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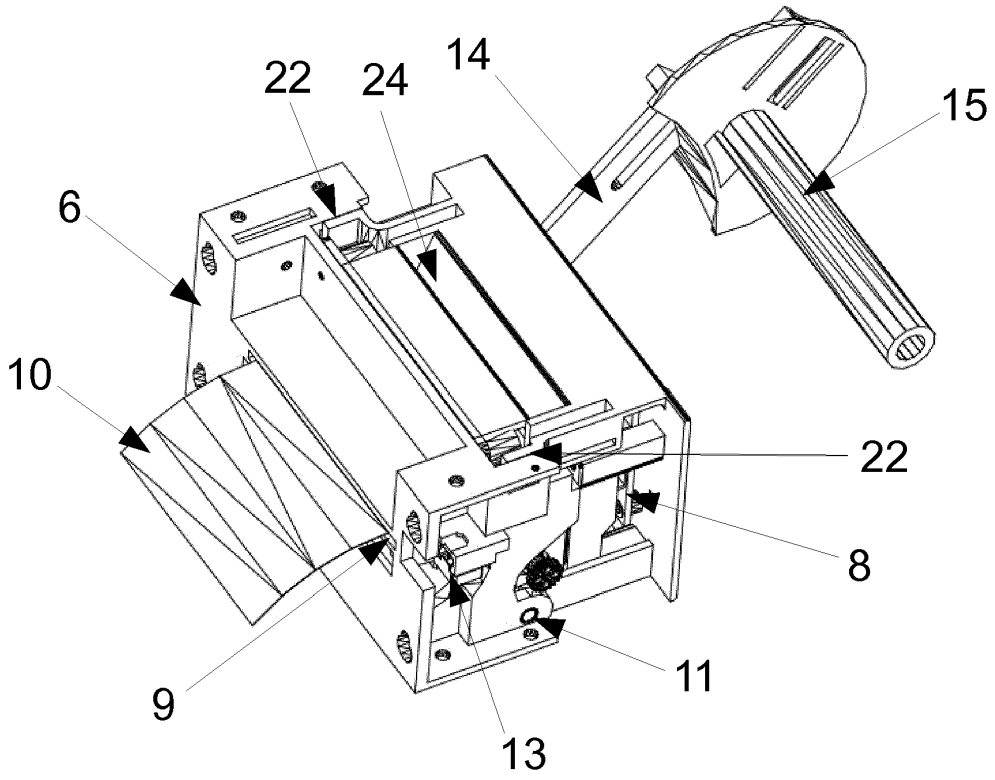
(54) **Thermal printer module**

(57) The invention relates to the thermal printer module applicable for vending machines or standalone dispenser, where the structure is simplified, and dimensions and cost are reduced. In particular, it provides the possibility to use a compact thermal print mechanism, and mount it onto two simple frames, one movable (7) and one fixed (6). Other functions can be added such as a cutter device, paper jam detection (13), supporting arm (14) for a paper roll holder (15) and an electronic control unit (8).

FIGURE 1



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Description

TECHNICAL FIELD OF THE INVENTION

[0001] The invention relates to the thermal printer module applicable for vending machines or standalone dispenser, where the structure is simplified, and dimensions and cost are reduced.

PRIOR ART

[0002] Thermal printing technology is widely used in the industry. Thermal printer mechanism is used in portable applications where capacity and cost are critical. In standalone application like boarding pass dispenser or parking systems, where the equipment is a much bigger standalone unit, and where the volume available for the printing function is much higher and the paper autonomy needs also to be much higher, a complete thermal printer module, with bigger paper roll holders and paper jam detection systems is used.

[0003] The patent EP2159068 presents such a printer module, where the thermal printer mechanism is integrated on a main fixed frame, which holds also a paper roll and an electronic controller board.

[0004] Even if this printer module uses a standard print mechanism, many parts are used in this complex printer module, and in particular the paper loading requires tilting the print mechanism, and the platen roller can be separated from the thermal printhead but remains on the print mechanism.

[0005] In other thermal printer modules, the thermal printhead is mounted on a support which is mounted on the main fixed frame by a hinge, in order to separate the printhead from the platen roller. In this case, it is not possible to use a standard print mechanism, making the printing module more expensive.

[0006] Such printer modules have been widely used in the industry, and in the recent years, more and more applications integrating tickets and receipts dispensing function have appeared, even for small products, like cigarette packs, bus ticketing, drinks and small snacks, leading to a need of integrating smaller units while keeping the global functionality unchanged, which includes a thermal printing unit, an electronic control board, a paper roll holder, and an optional paper jam detector, to halt the printing process in case some physical obstacle is blocking the ticket delivery or the more sophisticated paper loop presenter to separate the printing phase from the ticket delivery one.

SUMMARY OF THE INVENTION

[0007] The aim of the invention is to provide a thermal printer module with simple construction, low dimensions and reduced manufacturing cost.

[0008] Within this aim, an object of the invention is to provide a thermal printer module comprising standard elements available on the market.

[0009] Another object of the invention is to provide a thermal printer module with easy loading system for the paper and easy cleaning function.

[0010] Another object of the invention is to provide a compact thermal printer module suitable for mounting in different devices with different requirement to dimensions and shape of the printer module.

[0011] For this purpose, a very simple structure is provided around one movable frame and one fixed frame holding all the required elements as mentioned above.

[0012] This aim and these objects are achieved by the thermal printer module according to the present invention that comprises:

- a fixed frame, holding a platen roller and having a paper exit slot arranged on one of the outer faces of the fixed frame parallel to the platen roller
- a movable frame, movable towards the fixed frame between open and closed position, said movable frame comprising a thermal printhead and motion means to put the platen roller in rotation when the movable frame is closed position. This position also corresponds to the printing position of the thermal printer module.

[0013] Advantageously the movable frame is mounted on the fixed frame by a hinge and clips for locking the thermal printer module in the closed position.

[0014] According to a variant of the present invention, the thermal printer module further comprises an electronic control board and a cutting device mounted on the movable frame. The thermal printhead is advantageously spring loaded onto the movable frame, and the cutting device is a two blades knife moved by a motor. Preferably, one of the two blades is mounted on the fixed frame in order to provide the easy cleaning function of the cutter and separating the two blades from each other when the movable frame is in the open position, offering the possibility to easily clean a paper jam.

[0015] According to a variant of the present embodiment, the printing mechanism and the cutting device are combined in one standard unit, thus reducing the number of parts required to design and manufacture the thermal printer module.

[0016] Advantageously, the fixed frame has a paper management section, arranged before the paper exit slot, which comprises paper jam detector or a paper loop presenter, to avoid generating paper jams when the paper exit slot is physically obstructed by stopping the printing process.

[0017] According to another variant of the present invention, the fixed frame further comprises a supporting arm for a paper holder, which is mounted on a distal end of the supporting arm. This supporting arm can be mounted in several positions on the fixed frame in order to offer a maximum of possibilities of the thermal printer integration in the device of the customer.

[0018] Advantageously, the paper roll holder can be mounted on several positions in longitudinal direction of the supporting arm in order to keep the paper roll as close as possible to the thermal printer module thus minimizing the overall dimensions of the module.

[0019] Advantageously, only one arm is enough to realize this complex function, because it can be not only mounted in several positions but also mirrored in order to offer all the required positions in a very narrow space.

[0020] Thus with only one model of supporting arm, all configurations can be covered with one product reference only, simplifying the product manufacturing and marketing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The characteristics of the invention will be disclosed in details in the following description of preferred embodiments, given as non-restrictive examples, with reference to the attached drawings wherein:

Figure 1 shows a top view of the thermal printer module according to the invention in the closed position.
Figure 2 is a side view of the thermal printer module according to the invention, when the movable frame is open at an angle of approximately 90 degrees.
Figure 3 is the same angle view of the thermal printer module, in the same open position, but in an arrangement where the cutting device is absent.
Figure 4 is a front view of the thermal printer module with the cutting device present, in the same open position.
Figure 5 is an inner view of the thermal printer module in the open position, with the cutting device, but without the top cover of the cutting device removed to see the moving blade of the cutting device.
Figure 6 is a back view of the thermal printer module in the closed position.
Figure 7 is a section view of three possible mounting positions of the supporting arm.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS:

[0022] Figure 1 is a top view of the thermal printer module according to the invention in a closed position, which is also a printing position. The thermal printer module comprises a fixed frame 6 with a paper exit slot 9, from where comes out the paper 10. Said fixed frame 6 is to be fixedly mounted inside a device in which the thermal printer module is integrated. Usually in such devices there is a front panel through which the paper strip 10 is passing before to be then taken by the customer. This front panel is shown schematically by the line 18 on the section view of Figure 7. On the figures are also shown lateral holes on the front face of the fixed frame 6 for attaching and fixing elements. Said holes are shown as non-limiting example and could be with different shape, position and number.

[0023] The terms "upper"/"top", "below"/"lower"/"bottom", "lateral", "front" and "back", used in this description in connection with the relative positions of the elements in the construction, are relative terms corresponding to the particular embodiment shown in the figures and therefore have no limiting effect to the scope of the invention. For example the thermal printer module could be mounted to the other device in different position than shown on the figures - inclined or upright position. In such cases the elements of the construction will have different position in the space.

[0024] The thermal printer module further comprises a movable frame 7 that in this embodiment is hinged on the fixed frame 6 and is rotatable between one open position and one closed position. In the closed position which is also the printing position of the module, the movable frame 7 is locked to the fixed frame 6 by means of, for example, two lateral clips 22. Any other known locking mechanism suitable for the purpose is possible.

[0025] The thermal printer module further comprises a thermal printhead 2 and motion means 3, mounted on the movable frame 7 able to put in rotation a detachable platen roller 4. Said motion means 3 generally comprise a driving motor and a gear train able to engage a corresponding platen roller gear.

[0026] Advantageously, said platen roller 4 is mounted on the fixed frame 6, and is put in rotation by the motion means 3, when the movable frame 7 is in the closed position.

[0027] The thermal printer module further comprises a paper inlet 24 for loading of the paper strip. In the illustrated embodiment the paper inlet 24 is arranged on the upper face of the movable frame 7. Alternatively the paper inlet 24 can be positioned on the fixed frame 6 or can be a slot configured between the fixed frame 6 and the movable frame 7 in the closed position.

[0028] In the illustrated embodiment the thermal printer module further comprises an electronic control board 8 mounted at the back face of the movable frame 7, with lateral and bottom access as shown also on Figure 4.

[0029] The thermal printer module also comprises a supporting arm 14, for a paper holder 15 that is detachably mounted on the fixed frame 6.

[0030] Figure 2, shows the thermal printer module in open position. In this embodiment of the invention, a very small standard thermal printing mechanism with an integrated cutting device is mounted in the movable frame 7, which make the total cost low, in terms of investments and also unit cost, since such small standard mechanism is used for other applications.

[0031] This thermal printing mechanism generally comprises a thermal printing chassis 23, on which a thermal printhead 2 and a cutting device are mounted, and a top cover 21 for closing the cutting device.

[0032] In order to save space, advantageously the cutting device is made of two blades - one mobile blade 1 driven by a cutting device motor 12 mounted on the mov-

able frame 7 (shown on Figure 4), and a second fixed blade 5 mounted on the fixed frame 6 (shown on Figure 5). This allows the cutting device to be openable for easy paper jam removal.

[0033] On Figure 2 is also disclosed a paper jam detector 13 provided to stop the printing process when a physical obstacle prevents the paper 10 to come out freely from the paper exit slot 9. Advantageously this paper jam detector is very compact. Alternatively a paper loop presenter type could be also implemented. Such paper loop presenter is known from the prior art, and separates the printing phase from the presenting phase, by storing the printing paper in a paper loop while printed. This paper loop is ejected when the printout and eventually the cutting are completed.

[0034] In the present invention, the paper jam detector 13 is made with a flapper which can rotate to detect a paper loop formation in case some obstacle is present after the paper exit slot 9 during the printing process.

[0035] Figure 3 is a similar view of figure 2 but in an arrangement where the cutting device is absent. Only the thermal printing mechanism is present. The thermal printhead 2 is hinged and spring loaded on the printing mechanism chassis 23 mounted of the movable frame 7. Another variant is possible wherein the platen roller 4 is spring loaded and the thermal printhead 2 is fixedly mounted onto the chassis 23 of the thermal printing mechanism. The motor 3 puts in rotation the platen roller 4 through a gear train not shown on this figure, when the platen roller 4 is in printing position onto the thermal print mechanism. This position corresponds to the closed position of the movable frame 7.

[0036] When the movable frame 7 rotates around the hinge 11, the platen roller gets closer to the thermal printhead 2 and engages with the thermal printing mechanism chassis 23, up to when the platen roller 4 is aligned with the dotline of the thermal printhead 2, thus reaching the printing position. Simultaneously the clips 22 engage with the corresponding holes 25 on the fixed frame 6, thus closing the thermal printer module.

[0037] Figure 4 which is a front view of the thermal printer module discloses the cutting device motor 12 and the electrical interface connectors of the electronic control board 8.

[0038] Figure 5 is an inner view of the thermal printer module with the cutting device but without the top cover 21 of the cutting device in order to present the movable blade 1. The platen roller 4 is translated in the direction of the movable frame 7 in order to show the fixed blade 5. The thermal printhead 2 is situated right below the movable blade 1.

[0039] Figure 6 discloses a keyboard 16 on the back of the thermal printer module including two pushbuttons and one led, to indicate the printer module status and print self-test and configure the thermal printer module by pressing on the two pushbuttons.

[0040] Figure 6 also shows the supporting arm 14 that is fixed on the lateral side of the fixed frame 6 with one screw and is passing through one bracket arranged on the fixed frame. Other brackets or slots can be arranged on of the fixed frame 6 for mounting of the supporting arm 14 in alternative positions. In the shown variant the supporting arm 14 consists of two elongated sections: one proximal section that is mounted on the fixed frame 6 and one distal section that in which the paper holder 15 is mounted. The long central axes of the two sections are angled to each other at substantially 45 degrees. As shown on Figure 6 the distal section of the supporting arm 14 has an elongated slot for mounting of the paper holder 15 in several positions in order to accommodate any paper roll diameter and optimize the overall size of the thermal printer module whatever is the paper roll diameter.

[0041] Figure 7 presents how this overall dimensions optimization is done, keeping the supporting arm 14 very simple. Two possible paper roll nominal diameters, when the paper rolls are full (whole), are shown on figure 7, corresponding to the big paper roll 20 and the small diameter 19. Both paper rolls 19 and 20 are shown in three different possible positions of the supporting arm 14.

[0042] As already mentioned, the thermal printer module is generally mounted as close as possible to a front panel represented by the front line 18. In some applications, where the space is limited, for instance when the thermal printer module is integrated in a wall mounting dispenser, the overall thickness has to be as small as possible. This means that the paper roll has to be situated over, called top position, or below, called bottom position, the frame of the thermal printer module as shown in the Figure 7. Figure 7 shows that in both cases, the distance from the central axis of the paper roll, whatever is its diameter, to the front line 18 is very close to the paper roll radius. This means that the lateral surface taken by the thermal printer module and the paper roll is minimized, whatever is the paper roller diameter.

[0043] In this specific embodiment, the supporting arm 14 can be detached and alternatively mounted onto the fixed frame 6 in three different positions as shown in Figure 7. In order to replace the supporting arm 14 from the top to the bottom position on the fixed frame 6, the supporting arm 14 has to be mirrored along the section plane of Figure 7. Thus, one supporting arm 14 only can be used to cover all three positions. The paper holder 15 needs also to be remounted on the opposite lateral side of the distal section of the supporting arm 14.

[0044] Advantageously, the supporting arm 14 can also be mounted in a middle position after being rotated of 90° from the bottom position, when, for instance, the thermal printer module is mounted on a flat horizontal surface shown schematically on figure 7 by the line 17. In this configuration, and as shown in figure 7, both paper roll 19 and 20 at their nominal diameter are very close to the line 17, thus minimizing the overall height of the thermal printer module.

[0045] Such configuration allows providing a very limited space on the fixed frame 6 for attaching the support-

ing arm 14, thus keeping the overall dimension of the thermal printer module very small.

[0046] Advantageously, this supporting arm 14 is done in punched sheet metal, with a flat shape, and divided into two section angled to each other at about 45 degrees.

[0047] Various modifications and/or additions of parts will be apparent to those skilled in the art that will remain within the field and scope of the present invention defined in appended claims. All the parts may further be replaced with other technically equivalent elements.

[0048] Reference signs for technical features are included in the claims for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. Thermal printer module comprising:

- a fixed frame (6) having a paper exit slot (9) for a printed paper strip (10), said paper exit slot (9) being arranged on one of the outer faces of the fixed frame parallel to rotation axis of a platen roller (4),
- a movable frame (7) comprising a thermal printhead (2),

characterized in that

- the movable frame (7) is movable towards the fixed frame (6) between open and closed position,
- the platen roller (4) is detachable and is mounted on the fixed frame (6), and
- the movable frame (7) also comprises a motion means (3) able to put in rotation the detachable platen roller (4) in the closed position that corresponds to a printing position of the printer module.

2. Thermal printer module according to claim 1, wherein the movable frame (7) is mounted to the fixed frame (6) by a hinge (11).

3. Thermal printer module according to claims 1 or 2, wherein the movable frame (7) further comprises an electronic control board (8) controlling at least the thermal printhead (2) and the motion means (3).

4. Thermal printer module according to claims 1, 2 or 3, wherein it further comprises a cutting device for the paper strip (10).

5. Thermal printer module according to claim 4, wherein the cutting device comprises two cutting blades (1) and (5) and a motion means (12) to activate at least one of the two blades (1) or (5) for cutting the paper strip (10).

6. Thermal printer module according to claim 5, wherein a first blade is mounted on the fixed frame (6), and a second blade and the motion means (12) of the cutting device are mounted on movable frame (7) and the cutting device is in the cutting position when the fixed frame (6) is in closed position.

7. Thermal printer module according any of the previous claims wherein the fixed frame (6) further comprises a paper management section (13) arranged before the paper exit slot (9)

8. Thermal printer module according to claim 7 wherein the paper management section (13) is a paper jam detector.

9. Thermal printer module according to claim 7 wherein the paper management section (13) is a paper loop presenter.

10. Thermal printer module according to any of the previous claims, wherein it further comprises a supporting arm (14) for a paper holder (15) that is mounted on a distal end of the supporting arm (14), said supporting arm (14) being detachably mountable to the fixed frame (6) with its proximal end in more than one position.

11. Thermal printer module according to claim 10, wherein the supporting arm (14) has two elongated sections angled to each other at substantially 45 degrees, a first section comprising the proximal end of the supporting arm (14) and a second section comprising the distal end of the supporting arm (14).

12. Thermal printer module according to claim 10 or 11, wherein the supporting arm (14) is mounted laterally on the fixed frame (6) in a first position where the central axis of the paper roll is positioned relative to upper face and front face of the fixed frame (6) at a distance approximately equal to nominal radius of the paper roll (19) and (20), and alternatively can be mounted in a second position where the central axis of the paper roll is positioned relative to lower face and front face of the fixed frame (6) at a distance approximately equal to nominal radius of the paper roll (19) and (20), and where the supporting arm in the second position is mirrored compared to the first position.

13. Thermal printer module according to claim 10, 11 or 12, wherein the supporting arm (14) is made of a flat sheet metal.

FIGURE 1

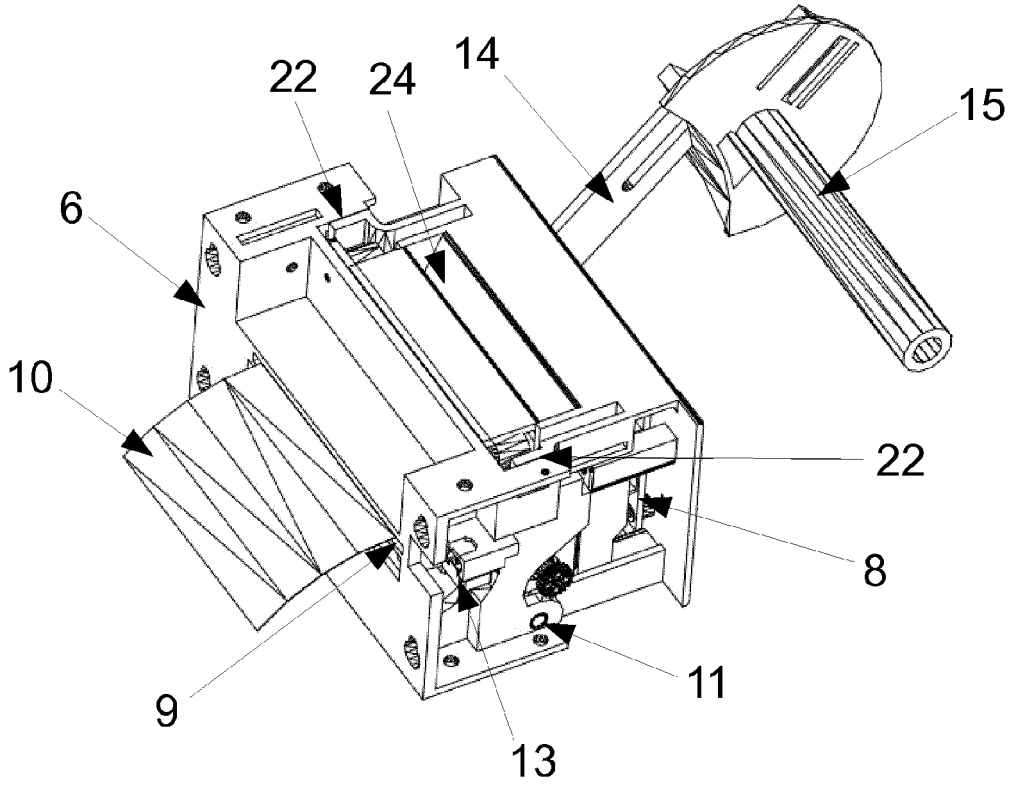


FIGURE 2

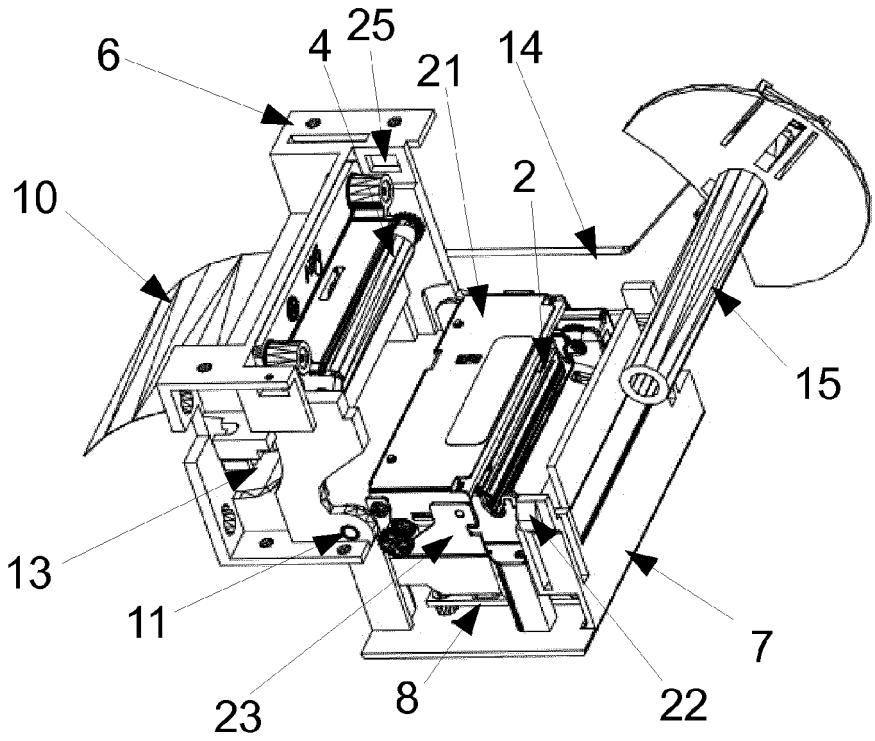


FIGURE 3

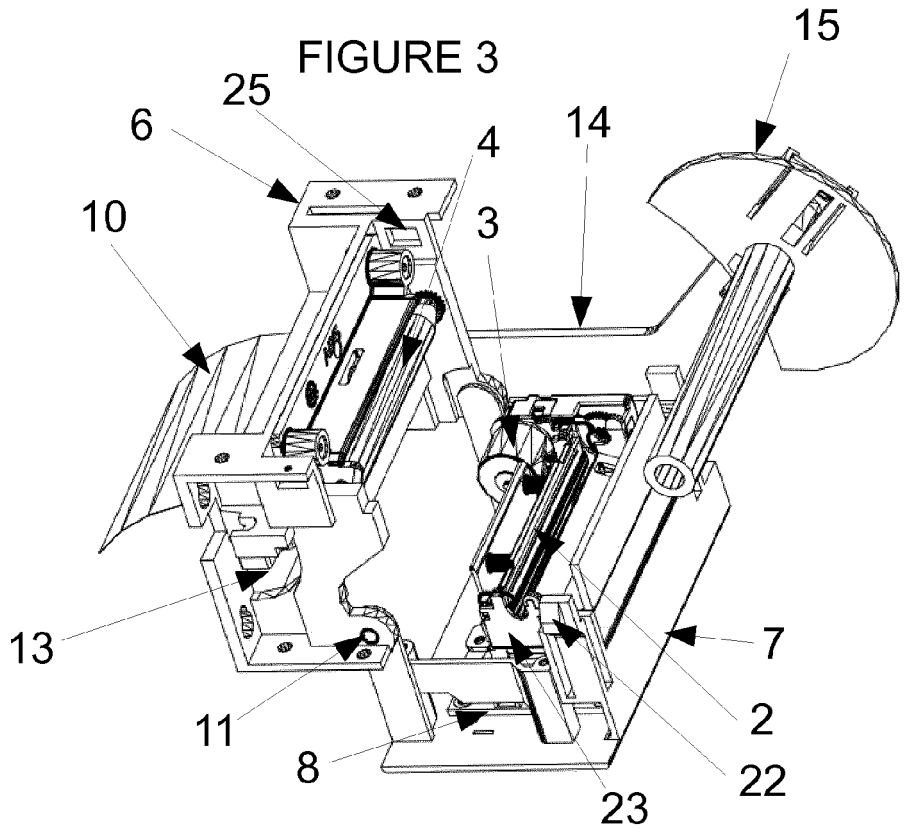


FIGURE 4

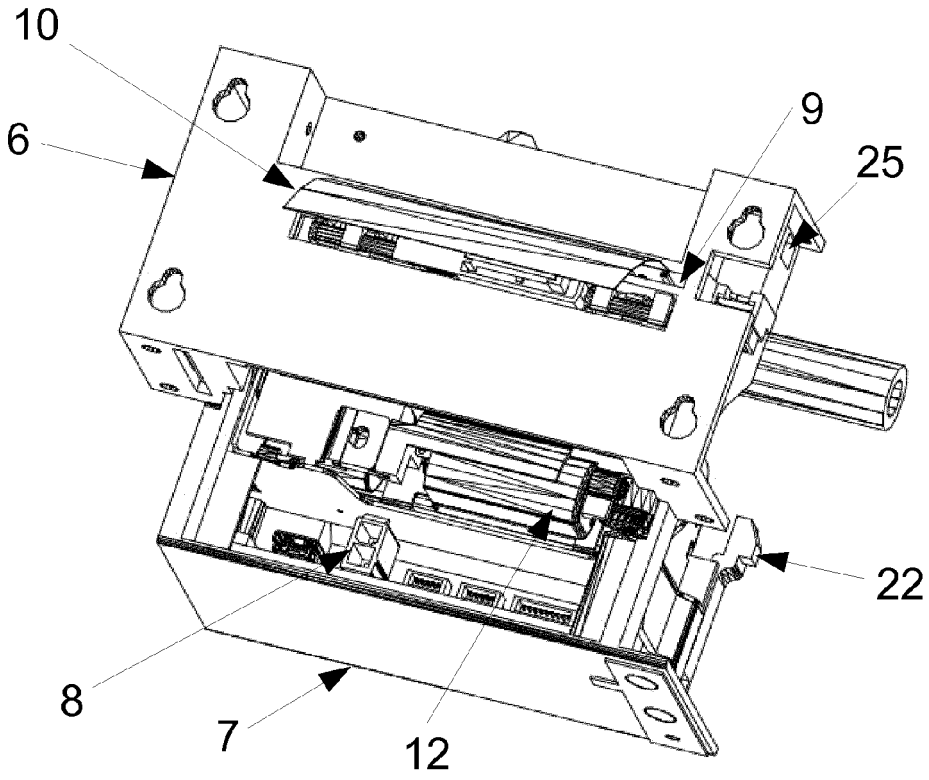


FIGURE 5

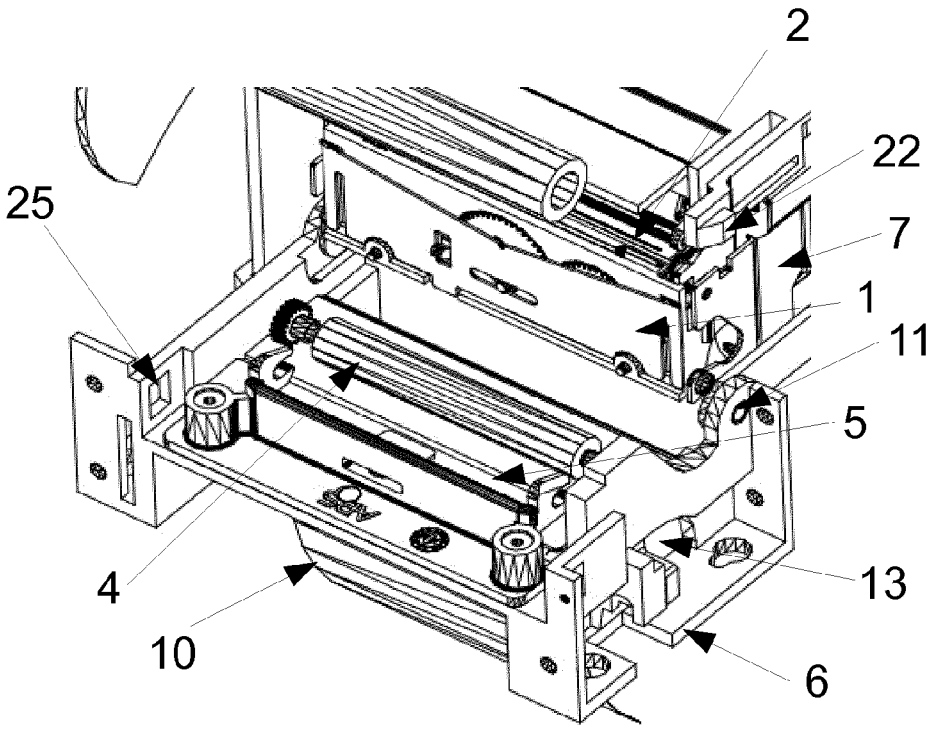


FIGURE 6

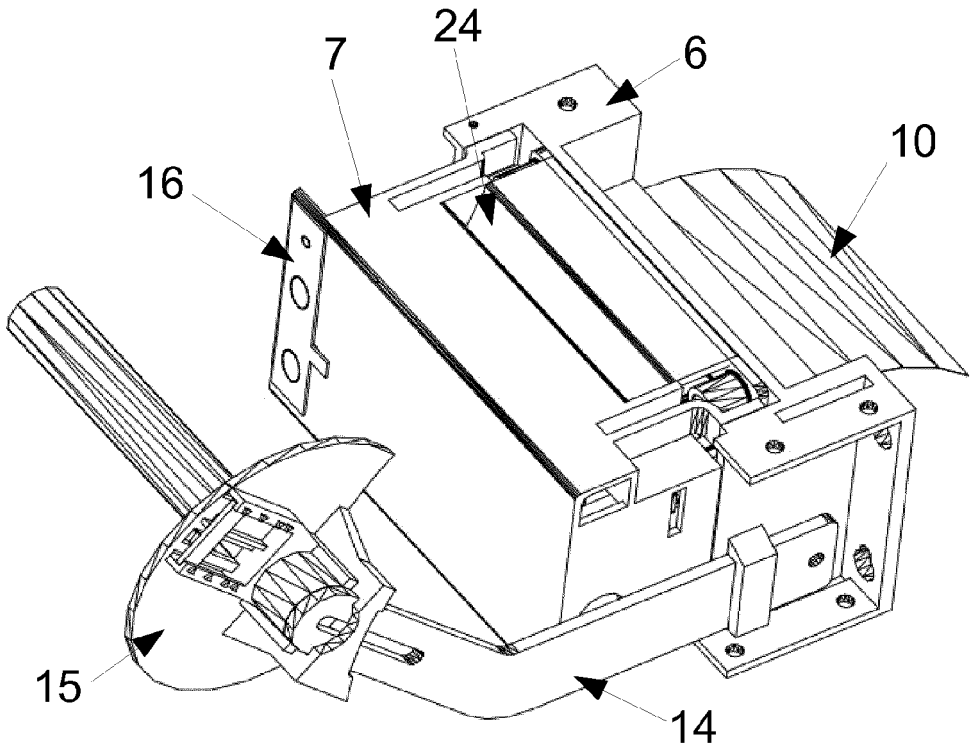
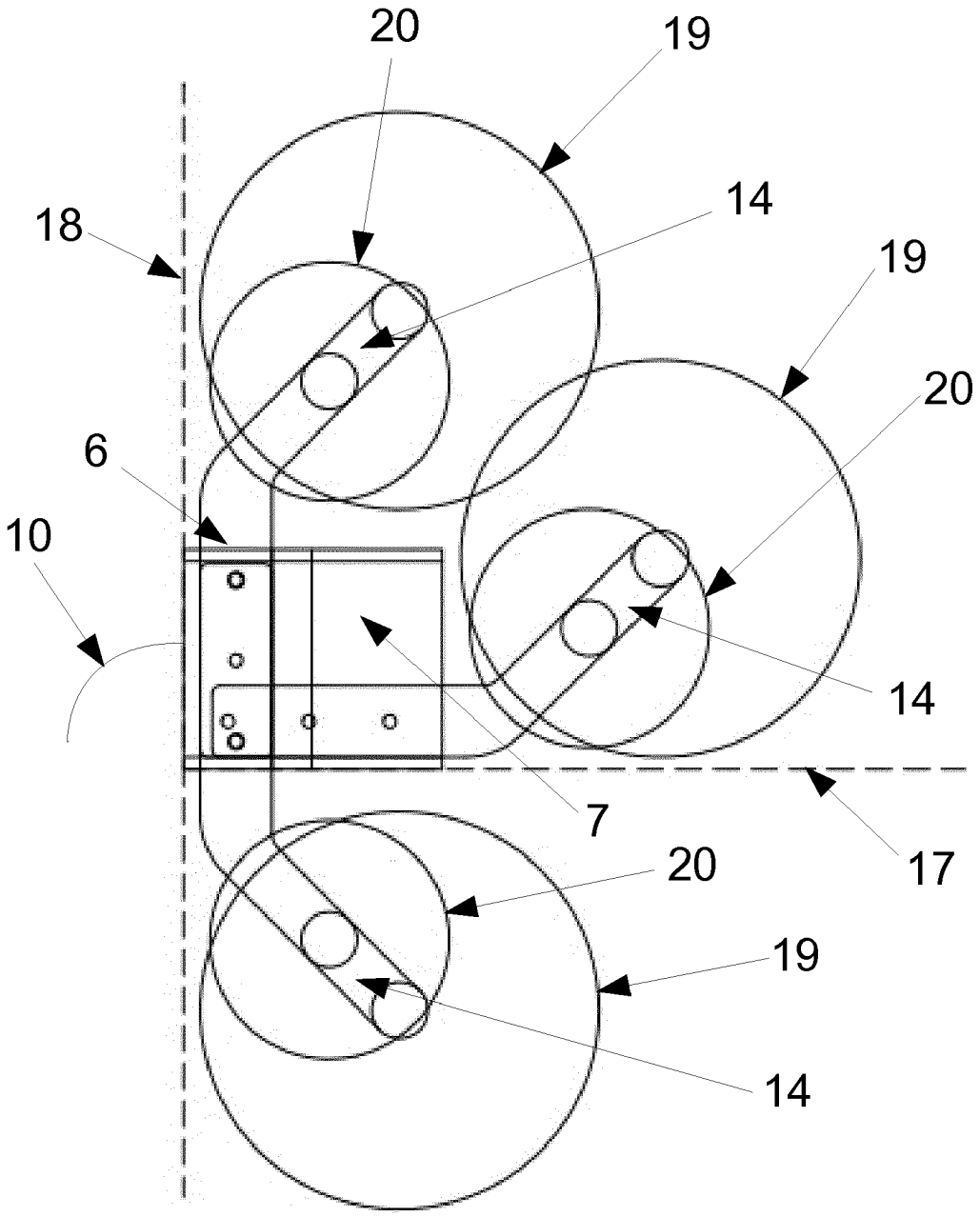


FIGURE 7



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EUROPEAN SEARCH REPORT

Application Number
EP 14 19 1342

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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	29 January 2015	Van Oorschot, Hans

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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