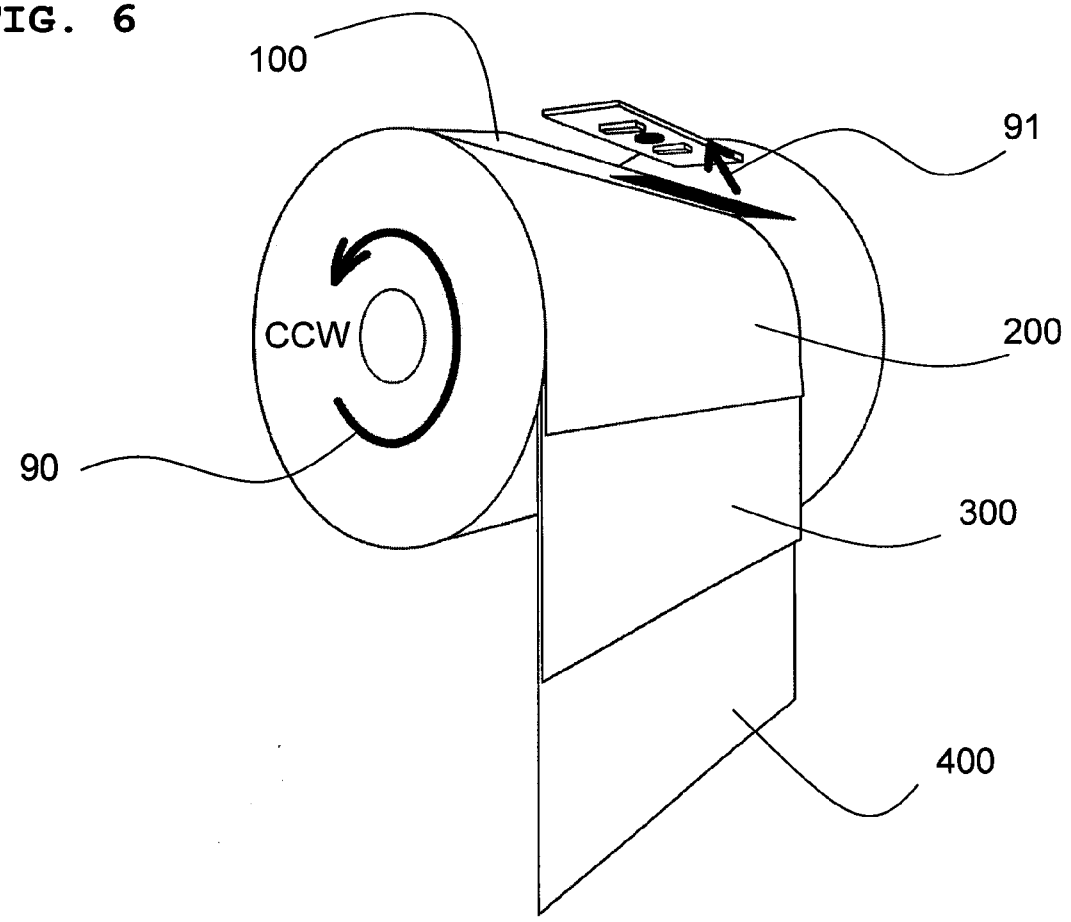


FIG. 7

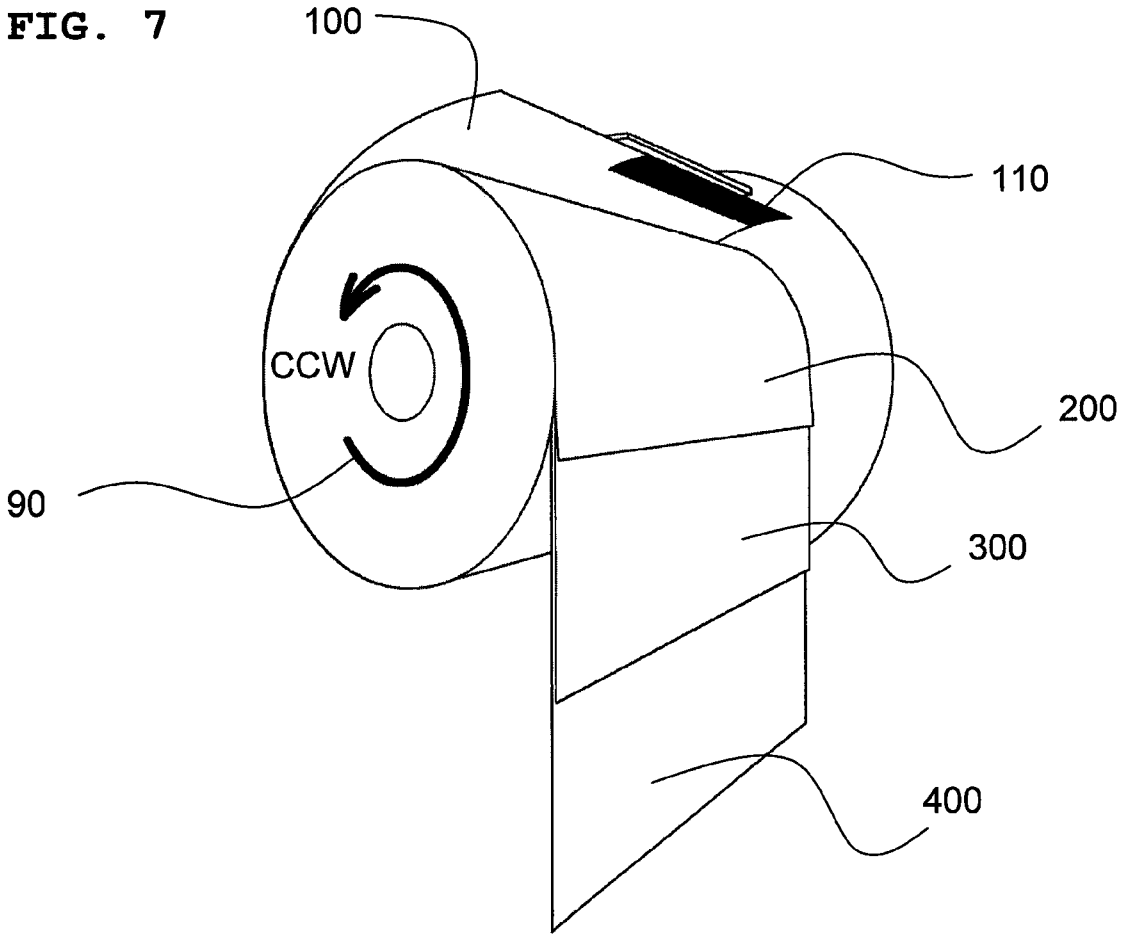


FIG. 8

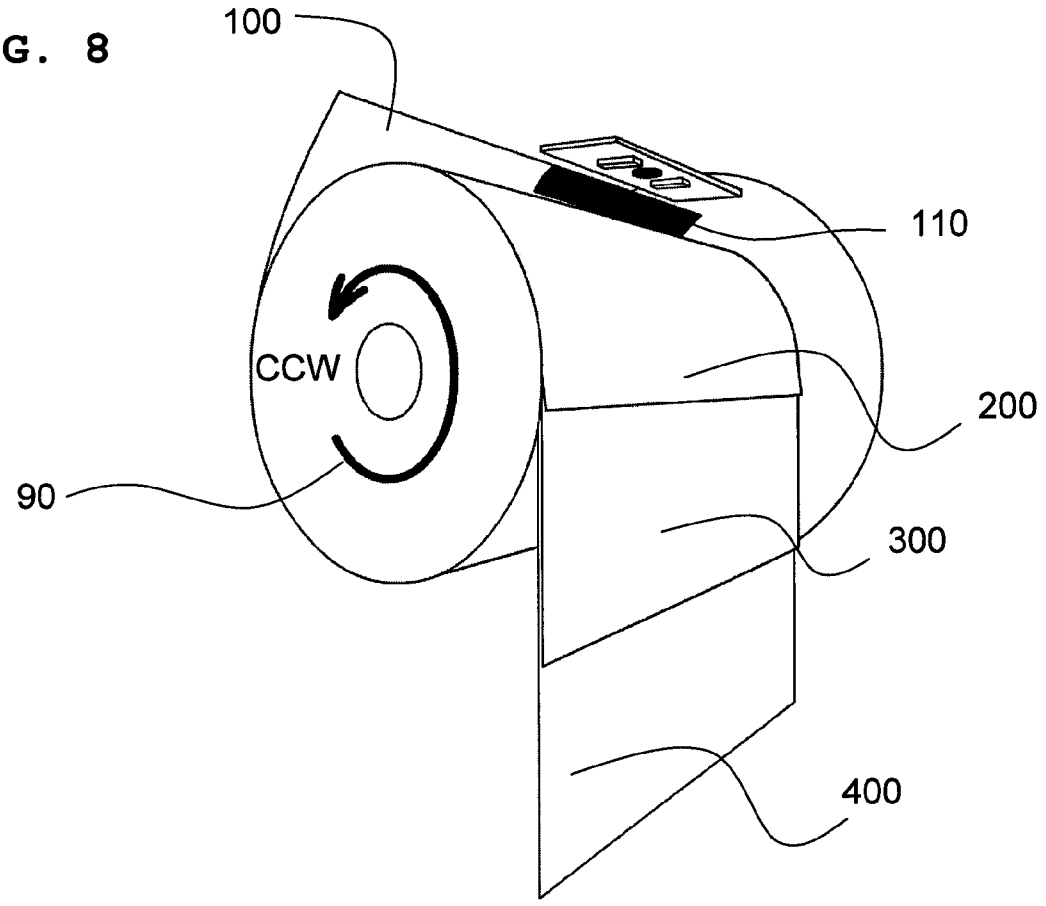


FIG. 9

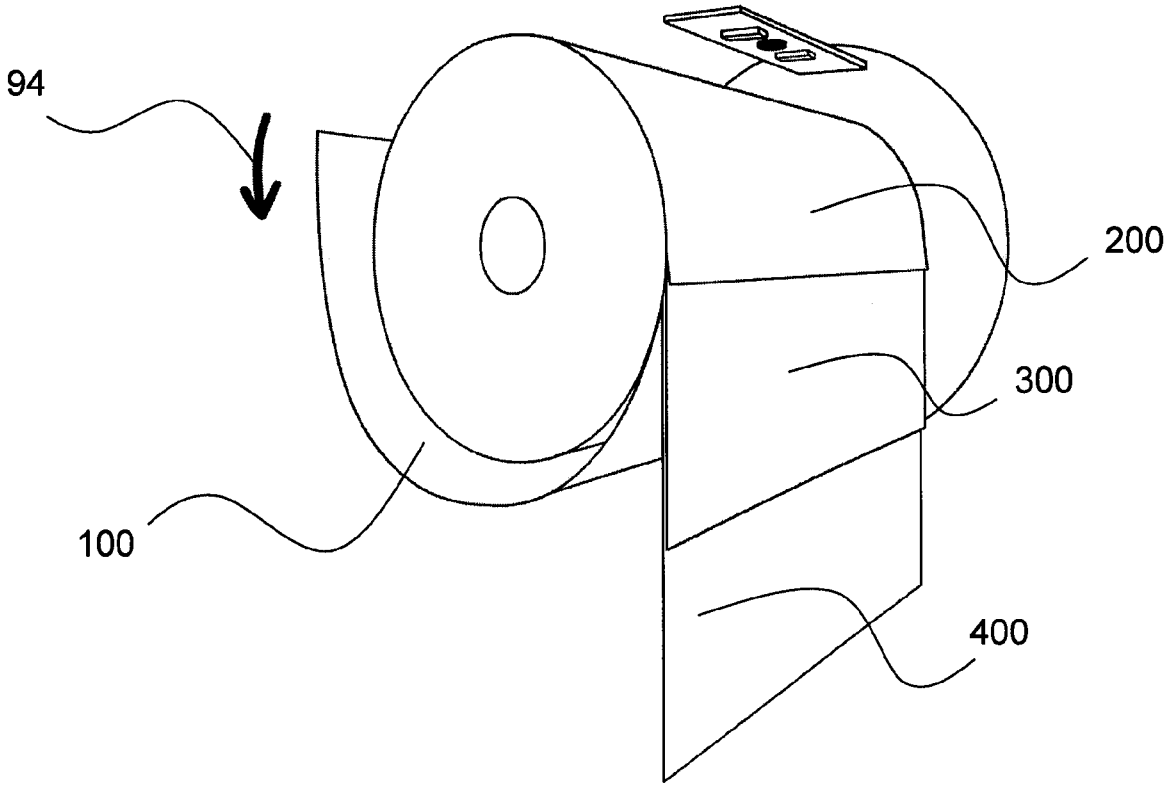


FIG. 10

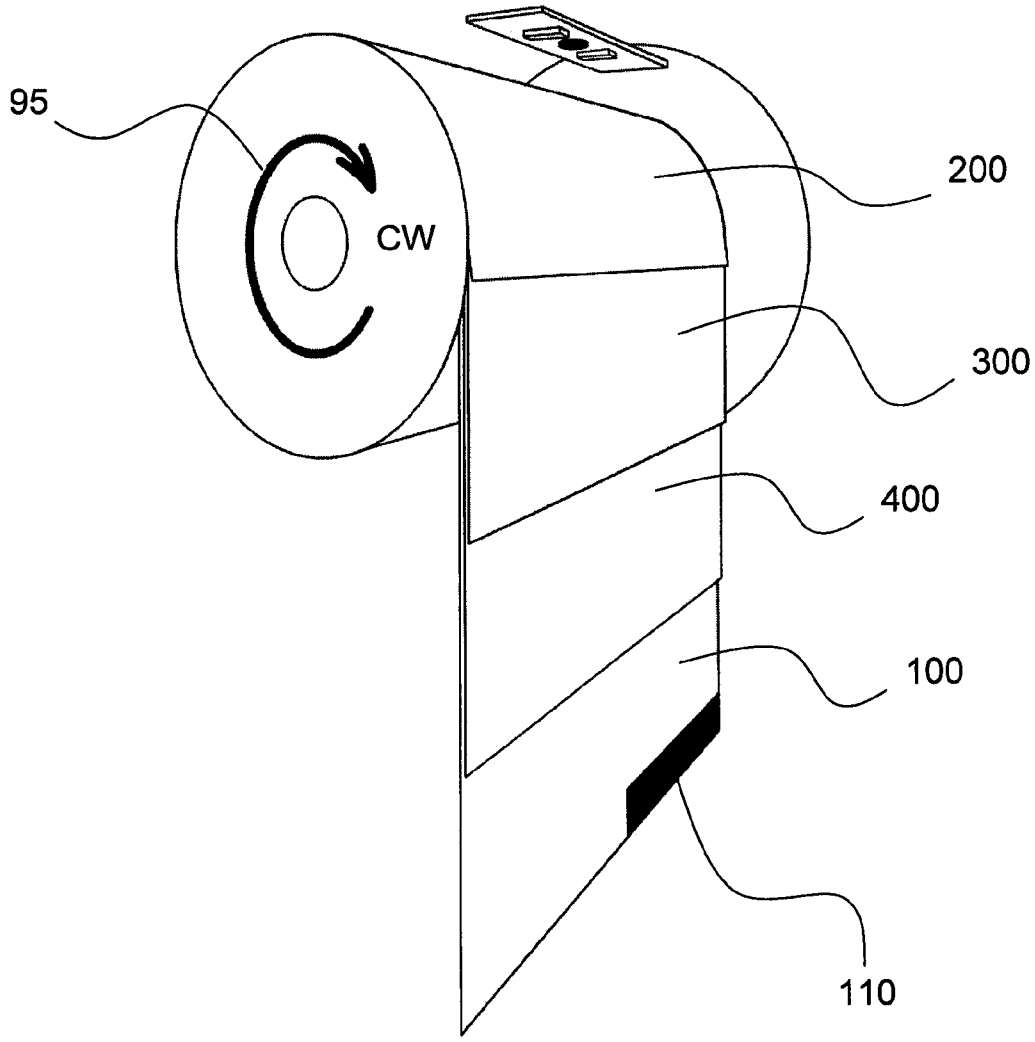
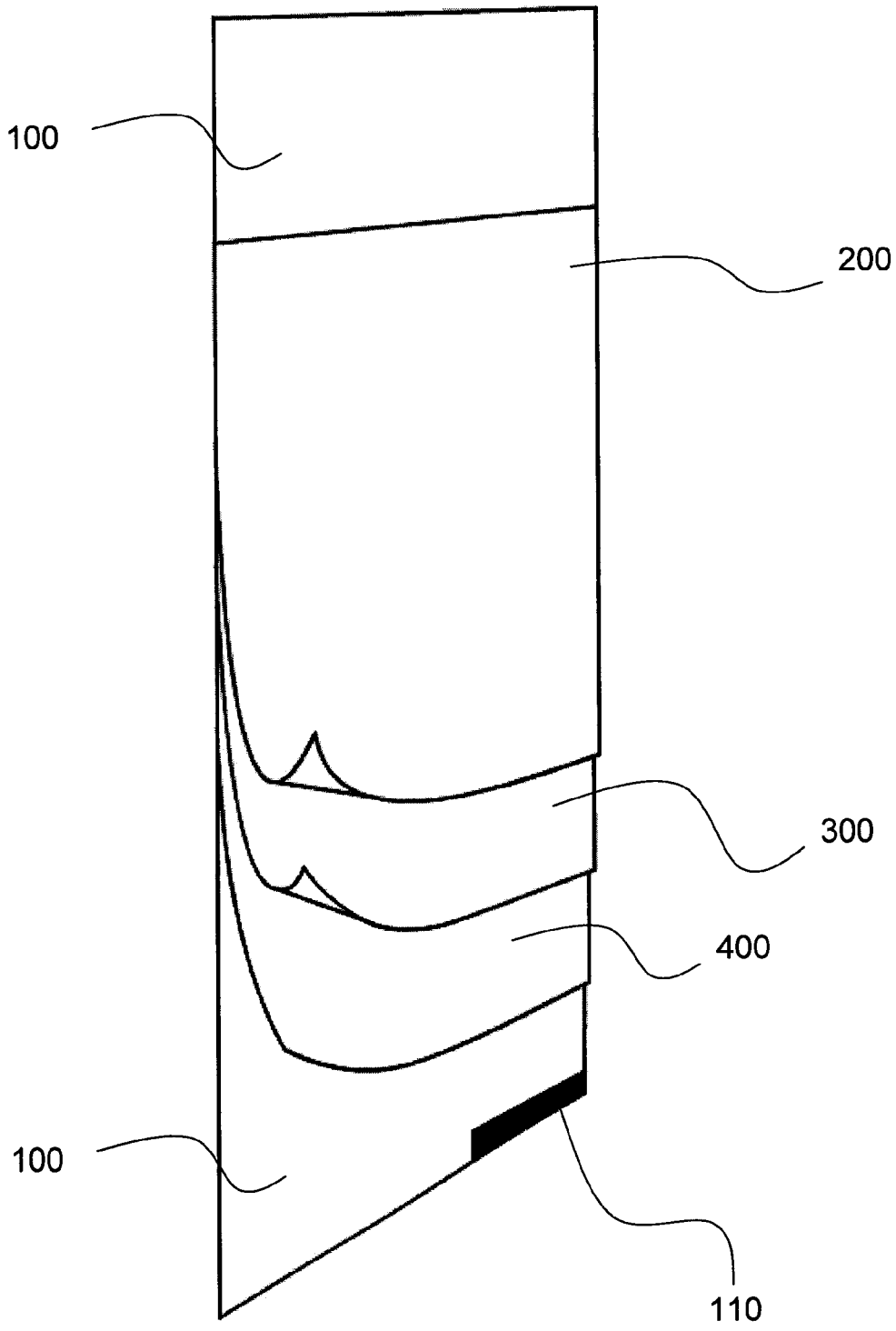


FIG. 11



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE201 1/0001 24

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

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)

IPC: E06B, F16D, G09F

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

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9732294 A1 (TOERNQVIST PETER J T), 4 September 1997 (1997-09-04); whole document --	1-11
A	EP 0751 278 A1 (BUBENDORFF SA), 2 January 1997 (1997-01-02); whole document --	1-8
A	US 375987 A1 (CASTLE JAMES), 3 January 1888 (1888-01-03); whole document --	1-11
A	JP 2003096725 A (S S KOGYO KK), 3 April 2003 (2003-04-03); whole document --	9-11

☒ Further documents are listed in the continuation of Bos C. ☒ 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 claimfs) 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
03-10-2011	13-10-2011
Name and mailing address of the ISA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Lisa Sellgren Telephone No. +46 8 782 25 00

Form PCT/IS A/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE201 1/0001 24

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 200901 58627 A 1 (LEE CHIA-EN), 25 June 2009 (2009-06-25); whole document -- --------	9-1 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE201 1/0001 24

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. Ill Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

The following separate inventions were identified:

1: Claims 1-8 directed to a device for successively changing elongated flexible objects.

2: Claims 9-1 1directed to a method for mounting elongated flexible objects on a drum.

The present application has been considered to contain 2 inventions which are not linked

.../...

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

Continuation of: Box No. Ill

such that they form a single general inventive concept, as required by Rule 13 PCT for the following reasons:

Claim 1 relates to the problem of finding a device for successively changing elongated objects and that are more energy efficient and user friendly. This problem appears to be solved by the device being arranged with a balancing spring and a freewheeling clutch mechanism, where the balancing spring take on load from the elongated objects.

Claim 9 relates to the problem of more easily attaching the elongated objects to a drum. This problem is solved by attaching the objects to each other before attaching it to the drum and where the carrier object is long enough to cover the other flexible objects.

As both the problems and solutions are technically different, no single general concept can be formulated based on the technical features of the inventions. Consequently, the requirements of Rule 13.1 PCT are not met.

It was investigated under Rule 13.2 if any further feature, either in the claims or derivable from the description, could be considered as a same or corresponding feature, and could be considered a special technical feature establishing a technical link between the two groups of inventions.

No such features were identified.

Consequently, the two groups of inventions are not so linked as to form a single general inventive concept as required by Rule 13.1 PCT.

Continuation of: second sheet

International Patent Classification (IPC)

G09F 11/30 (2006.01)
G09F 11/08 (2006.01)
E06B 9/62 (2006.01)
G09F 11/10 (2006.01)

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Paper copies can be ordered at a cost of 50 SEK per copy from PRV InterPat (telephone number 08-782 28 85).

Cited literature, if any, will be enclosed in paper form.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE201 1/0001 24

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				SE	9600746	L	09/06/1997
				US	6381888	B 1	07/05/2002
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				DE	69605983	D 1	10/02/2000
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				US	7596897	B2	06/1 0/2009