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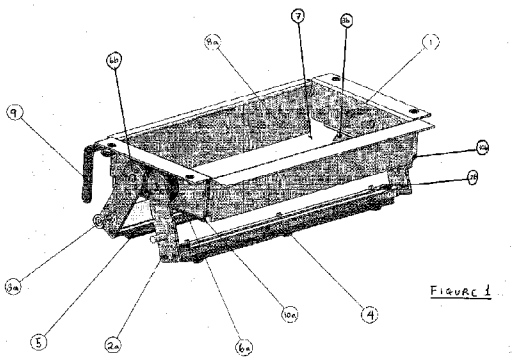
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(54) **Title**: A BAG AND SEALING METHOD AND APPARATUS



(57) **Abstract**: A device for receiving sheet documents or coins from sheet document or coin processing equipment and sealing the sheet documents or coins in a bag. The device comprises a bag retainer for holding the bag, in a vertical orientation such that an open end of the bag is uppermost, thereby allowing falling sheet documents or coins discharged by the sheet document or coin processing equipment to collect in the bag, and a heat sealer for sealing the open end of the bag.

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A BAG AND SEALING METHOD AND APPARATUS

This invention relates to a device and method for sealing sheet documents or coins in a bag. It also relates to a bag suitable for use with the device and method.

The use of cash-recycling machines in banks and large retailers is becoming increasingly common. Cash is normally collected from these site by 'Cash-in-Transit' (CIT) companies. It is clearly vitally important than any cash-in-transit is carried securely to avoid any theft and that any attempt to interfere or tamper with the container that the cash is transported in is immediately apparent.

CIT companies have developed various, more or less, secure ways of handling currency in order to transport it. Traditionally, to transport secure goods, bulky locked metal cassettes containing the sheet documents or coins were removed from cash-recycling machines by the CIT companies and moved in the CIT companies' secure vans. A number of issues have arisen by transferring the valuable goods in this way.

Firstly, the bulkiness of the cassette greatly limited the amount of sheet documents or coins that the CIT companies can transfer. Standard practice for the CIT companies is to remove the cassettes for cash machines, load them onto fortified trucks and transport them to a desired location. The size and weight of the cassettes is substantial in relation to the amount of cash contained within them, making them awkward to handle. In addition, the cassettes are expensive items in their own right.

Secondly, although it is standard practice for the cassettes to contain a locking mechanism, often these locks are quite rudimentary. In many cases, neither the locking mechanism nor the cassette itself provides a way of detecting an attempt, either successful or unsuccessful, to access the items inside the cassette. In other cases, tamper evident capabilities are provided, although these employ complicated and expensive mechanisms to provide such capabilities.

EP0852279 discloses a bag for storing cash which can be sealed after the cash has been loaded into it. This overcomes some of the problems mentioned above, being lighter and cheaper than a cassette. However, loading cash into the bag is complicated, requiring cash handling equipment to be fitted with dedicated transport elements to introduce the cash into the bag through a narrow inlet slot formed in the bag. Alignment between the bag and the transport elements is clearly critical. Furthermore, the design of the bag does not lend itself to being easily stacked with other bags of the same type because the sealed inlet slot interferes with adjacent bags. The bags are also unsuitable for use with coins.

In accordance with a first aspect of this invention, there is provided a device for sealing sheet documents or coins in a bag, the device being adapted for receiving sheet documents or coins from the sheet document or coin processing equipment in use, the device comprising a bag retainer for holding the bag, in use, in a vertical orientation such that an open end of the bag is uppermost, thereby allowing falling sheet documents or coins discharged by the sheet document or coin processing equipment to collect in the bag, and a heat sealer for sealing the open end of the bag.

Hence, the invention provides a device which allows bags to be loaded with sheet documents or coins simply by allowing these to fall out of the transport mechanisms of cash handling machinery at the appropriate point along the transport through the open end of the bag. The invention can therefore be easily used with existing cash handling machinery without extensive modification; alignment between the bag and the machinery is not critical and no dedicated transport elements are required. Furthermore, the use of bags ensures that cost can be minimised (which is important as the bags are destroyed during monitored opening as part of the cash-in-transit process) and it is easy to detect tampering as this will involve destruction of the bag or seal. In addition, the use of this device allows bags to be sealed whilst still within sheet document or coin processing equipment, which reduces the possibility of pilfering as may occur if the bag was removed for manual sealing.

The device and bags can accept documents such as banknotes delivered (for example, by discharge from the transport of a banknote or other sheet document processing equipment) in a horizontal plane, which is important for efficient stacking within the bag. This is needed because a large number of banknotes must be collected in each instance for economic reasons and because the space available in banknote processing equipment is limited.

The term “sheet documents” in this specification includes paper currency and other security documents.

The bag retainer may comprise one or more hooks, each of which engages with a corresponding eyelet disposed at the open end of a bag in order to hold the bag in the desired position.

However, in another embodiment, the bag retainer comprises a pair of opposed runners, each of which is adapted to engage, in use, with a corresponding retaining rail on the bag. Typically, the pair of opposed runners lie parallel to each other.

In a preferred embodiment, the bag retainer is adapted to hold the bag, in use, such that the open end of the bag is directly above a closed end of the bag, thereby allowing vertically falling sheet documents or coins discharged by the sheet document or coin processing equipment to collect on the closed end of the bag. Thus, if the closed end of the bag is rectangular and the bag has parallel sides perpendicular to the closed end, the combined action of the device and the bag is to ensure that bank notes or other rectangular documents “float” down into the bag in an ordered manner and form a neat stack in the bottom of the bag. This maximises stacking potential, both in terms of efficient use of space within the bag and stacking of the filled bags after sealing.

It will be appreciated from the foregoing that it is useful for the bag structure to be such that when it is held open with the open end above the closed end, the rectangular closed end lies flat. This can be achieved through suitable choice of bag material or some kind of stiffening means for the closed end. In the example to be described below the stiffening means is a wire frame.

The heat sealer may comprise a first sealing bar movable between a first position in which a bag may be brought into engagement with the bag retainer and a second position in which a first heating element mounted on the first sealing bar is brought into contact with a bag, in use.

In this case, the heat sealer preferably further comprises a pressure bar disposed in opposition to the first sealing bar when in the second position such that the first sealing bar and pressure bar trap the bag, in use, between them.

Alternatively, the heat sealer may further comprise a second sealing bar movable between a third position in which a bag may be brought into engagement with the bag retainer and a fourth position in which the second sealing bar is disposed in opposition to the first sealing bar when in the second position such that the first and second sealing bars trap the bag, in use, between them.

Preferably, a second heating element is mounted on the second sealing bar.

Normally, the first and second sealing bars are pivotally movable between the first and second positions and third and fourth positions respectively.

In a preferred embodiment, the second and fourth positions are such that first and second sealing bars are symmetrically arranged and move by equal amounts between the first and second positions and the third and fourth positions respectively. This ensures that the bag shape is not distorted during sealing helping the bag to lie flat to assist stacking.

The welding or sealing line made by the heat sealer cannot be made at the rim of the bag defining the open end because the bag retainer holds the open end in a fixed location. Indeed, in the embodiment described below a pair of flaps in conjunction with runners in the bag retainer hold the open end of the bag in an essentially rectangular shape. The welding bars cannot be positioned at this level (i.e. in line with the rim of the bag defining the open end) because this would impede the loading and removal of the bag. By allowing the first and second sealing bars to retract into the first and third positions, the bars can be stowed in a position where they will be out of the way of the bag during loading and unloading. Aside from making loading and unloading operations easier, this also results in a very compact device because the welding bars can be positioned at the same level as the bag retainer. In practice, we have found that a device having a depth of only 30mm (when the bars are retracted into the first and third positions) can be realised.

The device may further comprise an opening, for example in the bag retainer, through which falling sheet documents or coins discharged by the sheet document or coin processing equipment may pass, in use, into the open end of the bag.

In one embodiment, the opening is defined by a pair of flaps, each of which is movable between a first position in which a bag may be brought into engagement with the bag retainer and a second position in which the flaps hold the open end of the bag so that it does not impede the passage of falling sheet documents or coins into the bag.

Each of the pair of flaps may clamp a respective portion of the open end of the bag against a respective side wall of the device when in the second position.

The device may also comprise at least one finger movable between a first position in which a bag may be brought into engagement with the bag retainer and a second position in which the finger contacts the side of the bag, in use.

Preferably, the device comprises a pair of opposed fingers, each of which is movable between a first position in which a bag may be brought into engagement with the bag retainer and a second position in which it contacts a respective side of the bag, in use.

The device may further comprise a controller adapted to cause the or each finger to move repeatedly between the first and second positions, thereby shaking the bag to ensure sheet documents do not adhere to the bag. This assists in dislodging documents that have become attracted to the bag by static electricity.

There is also provided in the following a kit comprising a device as described above and at least one bag. Preferably the closed end of the bag is rectangular and the bag has parallel sides perpendicular to the closed end. The bag structure is preferably such that

when it is held open with the open end above the closed end, the rectangular closed end lies flat.

In accordance with a second aspect of the invention, there is provided a method for sealing sheet documents or coins in a bag, the method comprising holding a bag in a vertical orientation such that an open end of the bag is uppermost, thereby allowing falling sheet documents or coins discharged by a sheet document or coin processing equipment to collect in the bag, receiving at least one sheet document or coin from the sheet document or coin processing equipment in the bag, and sealing the open end of the bag.

The method typically further comprises engaging a bag with a bag retainer for holding the bag in a vertical orientation such that the open end of the bag is uppermost.

The method will also typically further comprise disengaging the bag from the bag retainer after the open end of the bag has been sealed.

The method preferably further comprises holding the bag such that the open end of the bag is directly above a closed end of the bag, thereby allowing vertically falling sheet documents or coins discharged by the sheet document or coin processing equipment to collect on the closed end of the bag.

The step of sealing the open end of the bag may comprise moving a first sealing bar from a first position in which the bag may be brought into position for holding in the vertical orientation such that the open end is uppermost to a second position in which a first heating element mounted on the first sealing bar is brought into contact with a bag.

In this case, the method may further comprise trapping the bag between a pressure bar disposed in opposition to the first sealing bar when in the second position.

Preferably, the step of sealing the open end of the bag further comprises moving a second sealing bar from a third position in which the bag may be brought into position for holding in the vertical orientation such that the open end is uppermost to a fourth position in which the second sealing bar is disposed in opposition to the first sealing bar when in the second position such that the first and second sealing bars trap the bag between them.

Typically, the first and second sealing bars move pivotally between the first and second positions and third and fourth positions respectively.

In a preferred embodiment, the second and fourth positions are such that first and second sealing bars are symmetrically arranged and move by equal amounts between the first

and second positions and the third and fourth positions respectively. As mentioned above, this ensures that the bag shape is not distorted during sealing helping the bag to lie flat to assist stacking.

Of course, the method normally further comprises activating the first heating element, thereby sealing the bag.

The method may also further comprise activating a second heating element mounted on the second sealing bar.

In one embodiment, the method further comprises clamping the open end of the bag in a defined position such that the open end of the bag does not impede the passage of falling sheet documents or coins into the bag.

The method may also comprise, prior to the step of sealing the open end of the bag, moving at least one finger from a first position in which the bag may be brought into position for holding in the vertical orientation such that the open end is uppermost and a second position in which the finger contacts a gusset portion in a side of the bag, thereby assisting the folding of the gusset portion.

In this case, the method preferably further comprises, prior to the step of sealing the open end of the bag, moving a pair of opposed fingers from a first position in which the bag may be brought into position for holding in the vertical orientation such that the open end is uppermost and a second position in which each finger contacts a gusset portion in a respective side of the bag, thereby assisting the folding of the gusset portions.

Typically, the method further comprises moving the or each finger repeatedly between the first and second positions, thereby shaking the bag to ensure sheet documents do not adhere to the bag. As mentioned above, this assists in dislodging documents that have become attracted to the bag by static electricity.

In accordance with a third aspect of the invention, there is provided a bag comprising open and closed ends joined by a plurality of side walls, at least one of which is gusseted; a frame for holding the closed end in a desired shape; and a retaining element by which the bag may be retained in a device according to the first aspect, in use.

This bag provides many advantages over prior art bags. Firstly, the use of an open end allows sheet documents and coins to be easily collected in the bag as discussed above. Further, the use of a frame assists with holding the bag's shape as the documents or coins are collected. The frame is also much cheaper than the use of a solid plate, as has been used in the prior art. The retaining element allows the bag to be easily brought into

engagement with the device of the first aspect so that it may be held with its open end in the correct position. The gussets allow the bag to expand in width to accommodate sheet documents and to lie flat when empty or partially filled.

The sheet documents or coins collect on the closed end of the bag. The fact that sheet documents stack neatly on the closed end after simply being allowed to fall out of sheet document processing equipment into the bag was unexpected and a particularly important benefit of this invention, as it allows the simple approach described herein to be adopted.

Typically, the frame is rectangular so as to hold the closed end of the bag in a rectangular shape and the bag has four side walls, of which two opposing side walls are gusseted.

In a preferred embodiment, the retaining element comprises a pair of mounting rails disposed at the top of the two opposing, gusseted side walls.

Each mounting rail may have an articulated joint, each articulated joint being co-axial with a central axis on a respective one of the gussets such that the mounting rails may fold along with the gusset.

In one embodiment, each of the four side walls has a first thickness, and additional layers of the first thickness are provided in a sealing region on each of the non-gusseted side walls such that when the gusseted side walls are folded inwardly the sealing region has a uniform thickness.

As noted above the device described above can be incorporated in coin processing apparatus. Thus in a fourth aspect of the invention, there is provided a sheet document or coin processing apparatus comprising a device according to the first aspect.

A sheet processing apparatus according to the invention preferably includes a sheet feed mechanism for delivering the sheet documents to the bag. In the case of rectangular documents it is advantageous to feed them short edge first. Further, it has been found to be helpful if the sheet feed mechanism imparts a slight upward curvature or fold to the sheets. In the case of rectangular sheets these are curved along their short edges or folded in the longitudinal direction. Each of these features helps to ensure that a sheet exiting the mechanism in a horizontal direction stays substantially horizontal as it falls vertically and will land major surface first (rather than edge first) on a flat surface.

An embodiment of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 shows a device according to the invention for sealing sheet documents or coins in bags;

Figure 2 shows a detailed view of movable flaps for clamping the open end of the bag;

Figure 3 shows a detailed view of a mechanism for assisting with clearing the sealing region on the bag and folding the gussets;

Figure 4 shows a cross-section through the heat sealer;

Figures 5a, 5b, 6a and 6b show a bag for use with the device illustrated in Figures 1 to 4; and

Figures 7a and 7b are perspective views of a set of forming rollers suitable for use in feeding sheet documents to a bag with figure 7a showing a sheet document being fed through the rollers.

Figure 1 shows a device for sealing sheet documents or coins in bags. The device is suitable for use so as to receive sheet documents or coins from sheet document or coin processing equipment (not shown). The device may be retro-fitted into sheet document or coin processing equipment or sheet document or coin processing equipment can be specifically built to contain the device.

The device comprises a bag retainer frame 1 and two pairs of arms 2a, 2b and 3a, 3b rotatably mounted on the bag retainer frame 1. Each pair of arms 2a, 2b and 3a, 3b carries a respective sealing or welding bar 4, 5. The two pairs of arms 2a, 2b and 3a, 3b are coupled together by gears 6a, 6b which ensure that they rotate in synchrony. They are driven by a motorised link mechanism (not shown) coupled to one of the arms. The two pairs of arms 2a, 2b and 3a, 3b are movable between a retracted or parked position in which the welding bars 4, 5 lie horizontally alongside the bag retainer frame 1 and a sealing or welding position in which the welding bars 4, 5 come together for sealing bags centrally beneath the bag retainer frame 1. More details of the heat sealer may be found in the description of Figure 4 below.

A rectangular opening 7 is formed within the bag retainer frame 4, which is fashioned to suit the maximum dimensions of the desired sheet documents (typically banknote currency) that will be used with the device. A pair of flaps 8a, 8b are rotatably mounted on the bag retainer frame 4. They are movable between open and closed positions by operation of a lever arm 9. The operation and purpose of the flaps 8a, 8b will be described in more detail with reference to Figure 2 below.

The bag retainer frame 1 comprises a pair of parallel, opposed runners 10a, 10b. As will be described below, the bags for use with the device have mounting rails which can engage with the runners 10a, 10b. Therefore, a bag may be easily engage and retained on the bag retainer frame 1 by sliding the mounting rails into the runners 10a, 10b. Thus, the bag retainer frame 1 holds the bag in a vertical orientation such that the open end of the bag is uppermost, thereby allowing vertically falling sheet documents or coins discharged by the sheet document or coin processing equipment to collect in the bag. A more detailed description of the bag is provided below with reference to Figures 5 and 6.

Figure 2 shows the moveable flaps 8a, 8b in more detail. The moveable flaps 8 are arranged in the opening 7 such that they lie in a parallel and opposed arrangements. The moveable flaps 8 are pivotally moveable relative to the bag retainer frame 1 between open and closed positions. The flaps 8a, 8b run the full length of the opening 7 as can be seen most easily in Figure 1.

When in the open position the flaps 8a, 8b are in the position shown in solid lines in Figure 2. Thus, their lower edges are withdrawn above the lower edge of the bag retainer frame 1, the lower edge of the bag retainer frame being defined by the runners 10, 10b. Thus, a bag 11 may be slid onto or off the runners 10a, 10b without the movable flaps 8a, 8b impeding this process.

When in the closed position, the movable flaps 8a, 8b are in the position shown by dashed lines. In this position, the movable flaps 8a, 8b clamp the sides of bag 11 against the side walls of bag retainer frame 1 and thereby serve to expand bag 11 to conform to the distance between the flaps 8a, 8b. Thus, a smooth, unobstructed passage is provided for sheet documents or coins through the bag retainer frame 1 into the bag 11.

The flaps 8a, 8b are pivotally movable between the open and closed positions about respective pivots 12a, 12b as a result of the actuation of a lever arm 9. The lever arm 9 may be moved by a motor (not shown) or solenoid (not shown) coupled to it.

The clamping action of the flaps 8a, 8b (along with a frame in the bag 11 described below) holds the bag 11 in a rigid, rectangular format, which again provides a smooth, unobstructed passage for sheet documents or coins falling into the bag 11. The weight of the sheet documents or coins assists holding the bag in this format as they fall in.

It is also possible for the flaps to be jogged or caused to oscillate slightly as documents or coins fall into the bag. This is particularly useful in connection with documents to help to ensure that they are neatly stacked. The jogging or oscillating motion would be much

smaller than the motion between the open and closed positions described above and could be achieved through the use of a small motor or other driver.

The preferred bag to be described below has a rectangular closed end. This is deliberate, not so much as the ideal container for `rectangular` cash notes but in order to cause the notes to `float` down into the bag from host coin processing equipment in an ordered manner to maximise stacking potential. In this respect the bag is not simply a loose sack. Further research on bag features has indicated that efficient free stacking is an important issue as most prior art bags need an artificial device to improve stacking.

Figure 3 depicts a front view of the device and shows a mechanism comprising a pair of fingers 13a, 13b which assist with clearing the sealing region on the bag and folding the gussets. The fingers 13a, 13b are arranged to rotate about respective pivots 14a,14b such that when in use, the fingers 13a, 13b press in on the gusseted sides of the bag (as shown by the dashed lines), thereby folding in the gussets 15a, 15b so that a sealing region near the open end of the bag 11 is straight and even and may be neatly clamped by the welding bars 4, 5 for sealing. Thus, a smooth, straight seal is formed, allowing tampering to be more readily identified.

The fingers 13a, 13b may be repeatedly moved at high speed between the position shown in solid lines and the position shown in dashed lines so as to shake the sides of the bag 11 in order to dislodge any sheet documents which have adhered to the bag 11, for example due to attraction by static electricity.

In some embodiments of the invention the fingers 13a and 13b are not be necessary and sheet documents will simply float to the base of a bag with a rectangular closed end in a neat stack.

After this, the welding bars 4, 5 are activated, thereby forming a seal in the seal region of bag 11.

Figure 4 shows a cross-section through the heat sealer. Welding bar 5, carried by arms 3a and 3b, has an electrically and thermally insulating strip 16 (for example, made form mica) fitted along its full length. An impulse heating element 17 is stretched over the insulating strip 16 and connected at each end of the welding bar 5 to an electrical supply (via an electronically controlled switch, such as a relay). A polytetrafluoroethylene (PTFE) sheet 18 is wrapped over the element and secured. A plastic strip 19 running along the full length of welding bar 5 provides an edge to grip the bag in conjunction a plastic strip mounted on the other welding bar 4 as described below.

Welding bar 4, carried by arms 2a and 2b, provides the reaction force to welding bar 5 when they are driven together for sealing. Along the front of the welding bar 4 is a sliding member 20, which is urged away from welding bar 4 by a spring 21. This allows any inconsistencies or unevenness in the sealing region of bag 11 to be taken up. The front of the sliding member 20 is also fitted with an insulator 22, which is also covered with a PTFE sheet 23. A plastic strip 24 running along the full length of welding bar 4 provides an edge to grip the bag in conjunction with the plastic strip 19 mounted on welding bar 5.

As the welding bars 4 and 5 are brought together, the spring-loaded sliding member 20 applies pressure against the heating element 17 with a bag trapped in between. The continuing closure of the welding bars 4 and 5 causes the plastic strips 19 and 24 to clamp the bag. The purpose of the clamping is to stop the bag dropping down under its own weight when the welding process causes the sealing region to become molten. The idea of the sprung bars is to ensure even welding.

Importantly, a bag cannot be removed from the machine until all of the flaps 8a, 8b, the fingers 13a, 13b and the welding bars 4, 5 have been retracted. This ensures that the bag cannot be removed from the device until it has been sealed and released, which reduces the opportunity for pilfering and tampering, thereby improving the security of the bag.

Figures 5a and 5b show the bag 11 in detail. The bag 11 has mounting rails 25 on each of two opposed, gusseted sides of the bag 11. Only one of the mounting rails is shown in Figure 5a. The bag 11 is welded at the seams. The gussets have a gusset fold point 26, the position of which is defined by three gusset folds 27a, 27b, 27c emanating from the gusset fold point 26. A similar gusset fold point (defined in part by fold 27c) will be defined near the closed end of the bag and the opposite side of the bag has corresponding gusset folds and gusset fold points.

As already described, the mounting rails 25 may be engaged with the runners 10a, 10b as described above. The mounting rails 25 each have an articulated joint 28 break in line with the gusset fold 27c such that when the fingers 13a, 13b press in the gusset folds, the articulated joints 28 allows the mounting rails 25 to conform to the folds. This allows the bag 11 to close completely at the open end giving a better fold and seal. Each of the articulated joints 28 may be provided by simply abutting two plastic tubes or rods within a sleeve formed in the bag 11 to form each mounting rail 25, the joint being provided by hinging action at the abutment.

The closed end 29 of the bag shown in Figure 6a is held in a rectangular shape by a rectangular wire frame (not shown) within the bag 11 corresponding to the shape of the open end when inserted in the device.

Figures 6a and 6b shows an improvement to the bag 11 in the sealing region. Specifically, the sides of the bag extend to form two flaps 30a, 30b at the open end. These flaps 30a, 30b are folded over the sides as shown before sealing. Thus, the flaps 30a, 30b ensure that the bag has four thicknesses of material across the entire sealing region, both in the folded gussets (where the thickness is made up of the gusseted sides and the plain sides) and in the remainder of the sealing region (where the thickness is made up of the plain sides and flaps 30a, 30b). This ensures that the bag 11 has a uniform thickness in the sealing region and assists with the sealing process.

The width and length of the bag 11 are adjusted to accept the maximum dimensions of banknotes or other sheet documents required to be collected and its height is adjusted to suit the volume of documents or banknotes intended for collection.

Each of the mechanisms described above (e.g. the flaps 8a, 8b; the welding bars 4, 5; and the fingers 13a, 13b) are electrically driven by motors or solenoids as appropriate operated by a suitable process controller, which may be linked to sheet document or coin processing equipment to which the device is coupled.

The device described will generally be used with a sheet document processing equipment (or coin processing equipment) such as a banknote counter or sorter. The device will be placed beneath a discharge location of the sheet document processing equipment such that any sheet documents (e.g. banknotes) discharged at that location will fall through the opening 7 into a bag 11 fitted to the device in the manner described above. The bag 11 may then be sealed as already described and removed from the device by cash-in-transit personnel.

Figure 7 shows a sheet feed mechanism suitable for incorporation into sheet document processing equipment to discharge notes to a bag sealing device as described above. The figure shows a rectangular sheet document 40 such as a bank note about to exit the feed mechanism which comprises a pair of rollers 41 and 42 mounted on drive axles 43 and 44 respectively. When the roller 41 is driven in the clockwise direction as shown roller 42 is driven in the opposite direction and the sheet document 40 is fed in the direction of the arrow shown on the document. The rollers have mating curved surfaces which together form a slight transverse bend extending along the longitudinal direction of the sheet document.

CLAIMS

1. A device for sealing sheet documents or coins in a bag, the device being adapted for receiving sheet documents or coins from sheet document or coin processing equipment in use, the device comprising a bag retainer for holding the bag, in use, in a vertical orientation such that an open end of the bag is uppermost, thereby allowing falling sheet documents or coins discharged by the sheet document or coin processing equipment to collect in the bag, and a heat sealer for sealing the open end of the bag.

2. A device according to claim 1, wherein the bag retainer comprises a pair of opposed runners, each of which is adapted to engage, in use, with a corresponding retaining rail on the bag.

3. A device according to claim 2, wherein the pair of opposed runners lie parallel to each other.

4. A device according to any of the preceding claims, wherein the bag retainer is adapted to hold the bag, in use, such that the open end of the bag is directly above a closed end of the bag, thereby allowing vertically falling sheet documents or coins discharged by the sheet document or coin processing equipment to collect on the closed end of the bag.

5. A device according to any of the preceding claims, wherein the heat sealer comprises a first sealing bar movable between a first position in which a bag may be brought into engagement with the bag retainer and a second position in which a first heating element mounted on the first sealing bar is brought into contact with a bag, in use.

6. A device according to claim 5, wherein the heat sealer further comprises a pressure bar disposed in opposition to the first sealing bar when in the second position such that the first sealing bar and pressure bar trap the bag, in use, between them.

7. A device according to claim 5, wherein the heat sealer further comprises a second sealing bar movable between a third position in which a bag may be brought into engagement with the bag retainer and a fourth position in which the second sealing bar is disposed in opposition to the first sealing bar when in the second position such that the first and second sealing arms trap the bag, in use, between them.

8. A device according to claim 7, further comprising a second heating element mounted on the second sealing bar.

9. A device according to claim 7 or claim 8, wherein the first and second sealing bar are pivotally movable between the first and second positions and third and fourth positions respectively.

10. A device according to any of claims 7 to 9, wherein the second and fourth positions are such that first and second sealing bar are symmetrically arranged and move by equal amounts between the first and second positions and the third and fourth positions respectively.

11. A device according to any of the preceding claims, wherein the device further comprises an opening through which falling sheet documents or coins discharged by the sheet document or coin processing equipment may pass, in use, into the open end of the bag.

12. A device according to claim 11, wherein the opening is defined by a pair of flaps, each of which is movable between a first position in which a bag may be brought into engagement with the bag retainer and a second position in which the flaps hold the open end of the bag so that it does not impede the passage of falling sheet documents or coins into the bag.

13. A device according to claim 12, wherein each of the pair of flaps clamps a respective portion of the open end of the bag against a respective side wall of the device when in the second position.

14. A device according to any of the preceding claims, wherein the device for sealing sheet documents or coins comprises at least one finger movable between a first position in which a bag may be brought into engagement with the bag retainer and a second position in which the finger contacts the side of the bag, in use.

15. A device according to claim 14, wherein the device comprises a pair of opposed fingers, each of which is movable between a first position in which a bag may be brought into engagement with the bag retainer and a second position in which it contacts a respective side of the bag, in use.16. A device according to claim 14 or claim 15, further comprising a controller adapted to cause the or each finger to move repeatedly between the first and second positions, thereby shaking the bag to ensure sheet documents do not adhere to the bag.

17. A kit comprising a device according to any preceding claim and at least one bag.

18. A kit as claimed in claim 17 in which the closed end of the bag is rectangular and the bag has parallel sides perpendicular to the closed end.

19. A kit as claimed in claim 18 in which the bag structure to be such that when it is held open with the open end above the closed end, the rectangular closed end lies flat.

20. A method for sealing sheet documents or coins in a bag, the method comprising holding a bag in a vertical orientation such that an open end of the bag is uppermost, thereby allowing falling sheet documents or coins discharged by a sheet document or coin processing equipment to collect in the bag, receiving at least one sheet document or coin from the sheet document or coin processing equipment in the bag, and sealing the open end of the bag.

21. A method according to claim 20, further comprising engaging a bag with a bag retainer for holding the bag in a vertical orientation such that the open end of the bag is uppermost.

22. A method according to claim 21, further comprising disengaging the bag from the bag retainer after the open end of the bag has been sealed.

23. A method according to any of claims 20 to 22, further comprising holding the bag such that the open end of the bag is directly above a closed end of the bag, thereby allowing vertically falling sheet documents or coins discharged by the sheet document or coin processing equipment to collect on the closed end of the bag.

24. A method according to any of claims 20 to 23, wherein the step of sealing the open end of the bag comprises moving a first sealing bar from a first position in which the bag may be brought into position for holding in the vertical orientation such that the open end is uppermost to a second position in which a first heating element mounted on the first sealing bar is brought into contact with a bag.

25. A method according to claim 24, further comprising trapping the bag against a pressure bar disposed in opposition to the first sealing bar when in the second position.

26. A method according to claim 24, wherein the step of sealing the open end of the bag further comprises moving a second sealing bar from a third position in which the bag may be brought into position for holding in the vertical orientation such that the open end is uppermost to a fourth position in which the second sealing bar is disposed in opposition to the first sealing arm when in the second position such that the first and second sealing bars trap the bag between them.

27. A method according to claim 26, wherein the first and second sealing bars move pivotally between the first and second positions and third and fourth positions respectively.

28. A method according to claim 26 or claim 27, wherein the second and fourth positions are such that first and second sealing bars are symmetrically arranged and move by

equal amounts between the first and second positions and the third and fourth positions respectively.

29. A method according to any of claims 24 to 25, further comprising activating the first heating element, thereby sealing the bag.

30. A method according to claim 29, further comprising activating a second heating element mounted on the second sealing arm.

31. A method according to any of claims 20 to 30, further comprising clamping the open end of the bag in a defined position such that the open end of the bag does not impede the passage of falling sheet documents or coins into the bag.

32. A method according to any of claims 20 to 31, further comprising, prior to the step of sealing the open end of the bag, moving at least one finger from a first position in which the bag may be brought into position for holding in the vertical orientation such that the open end is uppermost and a second position in which the finger contacts a gusset portion in a side of the bag, thereby assisting the folding of the gusset portion.

33. A method according to claim 32, wherein further comprising, prior to the step of sealing the open end of the bag, moving a pair of opposed fingers from a first position in which the bag may be brought into position for holding in the vertical orientation such that the open end is uppermost and a second position in which each finger contacts a gusset portion in a respective side of the bag, thereby assisting the folding of the gusset portions.

34. A method according to claim 32 or claim 33, further comprising moving the or each finger repeatedly between the first and second positions, thereby shaking the bag to ensure sheet documents do not adhere to the bag.

35. A bag comprising open and closed ends joined by a plurality of side walls, at least one of which is gusseted; a frame for holding the closed end in a desired shape; and a retaining element by which the bag may be retained in a device according to any of claims 1 to 16, in use.

36. A bag according to claim 35, wherein the frame is rectangular so as to hold the closed end of the bag in a rectangular shape and the bag has four side walls, of which two opposing side walls are gusseted.

37. A bag according to claim 36, wherein the retaining element comprises a pair of mounting rails disposed at the top of the two opposing, gusseted side walls.

38. A bag according to claim 37, wherein each mounting rail has an articulated joint, each articulated joint being co-axial with a central axis on a respective one of the gussets such that the mounting rails may fold along with the gusset.

39. A bag according to any of claims 36 to 38, wherein each of the four side walls has a first thickness, and additional layers of the first thickness are provided in a sealing region on each of the non-gusseted side walls such that when the gusseted side walls are folded inwardly the sealing region has a uniform thickness.

40. A sheet document or coin processing apparatus comprising a device according to any of claims 1 to 16.

41. A sheet document processing apparatus according to claim 40 comprising a feed mechanism for feeding sheet documents to a bag.

42. A sheet document processing apparatus according to claim 41 in which the mechanism is arranged to deliver rectangular documents with their short sides leading.

43. A sheet document processing apparatus according to claim 41 or 42 in which the mechanism is arranged to impart an upward curve or fold to each document.

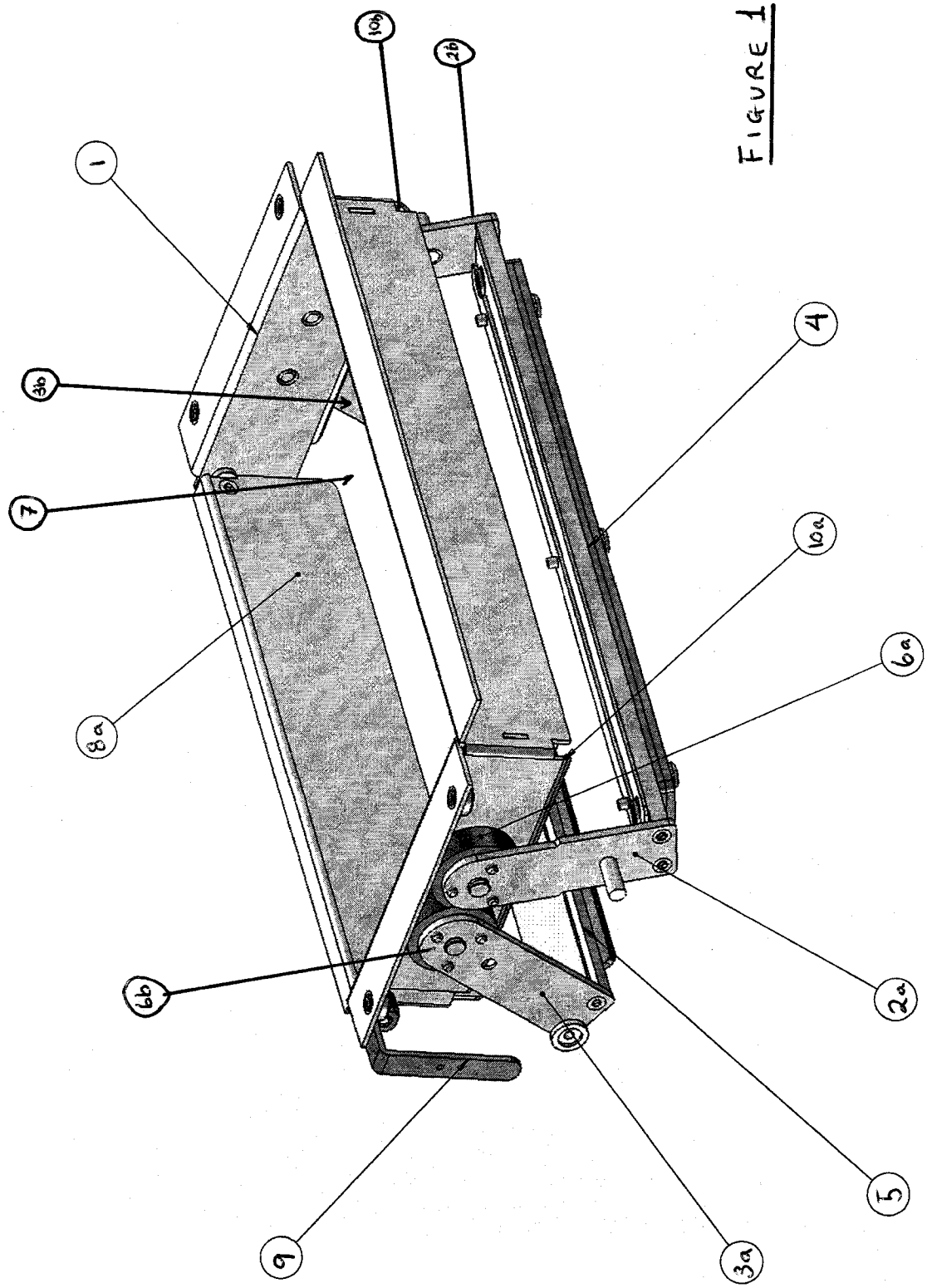


FIGURE 1

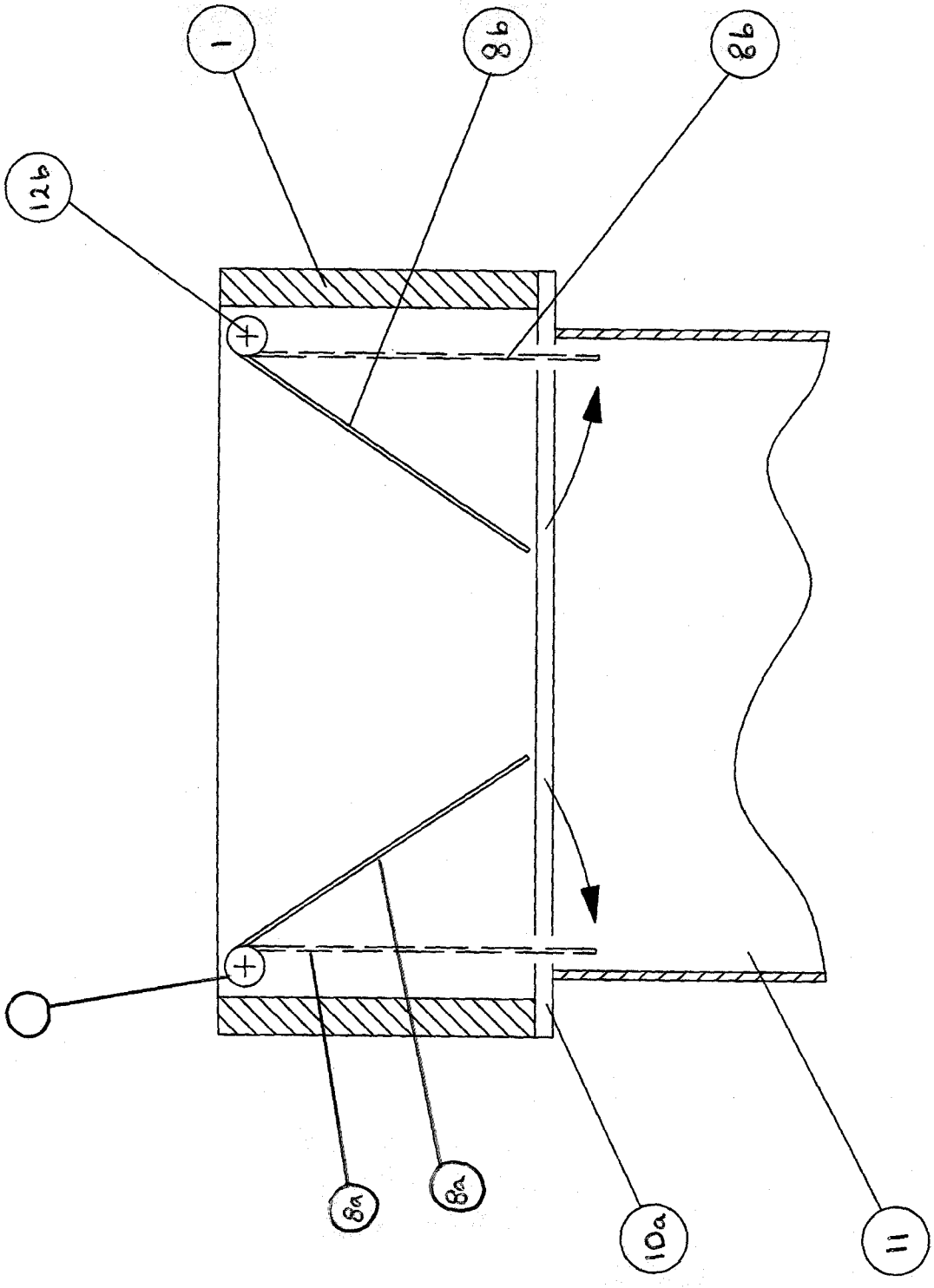


FIGURE 2

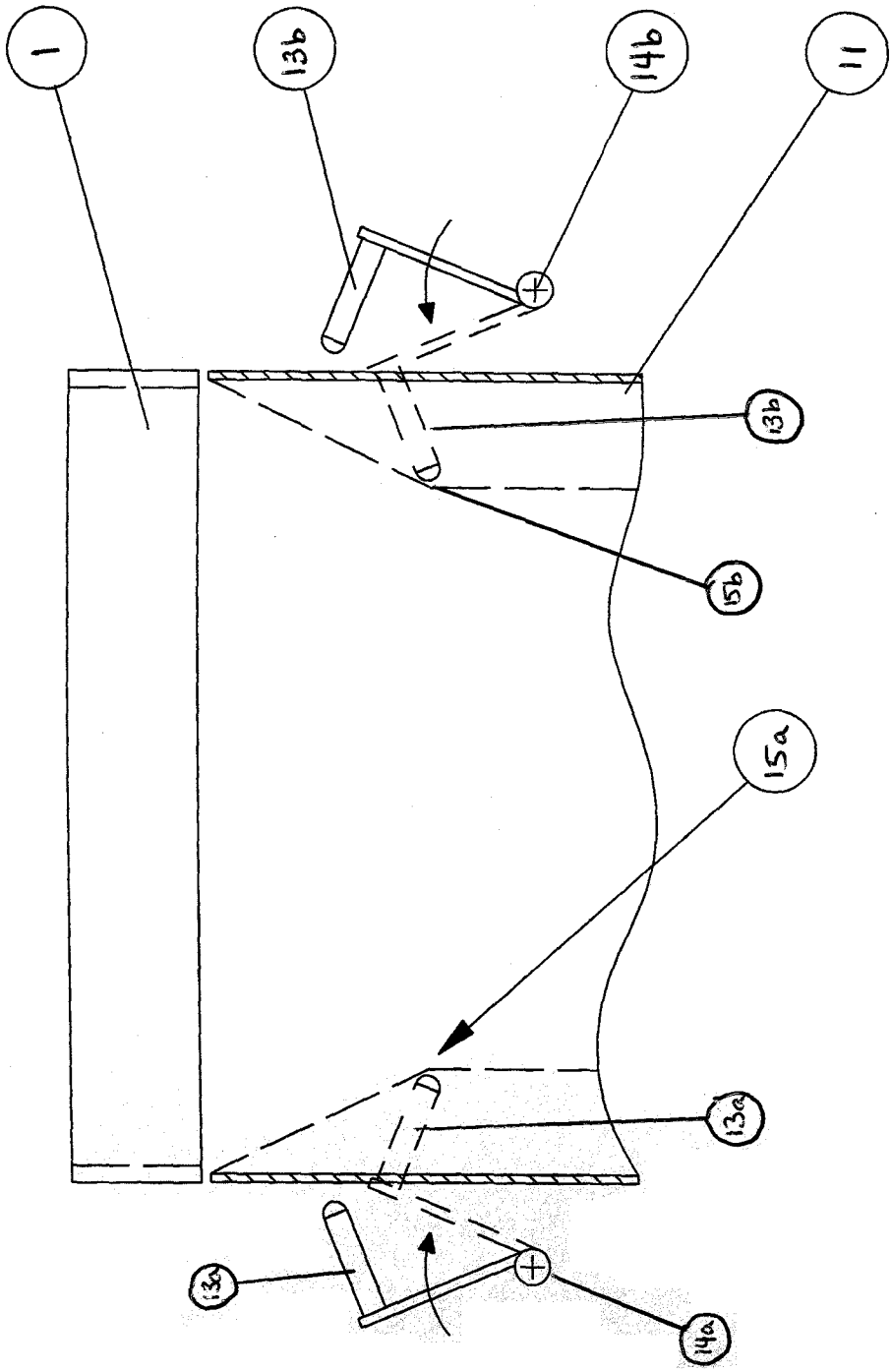


FIGURE 3

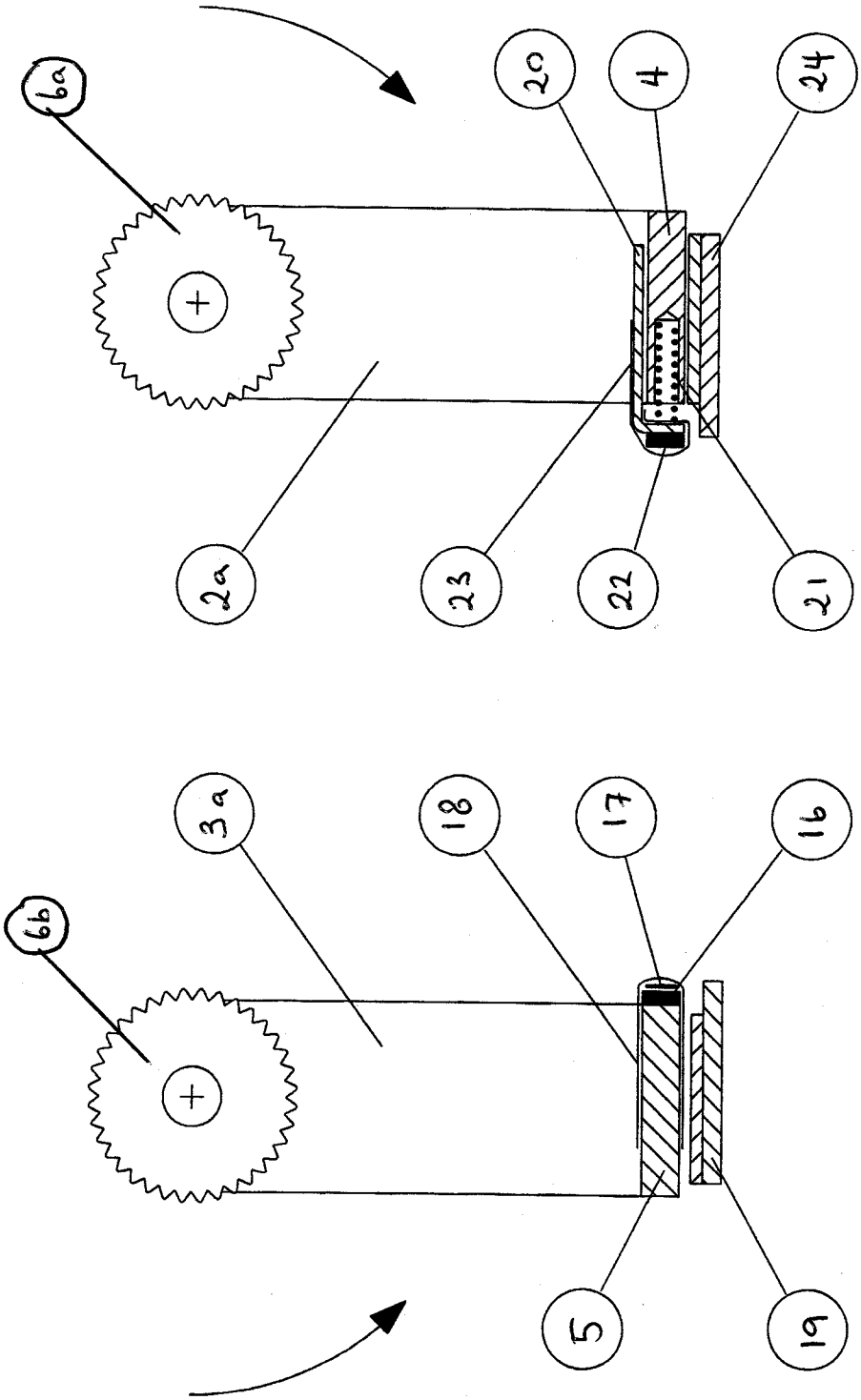


FIGURE 4

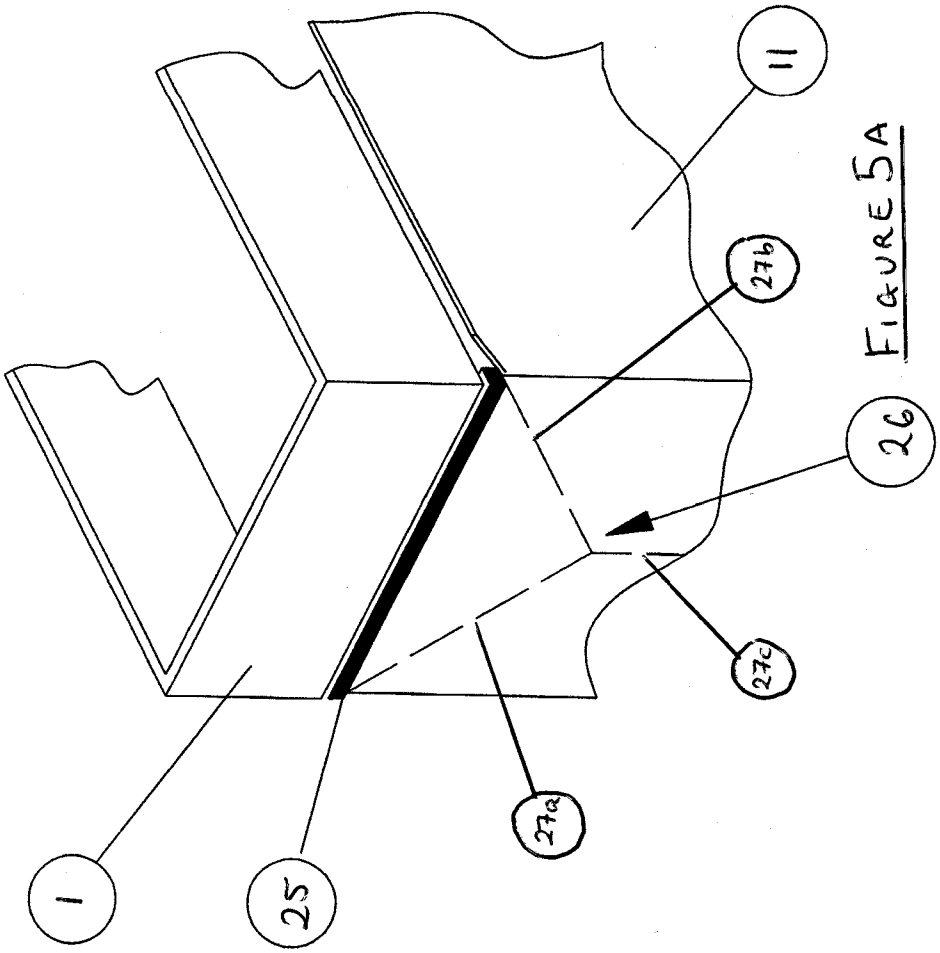


FIGURE 5A

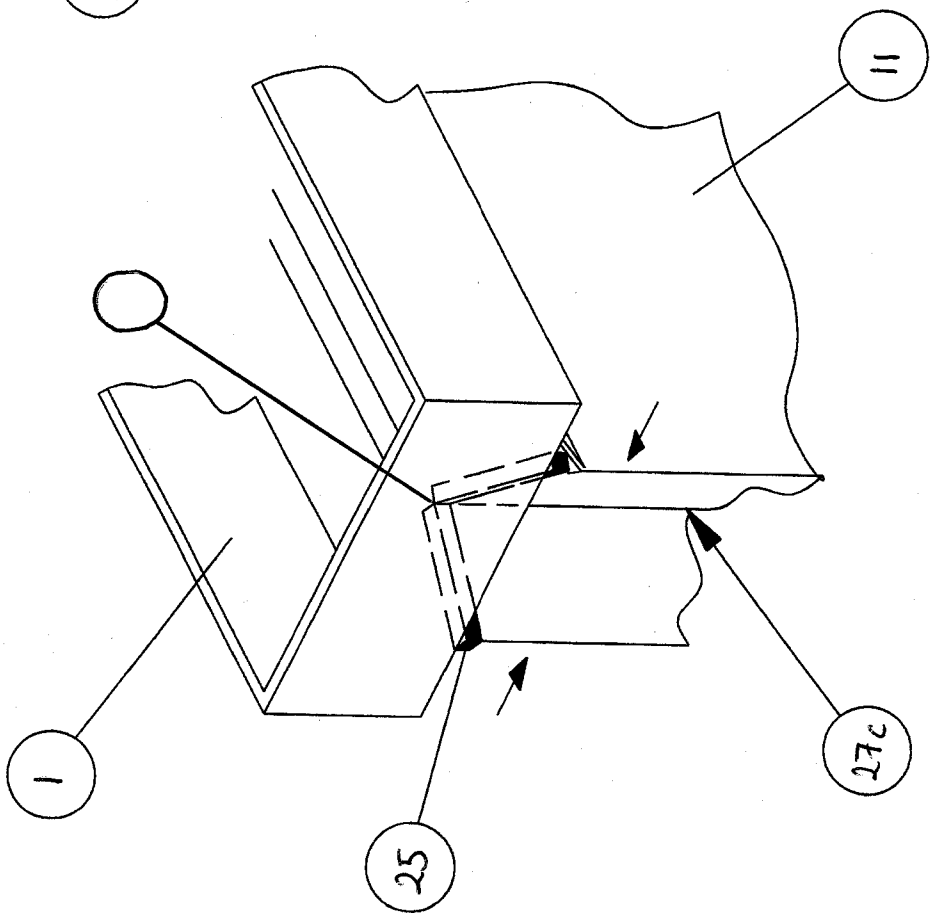


FIGURE 5B

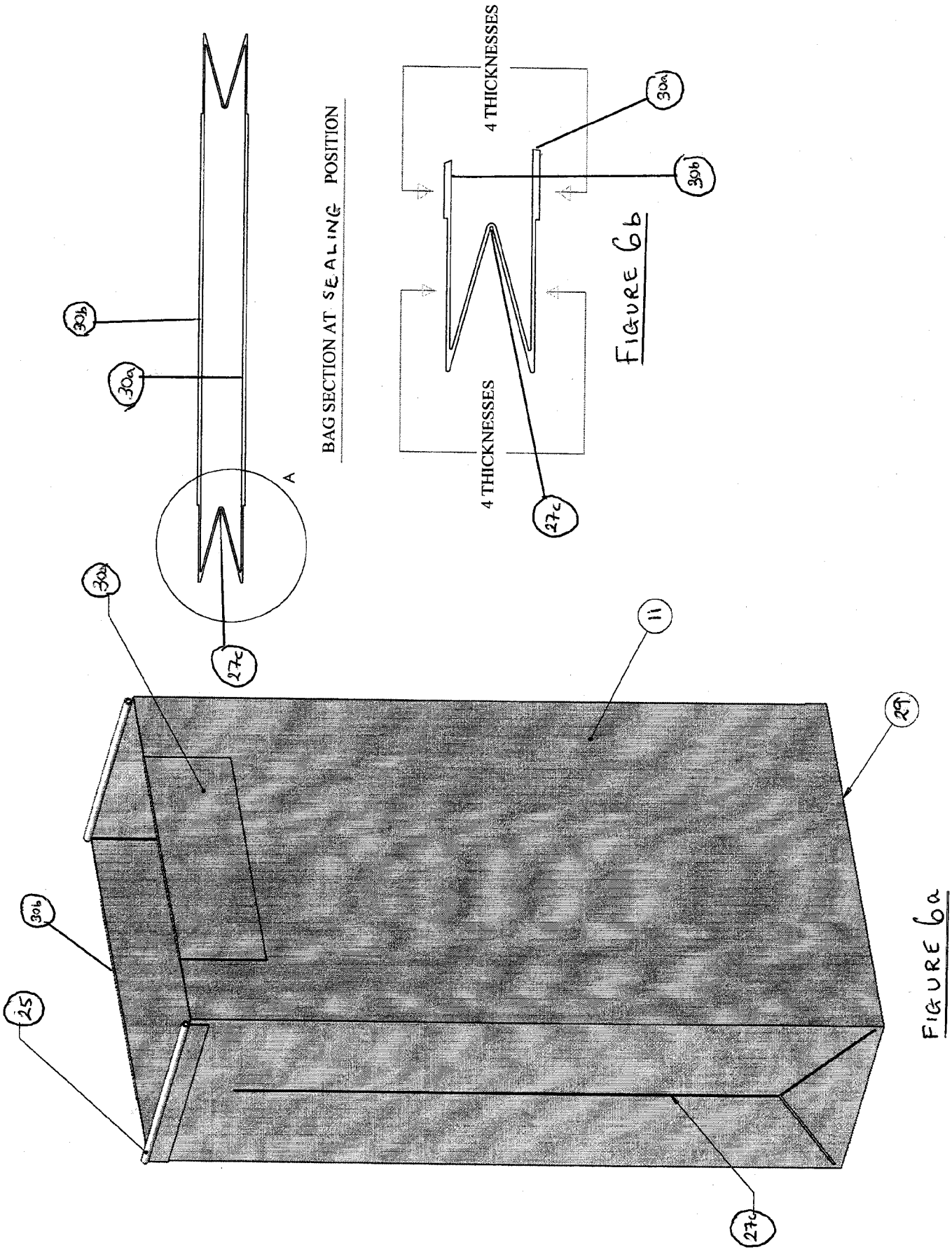


FIGURE 6b

FIGURE 6a

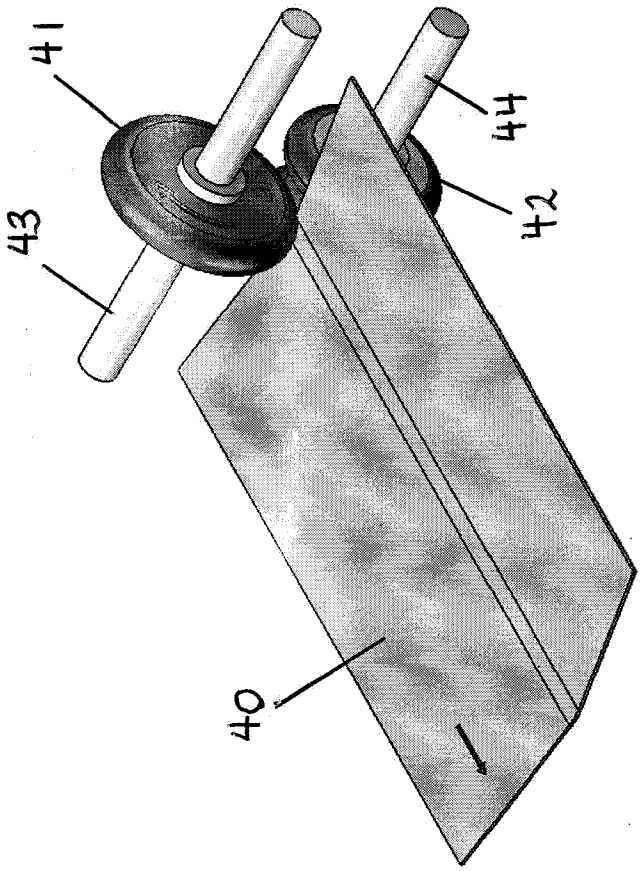


FIGURE 7A

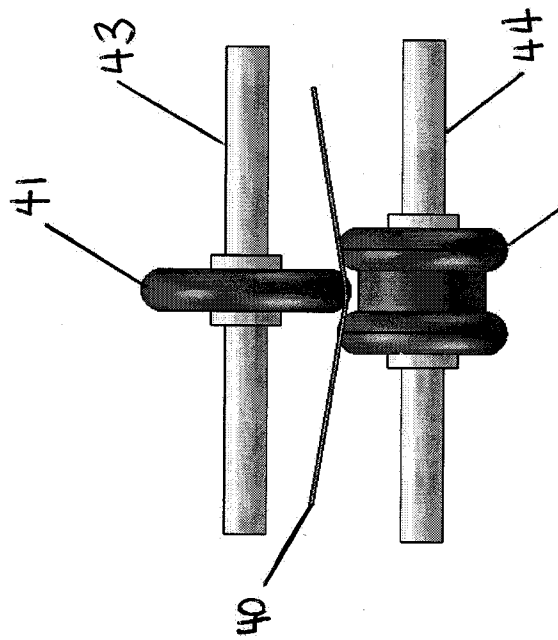


FIGURE 7B

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2010/050675

A. CLASSIFICATION OF SUBJECT MATTER
INV. G07D11/00 E05G7/00
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G07D E05G

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 practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 369 826 A1 (BRINK S FRANCE [FR]) 10 December 2003 (2003-12-10)	1-4, 11-13, 17-23, 31,40-43
Y	paragraph [0014] - paragraph [0015] paragraph [0017] - paragraph [0020] paragraph [0026] - paragraph [0037] paragraph [0043] - paragraph [0045] figures 1-4	5-10, 24-30, 35-39
	-/--	

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

[X] See patent family annex.

* Special categories of cited documents :

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"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
12 August 2010	20/08/2010

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

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INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2010/050675

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2008/151773 A1 (CIMA S P A DI RAZZABONI & C [IT]; RAZZABONI NICOLETTA [IT]; RAZZABONI) 18 December 2008 (2008-12-18)	1,20
Y	page 1, lines 10-28	35-39
A	page 2, line 20 - page 3, line 5 page 5, line 15 - page 8, line 12 page 9, line 18 - page 10, line 7 page 14, line 23 - page 18, line 17 figures 1-7,14,15,16,17	2-4, 11-13, 17-19, 21-23
Y	EP 1 413 703 A2 (LAMERS GENDT B V [NL]; KONINK MARTENS BRANDKASTEN B V [NL]; TRANSPOSAF) 28 April 2004 (2004-04-28) paragraph [0012] - paragraph [0016] paragraph [0020] - paragraph [0023] figures 1-3	5-10, 24-30
X	GB 2 352 006 A (STEVENS CLIVE [GB]) 17 January 2001 (2001-01-17)	20-23
A	page 1, paragraphs 3,4,7 page 2, paragraphs 1,9,10 figures 5a,5b,6,8	1-4, 11-13, 17-19, 40-43

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/GB2010/050675

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