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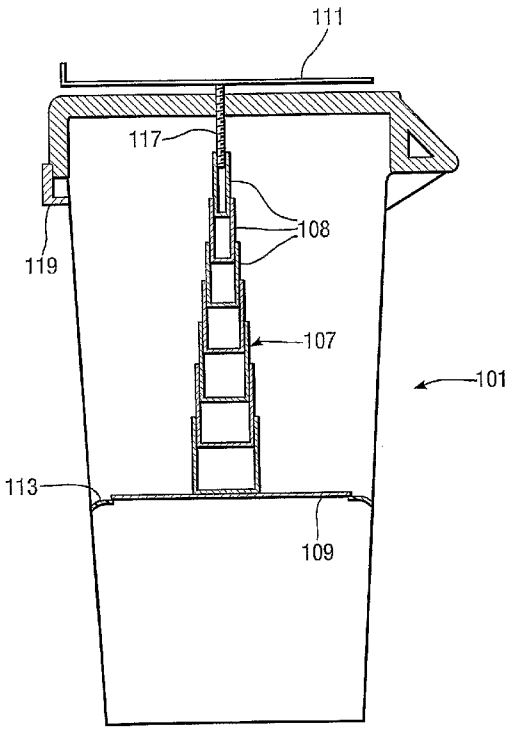
(54) **Title:** A WASTE COMPACTING DEVICE

Fig.4.



(57) **Abstract:** The invention relates to a waste compacting device. In particular the invention relates to a waste compacting device fitting within a lid of a bin. The invention also relates to a multiple thread jack mechanism, suitable for use in a waste compacting device. The waste compacting device (5, 105) comprises a moveable element (7, 107), and a rotatable member (11, 111) operatively coupled to a threaded member (17, 117). Rotation of the threaded member (17, 117) in a first direction moves the element (7, 107) into an operating position, and rotation of the threaded member (17, 117) in a second direction moves the element (7, 107) into a storage position. The moveable element (107) may be a multiple threaded jack mechanism, comprising a plurality of tubular elements (108) of increasing diameters concentrically arranged around a central threaded member (117).

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A WASTE COMPACTING DEVICE

The invention relates to a waste compacting device, and particularly, but not exclusively to a waste compacting device fitting within a lid of a bin. The invention also relates to a multiple thread jack mechanism, suitable for use in a waste compacting device and to a multiple scissor jack mechanism, suitable for use in a waste compacting device.

Households and businesses inevitably produce waste which has to be disposed of, usually by way of regular refuse collections. A household or business will be provided with one or more bins to be collected by a local authority. Although the quantity of waste generated by a typical household has increased over the years, the frequency of collections has not. Indeed, in many cases refuse collection is now less frequent that in the past. Problems arise when the bins provided to a household or business are not of a sufficient size to allow the volume of waste generated between collections to be stored. This can lead to overflowing bins or to additional waste being left in thin plastic bin bags adjacent the bin to be collected, which is both unsightly and unhygienic. Where waste is contained only in plastic bags, it is also possible for scavenging animals to tear the bags and distribute the waste originally contained therein across an area of ground, further exacerbating the problem. The need to handle additional bags also increases the work involved in disposing of the waste, as well as increasing the potential for scattering of waste due to tearing of the bags during disposal.

It is an object of the present invention to provide a means of compacting waste within a bin, such that more waste can be contained in the same volume and thereby avoid the problems associated with overflowing bins.

According to the present invention there is provided a waste compactor for compacting waste contained in a bin, the compactor comprising an element moveable from a storage position, in which said element locates adjacent a lid of a bin, to an operating position in which said element locates in the bin to compress waste contained therein; and a rotatable member operatively coupled to a threaded member such that rotation of the rotatable

member rotates the threaded member, wherein rotation of the threaded member in a first direction moves said element to the operating position, and rotation of the threaded member in a second direction, opposite to the first direction, withdraws the moveable element to a storage position.

Through use of the device, a user can increase the amount of waste that can be contained within a bin. The device preferably fits within the lid of a bin when not in use, and allows the bin to be filled and emptied as normal.

The moveable element is preferably extendable. In a multiple thread jack mechanism, the threaded member may be substantially cylindrical, and the moveable element may comprise a plurality of tubular elements of various diameters, arranged concentrically with the threaded member. In this case each tubular element should be provided with a thread on both its internal and external surfaces, for engagement with the threads of adjacent tubular elements. Accordingly, each tubular member may also be considered a threaded member. The thread may be provided either by simply producing threads on the interior and exterior surfaces of a plain tube or by producing tubular members with convoluted walls which engage with the walls of an adjacent tubular member. One advantage that the convoluted members have is that they have greater inherent strength than plain tubular members. Advancement of the element is preferably obtained by preventing one tubular element, usually the outermost element, from rotating while the central threaded member is rotated. Alternatively, the central threaded member may be prevented from rotation while another tubular element, usually the outermost element, is rotated. The engagement of the threads of the various tubular elements will then serve to advance the element. Stops may be provided to prevent over extension of each individual tubular element, preferably after extension of the element by around two thirds of its length.

Alternatively, in a multiple scissor jack version, rotation of the threaded member in said first direction may serve to shorten the distance between a pair of elements of a linkage in one direction, and thereby cause the linkage to extend in a perpendicular direction. The pair of elements should preferably be pivotably connected to one another at their

respective mid points, and each one should preferably comprise a threaded aperture at a first end through which the threaded member passes. Advancement of the threaded member through the threaded apertures causes the shortening of distance between the elements.

The second end of each element, opposite the threaded aperture, may be pivotably connected to the first end of one of a second pair of elements. The second pair of elements are preferably pivotably connected to one another at their mid points, in the same way as the first pair of elements.

Preferably, the threaded member is located at a first end of the element and a base plate is provided at a second, opposite, end of the element.

A common feature of both the multiple scissor jack mechanism and the multiple thread jack mechanism is that the base plate makes contact with the waste to be compressed and may also cover the movable element when it is in its withdrawn storage position within the bin lid. The base plate may be provided with a flexible flange portion, for example of brushes, rubber flaps or similar, around its edge. The flange portion allows the base plate to account for the varying cross-sectional area of the bin, and may also provide a means of cleaning the walls of the bin.

A clamp may be provided to keep the lid of the bin closed during use of the compactor. The rotatable member may be a handle, wheel or similar suitable for manual operation, or may be motorised. Where a handle is used, the handle may fold for storage. It is beneficial if gearing is provided between the rotatable member and the threaded member to provide a mechanical advantage. Preferably, the gearing provides more than one selectable gear ratio. To avoid potential damage to a bin when using the compactor, a clutch, for example a slip clutch, may be provided to limit the amount of compression force that can be applied by the moveable element. A locking device may be provided to prevent actuation of the waste compactor, for example by third parties.

The waste compactor may be provided within a specially made bin lid, for retrofitting to existing bins, or may be part of a specially made bin.

Although the multiple thread jack mechanism and multiple scissor jack mechanisms are primarily envisaged in waste compacting applications as described above, there is no reason why the mechanism would not be equally appropriate for other purposes including, but not limited to, mining, building and vehicle maintenance.

Accordingly, a further aspect of the present invention provides an extendable mechanism comprising a plurality of tubular elements of increasing diameters concentrically arranged around a central threaded member.

The use of plurality of tubular members provides an extendable mechanism with a small retracted size, which is capable of extending to many times its un-extended length. The amount of extension possible will depend on the number of tubular members used.

Each tubular element should preferably comprise an internal thread and an external thread. Where convoluted tubular members are used, both the internal and external threads are provided by the shape of the walls of each element. Preferably, the internal thread of a first of the plurality of tubular elements should engage with the thread of the central threaded member, and the internal thread of the or each further tubular element should engage with the external thread of an adjacent tubular element. Stops may be provided to prevent over extension of each individual tubular element, preferably after extension of the element by around two thirds of its length.

In use, either of the central threaded member and the outermost tubular element may be rotated about its axis, and the other of the central threaded member and the outermost tubular element should be prevented from rotation. The central threaded member and tubular members may be made from a variety of materials including metal and, in particular applications, plastics materials.

The invention further provides an extendable mechanism comprising a rotatable threaded member and a plurality of pairs of elongate crossing elements, each crossing element of each pair of crossing elements being pivoted to the other crossing element of each pair of crossing elements and to at least one crossing element of a further pair of crossing elements, wherein the rotatable threaded member passes through a first pair of crossing elements such that rotation of the rotatable member extends the mechanism.

A multiple scissor mechanism of this sort provides a relatively compact mechanism extendable to many times its un-extended length.

The rotatable threaded member preferably engages with threaded apertures provided in end portions of a first pair of crossing members, and extends the mechanism at right angles to the rotatable threaded member. Advancement and retraction of the mechanism is achieved through the increase or decrease of the distance between the ends of the crossing elements as a result of the rotation of the threaded member.

Each one of each pair of crossing elements, which may be made from metal, from a plastics material or similar, may be pivoted to the other of each pair of crossing elements at a mid-point of each crossing element, and to the crossing element of a further pair of crossing elements at an end point of the crossing element. A mechanism is thereby provided which extends along a line formed by the pivot points between the each pair of crossing elements.

A better understanding of the present invention will be obtained from the following detailed description. The description is given by way of example only and makes reference to the accompanying drawings in which:

Figure 1 is a cross-sectional view of a conventional wheelie bin incorporating a first embodiment of a compression device according to a first aspect of the present invention, the device being shown in a storage position;

Figure 2 is a cross-sectional view of the wheelie bin of Figure 1, with the device in an operating position;

Figure 3 is a cross-sectional view of a conventional wheelie bin incorporating an alternative embodiment of a compression device according to a first aspect of the present invention, the device being shown in a storage position;

Figure 4 is a cross-sectional view of the wheelie bin of Figure 3, with the device in an operating position;

Figure 5 is a schematic side view of a multiple thread jack mechanism according to a second aspect of the present invention in an un-extended state;

Figure 6 is a schematic cross-sectional view of the multiple thread jack mechanism as shown in Figure 5;

Figure 7 is a schematic side view of a multiple thread jack mechanism according to a second aspect of the present invention in an extended state;

Figure 8 is a schematic cross-sectional view of the multiple thread jack mechanism as shown in Figure 7.

Figure 9 is a cross-sectional view of a first specific example of the multiple thread jack mechanism incorporated in the lid of a wheelie bin;

Figure 10 is a cross-sectional view of a second specific example of the multiple thread jack mechanism incorporated in the lid of a wheelie bin;

Figure 11 is a cross-sectional view of the mechanism of Figure 9 in an extended state; and

Figure 12 is a cross-sectional view of the mechanism of Figure 10 in an extended state.

The wheelie bin 1 shown in Figure 1 incorporates a specially manufactured lid 3, inside which is contained a compression device 5, comprising a moveable element in the form of a multiple scissor jack 7, a metal base plate 9 and a rotatable handle 11. The multiple scissor jack 7 comprises a number of pairs of metal crossing elements 8 (three as shown).

Each element 8 has a pivoting connection to another element 8 at its mid point, and a further pivoting connection to a further element 8 at each end. The multiple scissor jack 7 can, therefore, extend and retract along a straight line taken through the mid points of the elements 8. The base plate 9 is substantially flat, but has vertical portions at its edges which surround the metal crossing elements 8 when the multiple scissor jack 7 is in its storage position. The base plate 9 is also provided with flexible rubber flanges 13 around its periphery. The base plate 9 and flanges 13 together, when viewed from above, have a substantially square shape with rounded corners, and are sized to fill the entirety of the interior cross-sectional area of the bin 1 at its opening. The base plate 9 is itself slightly smaller than the internal cross-sectional area of the bin at the extent of the reach of the compression device 5.

The compression device 5 is shown in its un-extended storage position, and is entirely contained within the lid 3 of the bin 1. In this position, the base plate 9 and flanges 13 provide a solid plate across the bottom part of the lid 3, obscuring and preventing access to the moving parts of the scissor jack 7. The handle 11 is shown in a storage position, folded flat against the top of the lid 3 of the bin 1. Running parallel to the handle 11, within the lid 3 of the bin 1, is a threaded rod 17 which drives the scissor jack 7. The threaded rod 17 is received in threaded apertures in the ends of two of the crossing elements 8. A sprung chain 15 connects the handle 11 to the threaded rod 17 of the scissor jack 7. Also shown in Figure 1 is a clamp 19, which may be one of several, for keeping the lid 3 of the bin 1 closed during operation of the compression device 5. During storage, as shown in Figure 1, the clamp 19 is contained within the edge of the lid 3 of the bin. The operation of the compression device 5 will now be described with reference to Figure 2.

Figure 2 shows the same bin 1 and compression device 5 as Figure 1 with the compression device 5 in its extended operating position. The clamp 19 is shown engaged with the body of the bin 1 to keep the lid 3 closed during operation of the compression device 5. The rotatable handle 11 has been folded out via the sprung chain 15 to a position where the connecting part of the handle is co-axial with the threaded rod 17 of the scissor jack 7. The handle 11 comprises a connecting part 21 which fits over the free end

of the threaded rod 17 and provides a torsionally secure coupling between the two. Although not visible in the drawings, the particular embodiment shown comprises a hexagonal end on the threaded rod 17 which is received by a similarly shaped recess in the handle part 11. The handle 11 and threaded rod 17 are held together by the spring force in the sprung chain 15 which runs internally between the two components. The handle 11 is formed of metal rod, and comprises two opposite right angled bends in a common plane to provide leverage for the person turning the handle. As shown in Figure 2, the handle 11 has been rotated through ninety degrees from the position at which it is folded flat against the lid 3 of the bin 1 for storage, and therefore this shape is clearly visible. With the handle 11 and threaded rod 17 torsionally connected, turning of the handle turns the threaded rod 17 to shorten the distance between the ends of the two crossing elements 8 through which it passes. This extends the multiple scissor jack 7 into the bin. The unfolded position of the handle 11 is well away from the edge of the bin 1, so that no parts of the bin 1 will interfere with the turning of the handle 11.

As the multiple scissor jack 7 is extended, the base plate 9 is driven downwards into the bin 1. The flexible rubber flanges 13 around the edge of the base plate 9 flex inwards to allow the compression device 5 to continue to move into the bin 1 as the internal cross-section of the bin 1 narrows. The flanges 13 further serve to ensure a good seal between the compression device 5 and the walls of the bin 1, preventing any loose waste from entering the mechanism of the multiple scissor jack 7. A scraping action provided by the rubber flanges 13 also cleans the interior walls of the bin 1 as the waste is being compressed. Once the multiple scissor jack 7 has been extended as far as possible, fully compressing the waste in the bin 1, turning the handle 11 in the opposite direction will cause an opposite rotation of the threaded rod 17 to withdraw the multiple scissor jack 7 back to the storage position as shown in Figure 1. The clamps 19 on the lid 3 of the bin 1 are released, and the lid 3 can now be opened to allow more waste to be added to the bin 1. The compression process can then be repeated if necessary. When the compression process is complete and the multiple scissor jack 7 has been returned to its storage position within the lid 3 of the bin for the final time, the handle 11 is pulled axially away from the threaded rod 17 against the spring force of the sprung chain 15. This disengages

the coupling 21 and allows the handle 11 to be folded at the sprung chain 15 into its storage position against the top of the lid 3 of the bin 1. The handle 11 is, therefore, stored in a position where it does not extend beyond the edge of the bin 1. This simplifies the everyday use of the bin 1, which can be opened, filled and emptied in the same way as any conventional wheelie bin.

Although not shown in the drawings, it may be preferable to include some form of gearing, between the handle 11 and the threaded rod 17, to increase the force that can be applied by a user to compress the waste. Ideally, the gearing would allow a first, low, ratio to be selected when extending the multiple scissor jack 7 to compress the waste; and a second, higher, ratio to be selected when withdrawing the multiple scissor jack 7 back to its storage position within the lid. This would allow a user to maximise the force applied when compressing waste, while also allowing the withdrawal of the mechanism at a higher speed.

An alternative embodiment of the system shown in Figures 1 and 2 is shown in Figures 3 and 4. A number of the features are similar, and their description will not be repeated in detail. However, there are a number of significant differences.

The bin 101 of Figure 3 comprises a compression device 105 in a withdrawn position similar to that shown in Figure 1. In contrast to Figure 1, the clamp 119 holding the lid 103 of the bin 101 closed is already engaged, ready for use of the compression device 105. The compression device 105 shown in Figure 3 comprises a base plate 109 as before, driven by a multiple thread jack mechanism 107 which is extended by turning a wheel 111. The multiple thread jack 107 comprises a central externally threaded rod or tube 117 with a number of further threaded tubes 108, seven as shown, of increasing diameter positioned concentrically around it. Each tube 108 may be formed from metal or a strong plastics material, and is threaded both internally and externally so as to engage with the tubes inside and outside it.

The workings of the multiple thread jack 107 will be explained more fully with reference to Figures 5 to 8, but for the sake of Figures 3 and 4 it is sufficient to say that the concentric tubes 108 are arranged centrally with respect to the lid 103 of the bin 101 with their axes oriented vertically. In Figures 3 and 4 the central threaded rod is rotated by a wheel 111, similar in form to a steering wheel, the central axis of which extends vertically out of the multiple thread jack mechanism 107, through the lid 103 of the bin 101. The wheel 111 is preferably provided with a small handle 112 to allow one handed operation if required. Turning the wheel 111 advances each of the tubes 108 in turn to extend the mechanism 107. The wheel 111 may be rotated relatively slowly by an operator when force is required for the compression of waste, and spun at a higher speed to raise or lower the mechanism 107 quickly when not under pressure. As an alternative to the wheel 111, a handle 11 similar to that shown in Figures 1 and 2 may extend vertically out of the multiple thread jack mechanism 107, through the lid 103 of the bin 101. The handle 11 may comprise two opposing right angle bends and run parallel to the top of the lid 103 of the bin 101 to provide leverage before extending vertically at one end providing a portion for a user to grip. Neither the wheel 111 nor handle 11 in this configuration extends beyond the edge of the bin 101, so there is no need for a mechanism allowing folding to a storage position as is required for the handle 11 of Figures 1 and 2.

The extended operating position of the alternative compression device is shown in Figure 4. The wheel 111 has been rotated in a first direction such that each of the individual threaded tubes 108 of the multiple thread jack mechanism 107 is unwound and extends from the tube inside it. The length of the multiple thread jack mechanism 107 is greatly increased in comparison to its storage position, and the base plate 109 has been driven down into the bin 101 to compress waste. Brushes 113 are provided around the edge of the base plate 109, and serve essentially the same purpose as the rubber flanges 13 of the earlier embodiment. As before, the compression device 105 is withdrawn by rotating the wheel 111 in an opposite direction, and once again gearing can be incorporated into the system as appropriate.

Either compression device 5,105 may, beneficially, be provided with a safety clutch within the mechanism, allowing a limit to be place on the force that could be applied so as to avoid damage to the bin. The clamps 19,119 may also be employed to ensure that the mechanism is securely held in a storage position when not being used. Additional or alternative locking means to prevent actuation of the device 5,105 may also be provided.

Figures 5 to 8 show the working principles of a multiple thread jack mechanism 31. The mechanism 31 differs from the mechanism 107 of the compacting device of Figures 3 and 4, having only four concentric parts as opposed to eight, but the principle of operation is the same in each case. The side view of Figure 5 shows the mechanism in its closed position. Only the outermost threaded tube 23 is clearly visible; the remainder of the tubes being contained within the mechanism. The configuration is more clearly shown in the cross-sectional view of Figure 6.

The cross-sectional view of Figure 6 shows a schematic view of a multiple thread jack mechanism 31 consisting of four threaded tubes. It would, of course, be possible to incorporate more tubes or fewer tubes as required. The outermost, or first, tube 23 is visible as in Figure 5. Inside the outermost tube 23 are contained three further tubes 25,27,29, of decreasing diameter. Each tube comprises a thread on both its interior and exterior surface. The threads are formed from the shape of the convoluted walls of each concentric tube. The interior thread of the outermost tube 23 engages with the exterior thread of the next largest, or second, tube 25. The interior thread of the second tube 25 engages with the exterior thread of the third tube 27, and the interior thread of the third tube 27 engages with the exterior thread of the innermost, or fourth, tube 29. Accordingly, a threaded portion of each tube 23,25,27,29 engages with a threaded portion of the or each tube located adjacent to it. In operation, either the innermost tube 29 or the outermost tube 23 is prevented from rotation by any suitable means and the other tube (ie the one not prevented from rotation) is turned in a first direction to extend the jack, or in a second direction to contract the jack. In the compression device 105 embodiment of Figures 3 and 4, the substantially square shape of the base plate 109, which is attached to the outermost tube 108 of the mechanism 107, and its engagement with the interior of the

bin 101 provides the necessary resistance to rotation. Alternative means of preventing rotation include, but are not limited to, the inclusion of a multiple scissor mechanism similar to that already described. The multiple scissor mechanism could be arranged between a bin lid 103 and base plate 109 to prevent the base plate 109 from turning while also providing increased lateral strength. For the purposes of the description of Figures 5 to 8, we will assume that the innermost tube 29 is prevented from rotation, and the outermost tube 23 is rotated.

To extend the multiple thread jack mechanism 31, the outermost tube 23 of the mechanism is rotated in a first direction. With the innermost tube 29 prevented from rotation, the thread of the outermost tube 23 will rotate relative to the thread of the second tube 25 to its interior, and the second tube 25 will advance out of the outermost tube 23. A flat stop point (not shown) is provided towards the end of the thread of the outermost tube 23 and or the second tube 25 to prevent the second tube 25 from advancing completely out of the outermost tube 23. The stop point is positioned so as to allow extension of the second tube by approximately two thirds of its overall length. Once the stop point is reached, continued rotation of the outermost tube 23 causes rotation of the second tube, which causes the third tube 27 to advance in the same way as previously described. Once the third tube 27 has fully extended it rotates with the outermost tube 23 and second tube 25 to advance the innermost tube 29. The multiple thread jack 31 is withdrawn by rotating the outermost tube in the opposite direction, and the action of the various tubes 23,25,27,29 is essentially the opposite of that described above.

The description given above relates to a theoretical operation of the multiple thread jack mechanism 31. In practice, it is more likely that the tubes 23,25,27,29 will not advance successively as described, but will advance in a more random fashion, dictated by varying levels of resistance in the system due to imperfections in, or contamination of, the various screw threads.

Figures 7 and 8 show a partially advanced multiple thread jack mechanism 31. In the side view of Figure 7 the second, third and innermost tubes 25,27,29 are all visible protruding

from the end of the outermost tube 23. The cross-sectional view of Figure 8 shows more clearly the relative positions of the four tubes. The second tube 25 has been unwound relative to the outermost tube by one turn. The third and innermost tubes 27,29 have been unwound by two turns relative to the second and third tubes 25,27 respectively. If stops were provided to prevent each tube 23,25,27,29 from extending by more than two thirds form the tube outside it, the fully extended length of the four tube example shown would be three times its un-extended length. The device shown would extend fully from its un-extended length after twelve full turns of the outermost tube 23.

As previously mentioned, the multiple thread jack mechanism 31 would work equally well if the innermost tube 29 were rotated with the outermost tube 23 being prevented from rotating. Indeed, this arrangement more closely represents the mechanism 107 shown in the compression device 105 of Figures 3 and 4.

Figure 9 shows a specific example of a mechanism 41 similar to that shown in Figures 5 to 8, with the shape of the individual convoluted members more clearly shown. The mechanism 41 is shown installed in the lid 43 of a wheelie bin 45 similar to that indicated in Figures 3 and 4. A flat base plate 49, similar to base plate 109 of Figures 3 and 4, is attached to the innermost member 51 of the mechanism 41, which is shown ready to extend into the bin 45 when a wheel 47 on the bin lid 43 is turned. The wheel 47 is connected to an outermost member 53 which has an inner surface profiled to engage with the outer surface of a convoluted member. The rubber flange 13 and brushes 113 described in Figures 1 to 4 are omitted from the base plate 49 of this embodiment.

Figure 10 shows an alternative embodiment of a mechanism 61 in the lid 63 of another wheelie bin 65. The mechanism 61 of Figure 10 is formed from a number of plain sided tubes, each having a full length thread provide on an outer wall, and a shorter length of thread provided on an inner wall. As in the Figure 9 embodiment, the innermost member 71 is connected to the base plate 69, which is extended into the bin 65 when a handle 67 is rotated to rotate an outer member 73 with a short internal thread similar to that of the threaded members. The base plate 69 in this embodiment is shaped so that the

mechanism 61, in its withdrawn state as shown, still extends slightly into the top of the bin 65. This allows the overall height of the bin lid 63 to be reduced in comparison the lid 43 shown in Figure 9, albeit at the expense of a small loss of bin capacity. A catch 75, to maintain the lid 63 in a closed position during use of the mechanism 61 is also shown in Figure 10.

Figure 11 shows the full bin 45 from Figure 9 with the mechanism 41 in an extended state. The convoluted nature of the individual tubes is clearly visible. Figure 12 likewise shows the bin 65 of Figure 12 with the mechanism 61 of Figure 10 in an extended state. The operation of the mechanisms 41 and 61 is as described in relation to the earlier Figures.

The invention is not considered to be limited to the configurations and materials described above. For example, the compression devices 5,105 described above could be motorised rather than hand driven. A solar powered version of the device could work with very little power and automatically compress waste in the bin slowly during the course of the working day. A householder would have the waste in their bin automatically compacted ready for when the bin was next needed in the morning or evening. The devices 5,105 would also be applicable, with the necessary changes, to bins and other waste receptacles of smaller or larger sizes than domestic wheelie bins, for example, commercial wheelie bins and other commercial waste containers including specially designed skips and roll on roll off containers. The compression devices 5,105 may be provided in specially made metal or plastic bin lids for retrofitting to existing bins or may, alternatively, be provided as part of an entire reinforced bin. Various specific aspects of the first compression device 5 could be incorporated into the second device 105 and vice versa. The various metal components of the compression device 5,105 and, in particular, of the multiple thread jack mechanism 31,107 could, in certain applications, instead be made form a suitably high density plastics or other suitable material.

CLAIMS:

1. A waste compactor for compacting waste contained in a bin, the compactor comprising an element moveable from a storage position, in which said element locates adjacent a lid of a bin, to an operating position in which said element locates in the bin to compress waste contained therein; and a rotatable member operatively coupled to a threaded member such that rotation of the rotatable member rotates the threaded member, wherein rotation of the threaded member in a first direction moves said element to the operating position, and rotation of the threaded member in a second direction, opposite to the first direction, withdraws the moveable element to a storage position.

2. A waste compactor according to claim 1, wherein the moveable element is extendable.

3. A waste compactor according to claim 1 or 2, wherein the threaded member is substantially cylindrical.

4. A waste compactor according to claim 3, wherein the moveable element comprises a plurality of tubular elements of various diameters, arranged concentrically with the threaded member.

5. A waste compactor according to claim 4, wherein each tubular element is provided with a thread on both its internal and external surfaces, for engagement with the threads of adjacent tubular elements.

6. A waste compactor according to claim 5, wherein the threads are provided by convolutions in the wall of each tubular member.

7. A waste compactor according to claim 5, wherein the threads are provided proud of the wall of each tubular member.

8. A waste compactor according to claim 7, wherein the thread on the internal wall is provided only over a part of the length of each tubular member.

9. A waste compactor according to any of claims 4 to 8, wherein, in use, one tubular element is prevented from rotation while the threaded member is rotated.

10. A waste compactor according to claim 1 or 2, wherein rotation of the threaded member in said first direction shortens the distance between a pair of elements of a linkage in a first direction, causing the linkage to extend in a second, perpendicular, direction.

11. A waste compactor according to claim 10, wherein each one of said pair of elements is pivotably connected to the other at its mid point, and comprises a threaded aperture at a first end through which the threaded member passes.

12. A waste compactor according to claim 11, wherein the second end of each element, opposite the threaded aperture, is pivotably connected to the first end of one of a second pair of elements, the second pair of elements being pivotably connected to one another at their mid points.

13. A waste compactor according to any of the preceding claims, wherein the threaded member is located at a first end of the moveable element.

14. A waste compactor according to claim 13, wherein a base plate is provided at the opposite end of the moveable element to the threaded member.

15. A waste compactor according to claim 14, wherein the base plate is provided with a flexible flange portion around its edge.

16. A waste compactor according to claim 15, wherein the flange portion comprises rubber flaps.

17. A waste compactor according to claim 15, wherein the flange portion comprises brushes.

18. A waste compactor according to any of the preceding claims, further comprising a clamp to keep the lid of the bin closed during use.

19. A waste compactor according to any of the preceding claims, wherein the rotatable member comprises a wheel.

20. A waste compactor according to any of the preceding claims, wherein the rotatable member comprises a handle.

21. A waste compactor according to any of claims 1 to 18, wherein the rotatable member is motorised.

22. A waste compactor according to claim 21, wherein the motor is solar powered.

23. A waste compactor according to any of the preceding claims, wherein gearing is provided between the rotatable member and the threaded member.

24. A waste compactor according to claim 23, wherein the gearing provides more than one selectable gear ratio.

25. A waste compactor according to any of the preceding claims, wherein a clutch is provided to limit the amount of compression force that can be applied by the moveable element.

26. A waste compactor according to any of the preceding claims, further comprising a locking device to prevent actuation of the moveable element.

27. A bin lid comprising a waste compactor according to any of the preceding claims.

28. A bin comprising a waste compactor according to any of claims 1 to 27.

29. A waste compactor substantially as herein described with reference to Figures 1 to 4, 11 or 12 of the accompanying drawings.

30. An extendable mechanism comprising a plurality of tubular elements of increasing diameters concentrically arranged around a central threaded member.

31. An extendable mechanism according to claim 30, wherein each tubular element comprises an internal thread and an external thread.

32. An extendable mechanism according to claim 31, wherein the internal thread of a first of said plurality of tubular elements engages with the thread of the central threaded member.

33. An extendable mechanism according to claim 32, wherein the internal thread of a further tubular element engages with the external thread of an adjacent tubular element.

34. An extendable mechanism according to any of claims 30 to 33, wherein stops are provided on each tubular element to prevent over extension of each tubular element relative to an adjacent tubular element.

35. An extendable mechanism according to any of claims 30 to 34, wherein, in use, one of the central threaded member and the outermost tubular element is rotated about

its axis and the other of the central threaded member and the outermost tubular element is prevented from rotation.

36. An extendable mechanism according to any of claims 30 to 35, wherein the central threaded member and tubular members are made from a metal.

37. An extendable mechanism according to any of claims 30 to 35, wherein the central threaded member and tubular members are made from a plastics material.

38. An extendable mechanism according to any of claims 30 to 37, wherein the threads are provided by convolutions in the wall of each tubular member.

39. An extendable mechanism according to any of claims 30 to 37, wherein the threads are provided proud of the wall of each tubular member.

40. A waste compactor according to claim 39, wherein the thread on the internal wall is provided only over a part of the length of each tubular member.

41. An extendable mechanism substantially as herein described with reference to Figures 5 to 10 of the accompanying drawings.

42. An extendable mechanism comprising a rotatable threaded member and a plurality of pairs of elongate crossing elements, each crossing element of each pair of crossing elements being pivoted to the other crossing element of each pair of crossing elements and to at least one crossing element of a further pair of crossing elements, wherein the rotatable threaded member passes through a first pair of crossing elements such that rotation of the rotatable member extends the mechanism.

43. An extendable mechanism according to claim 42, wherein the rotatable threaded member engages with threaded apertures provided in end portions of a first pair of crossing members.

44. An extendable mechanism according to claim 42 or 43, wherein the mechanism extends at right angles to the rotatable threaded member.

45. An extendable mechanism according to any of claims 42 to 44, wherein each one of each pair of crossing elements is pivoted to the other of each pair of crossing elements at a mid-point of each crossing element.

46. An extendable mechanism according to any of claims 42 to 45, wherein each one of each pair of crossing elements is pivoted to the crossing element of a further pair of crossing elements at an end point of the crossing element.

47. An extendable mechanism according to any of claims 42 to 46, wherein the crossing elements are made from a metal.

48. An extendable mechanism according to any of claims 42 to 46, wherein the crossing elements are made from a plastics material.

Fig.1.

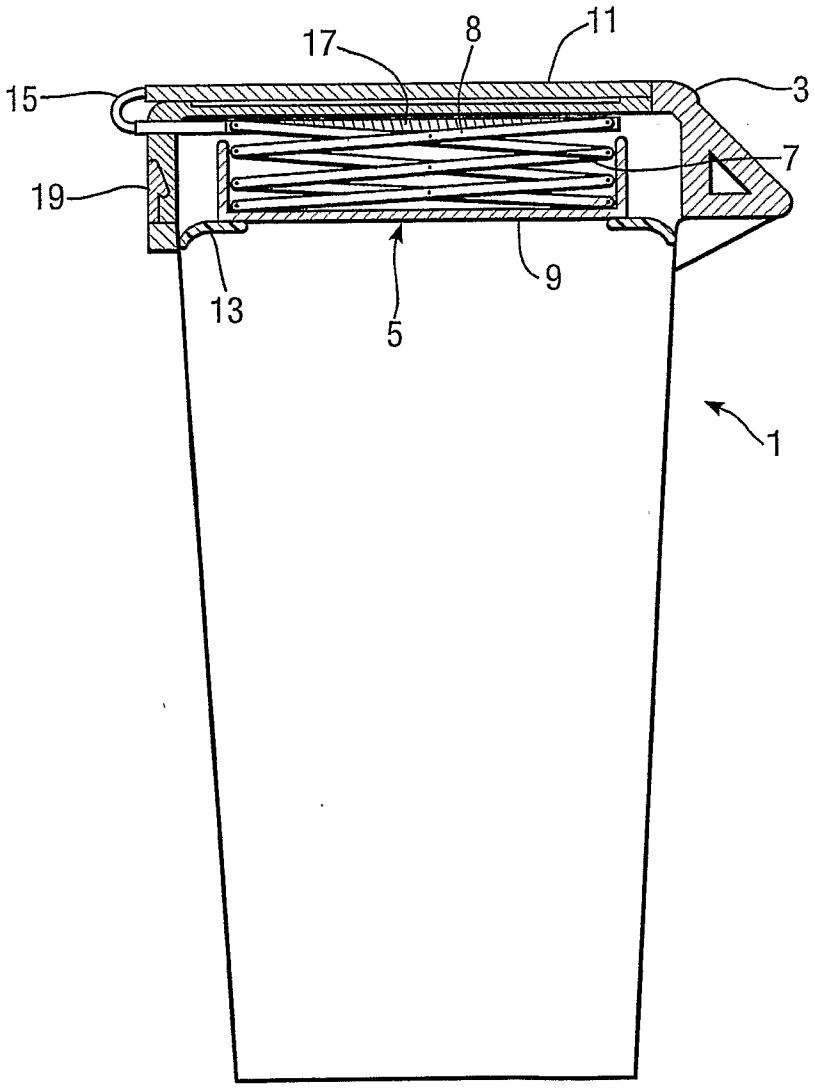


Fig.2.

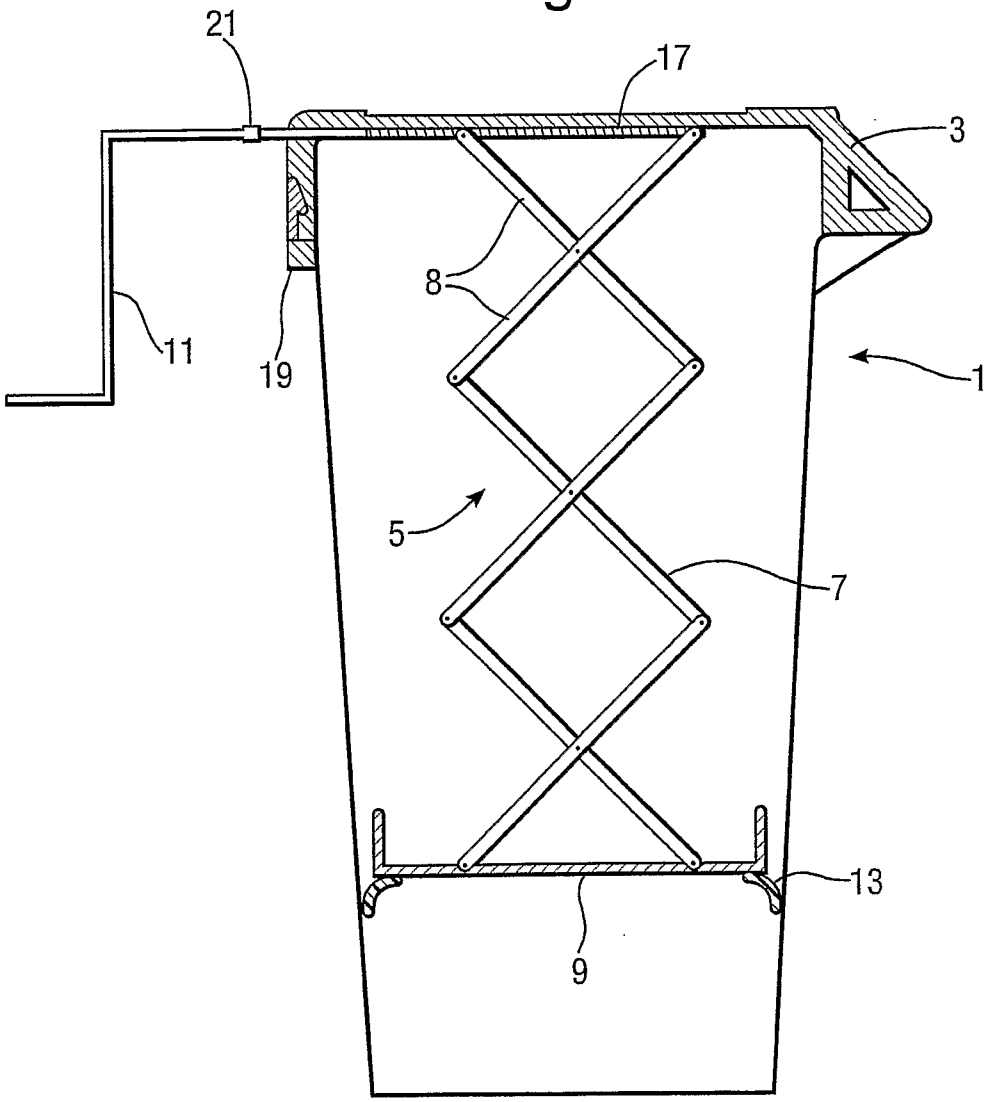


Fig.3.

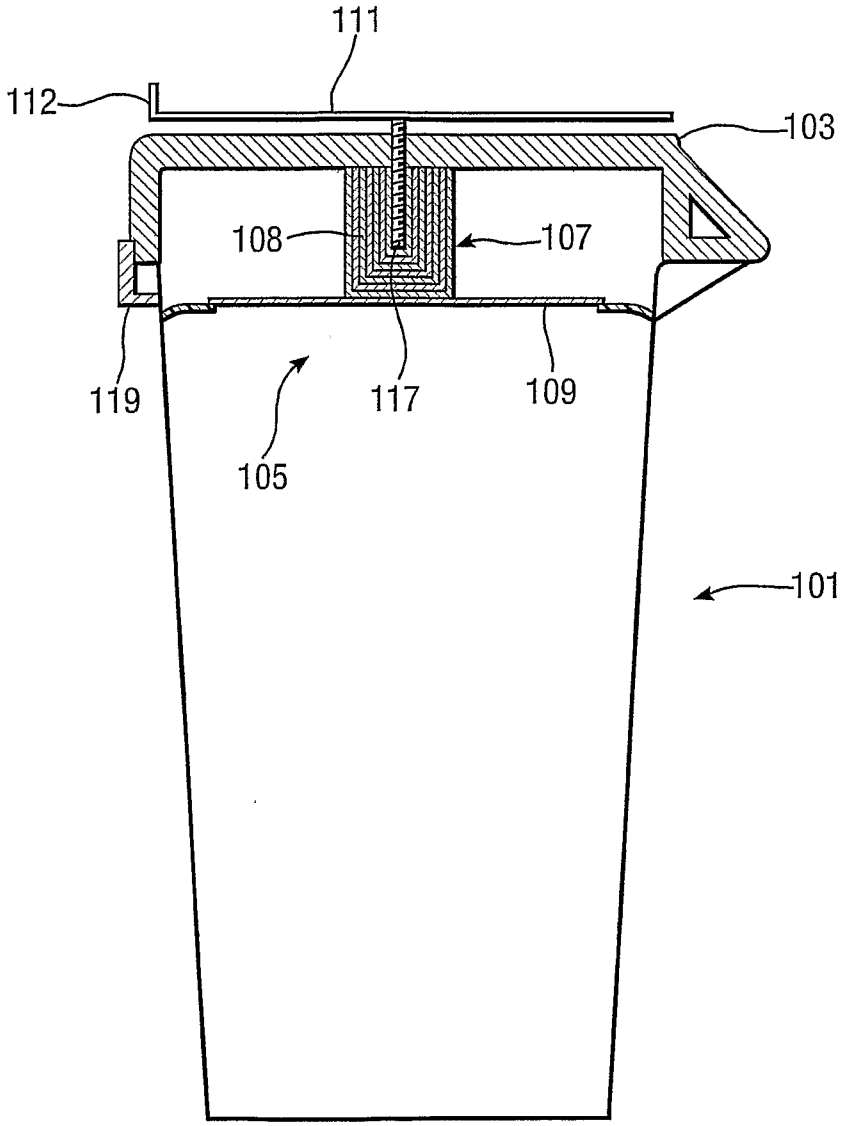


Fig.4.

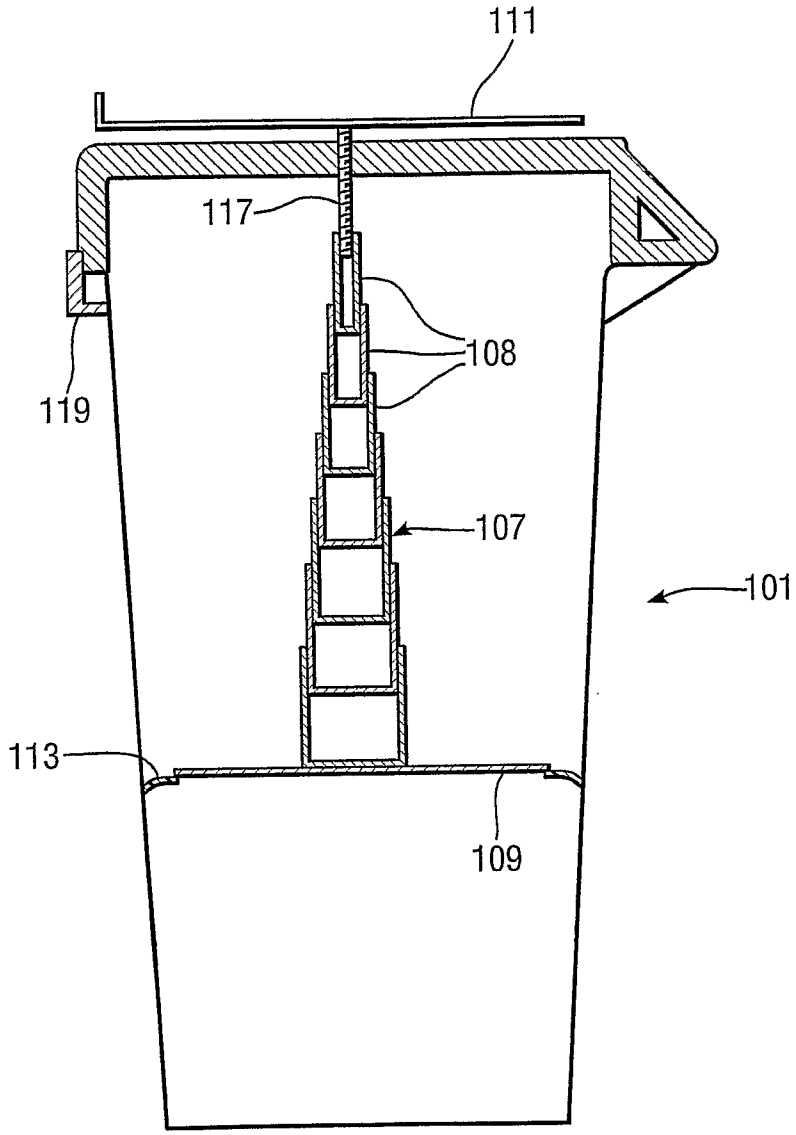


Fig.5.

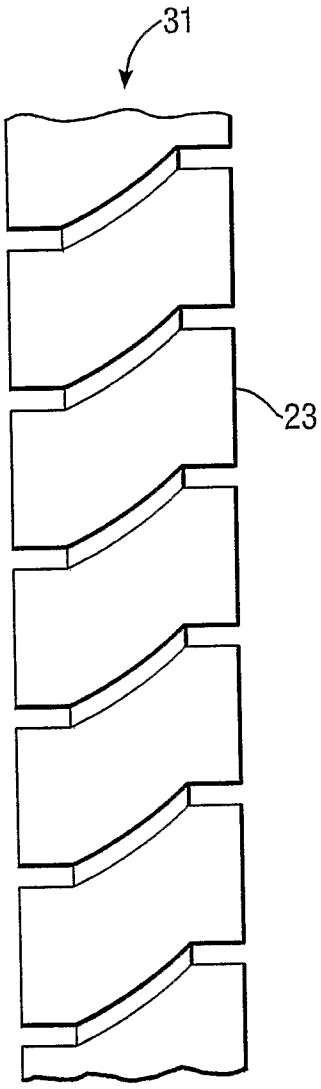


Fig.6.

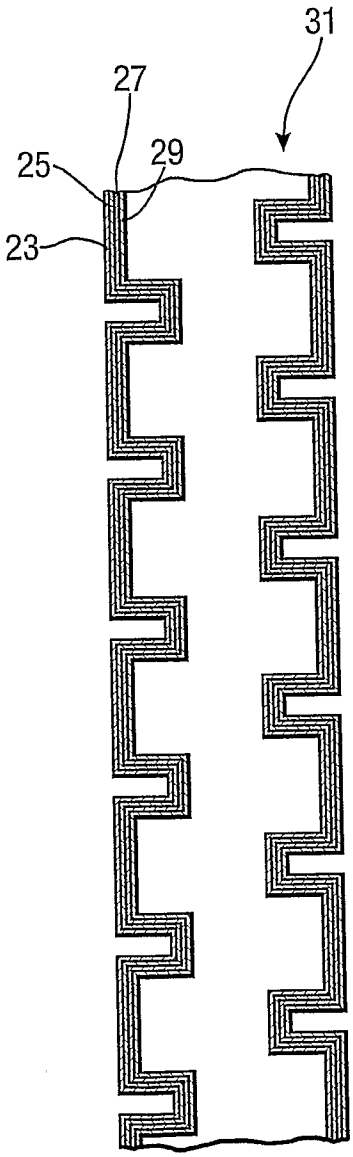


Fig.7.

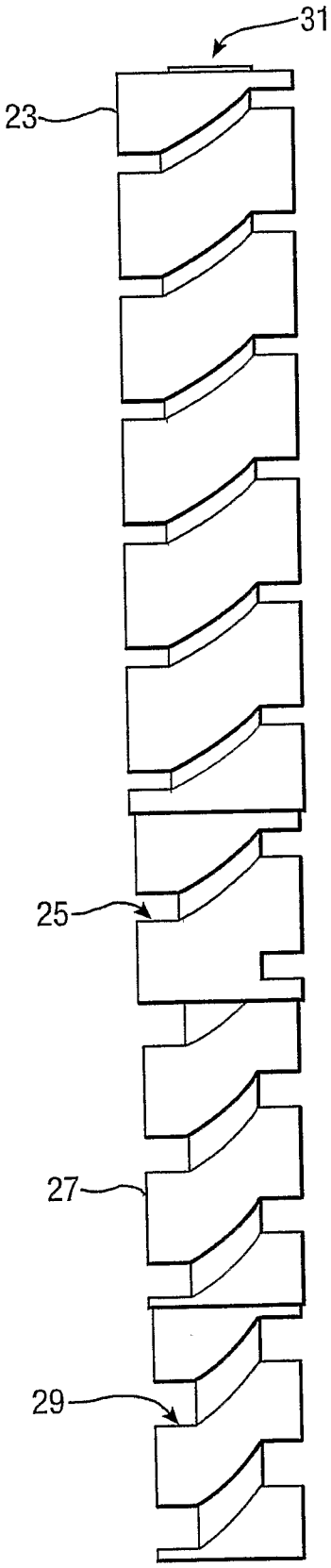


Fig.8.

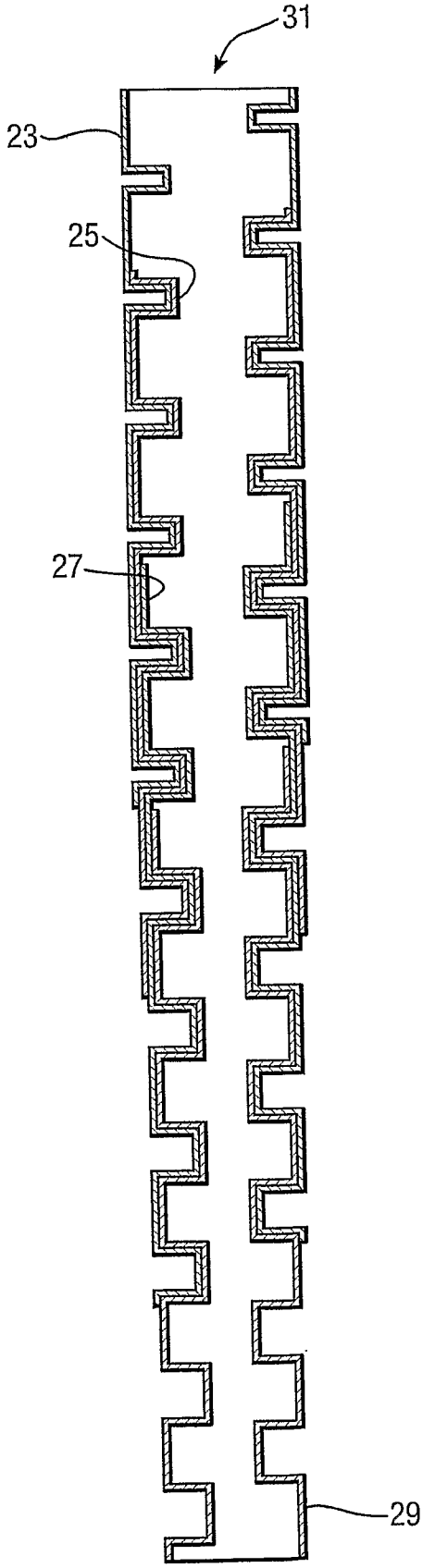


Fig.9.

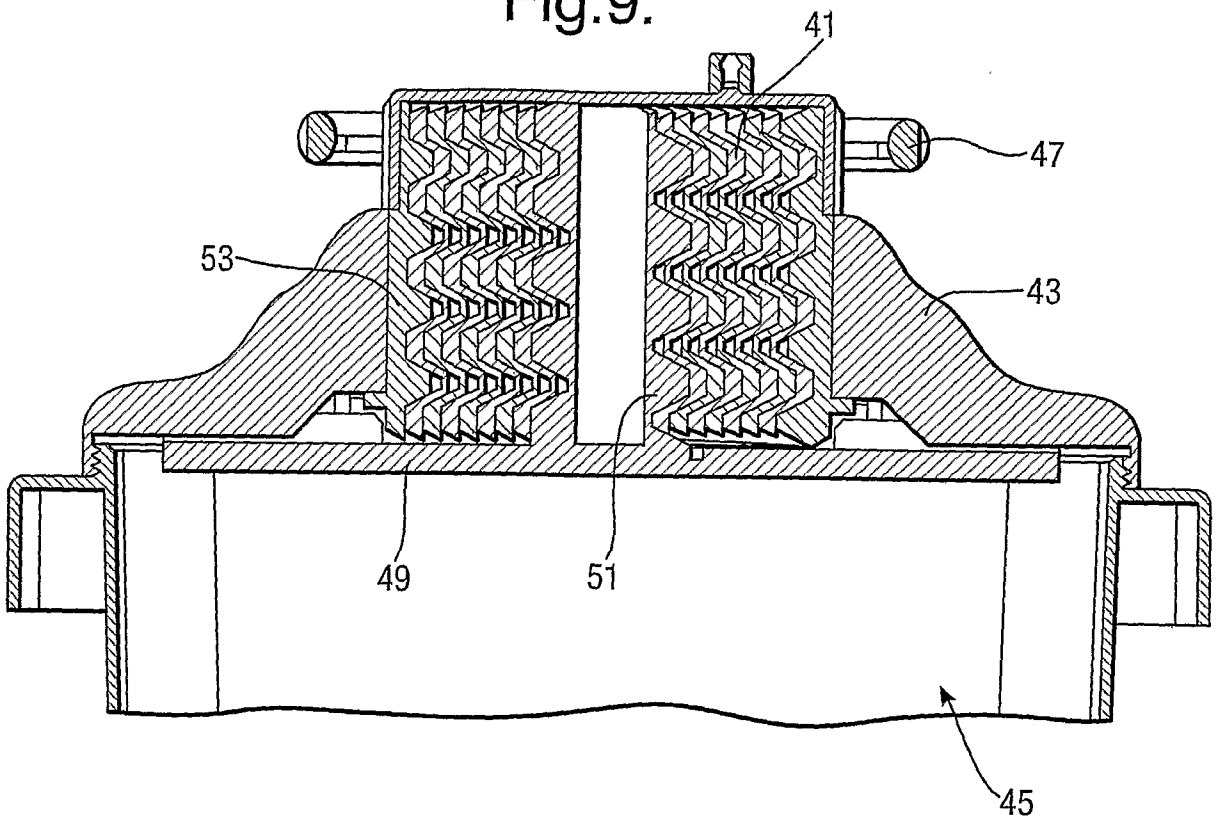


Fig.10.

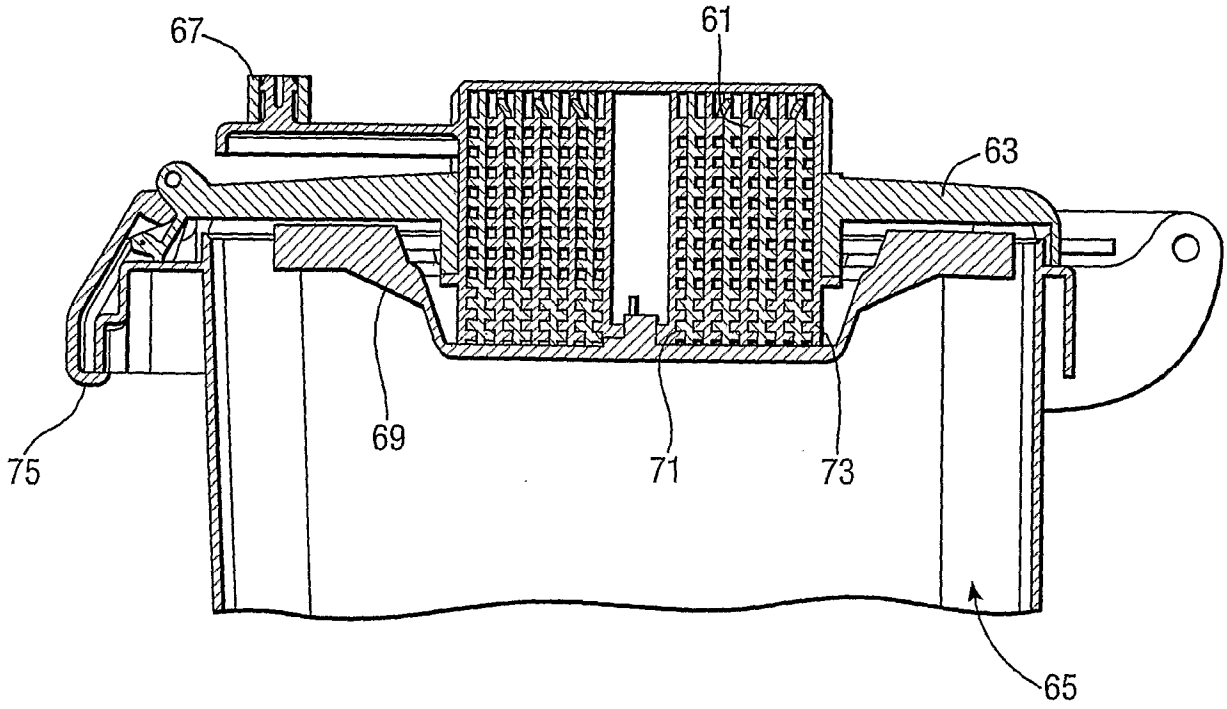


Fig.11.

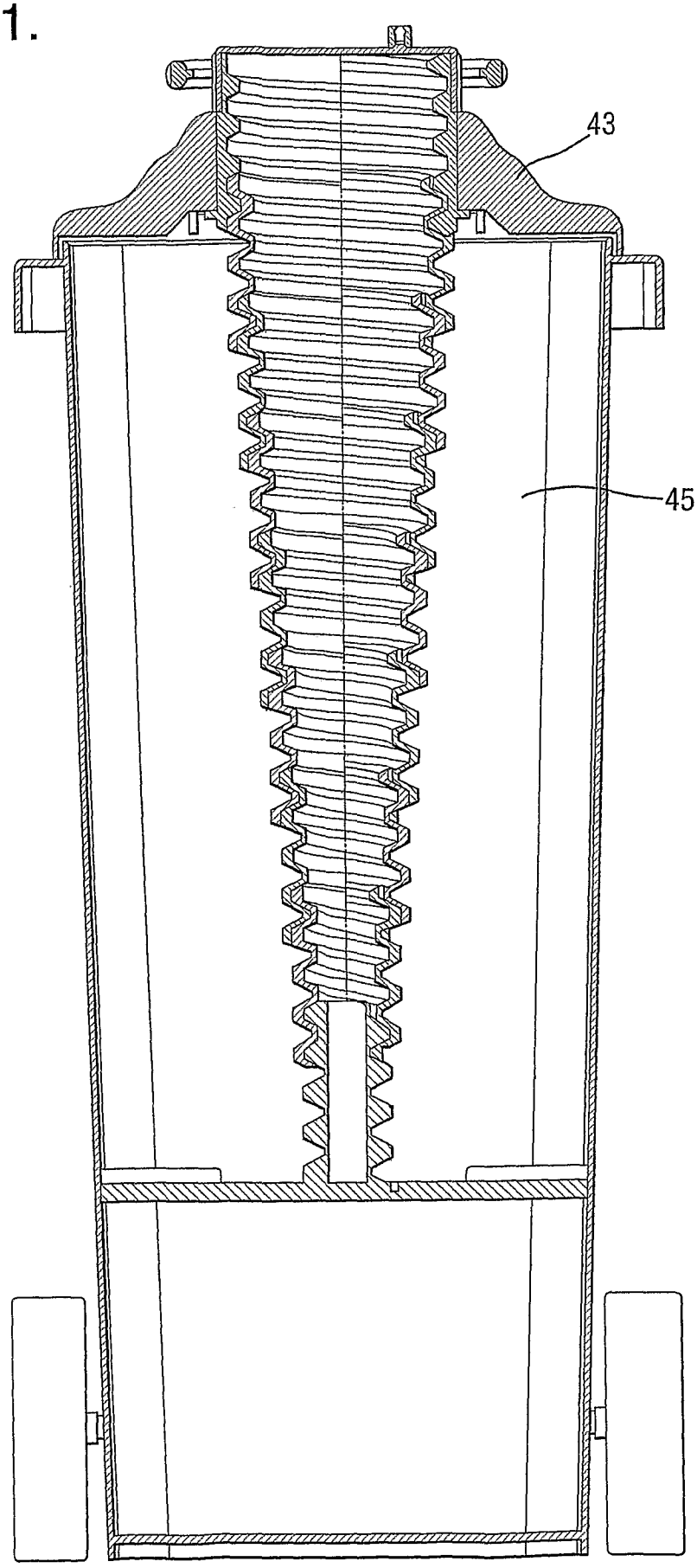
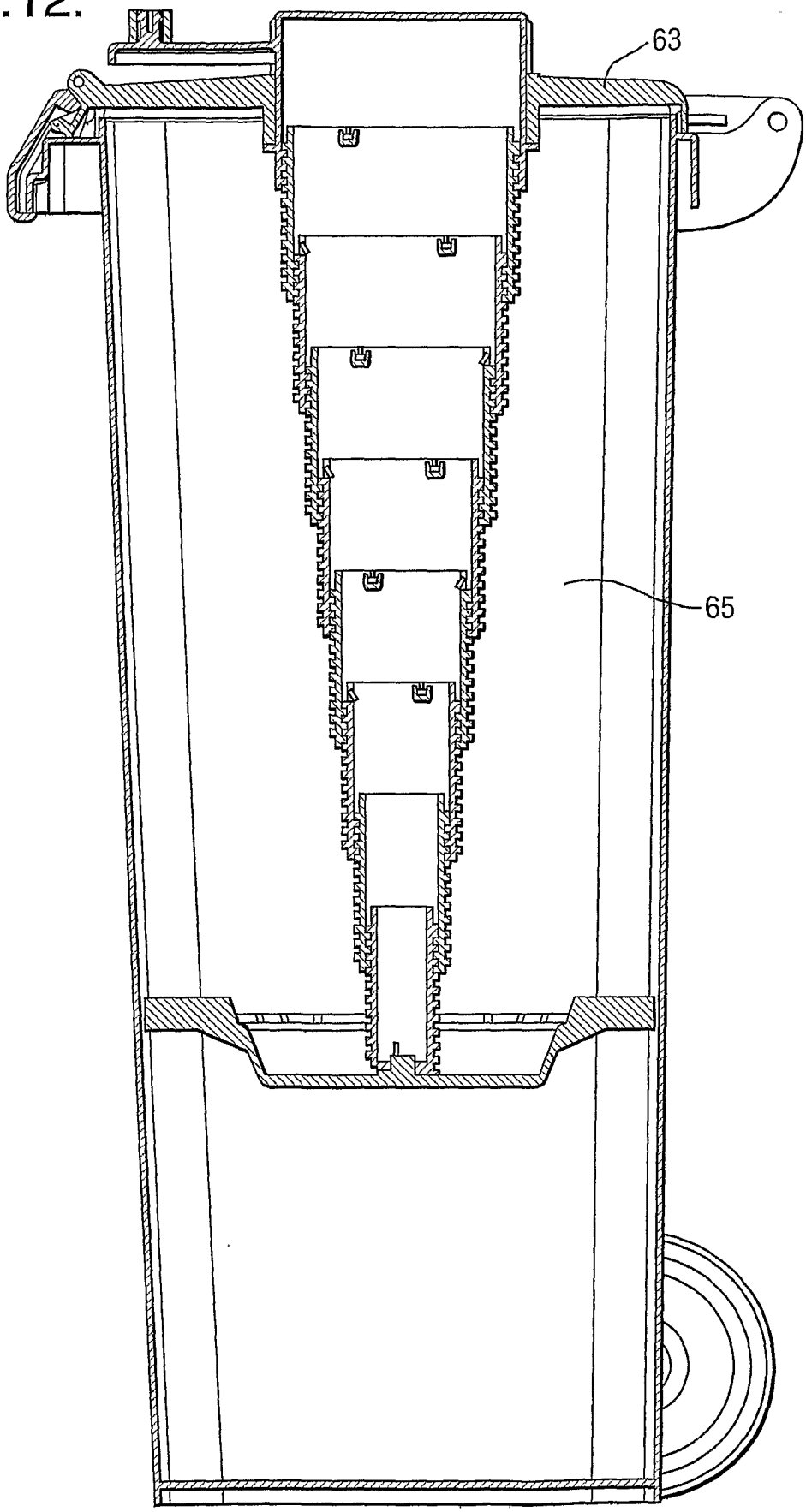


Fig.12.



INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2008/003647

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65F1/14 B30B9/30

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)
B65F B30B

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 22 02 514 A (FICHTEL & SACHS AG) 26 July 1973 (1973-07-26)	1-6,8,9, 13,14, 21,28, 30-36, 38,40
A	page 5, line 23 - page 10, line 3 figures 1,2	7,15-20, 22-27, 37,39
X	DE 40 13 107 A (ANDREAS BENZ APPARATEBAU GMBH) 31 October 1991 (1991-10-31)	1-3, 10-14, 18,21, 27,28, 42-47
A	column 3, line 24 - column 4, line 65 figures 1-4	15-17, 22-26,48

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

[X] 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 document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) 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
20 January 2009	29/01/2009

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	Smolders, Rob

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2008/003647

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	NL 7 702 575 A (WOHNIDYLL INTERNATIONAAL NEDERLAND B.V.) 12 September 1978 (1978-09-12)	1,2,10, 11,13, 14,18, 21,28
A	the whole document	12, 15-17, 22-26, 42-48
X	DE 20 2006 004237 U (P. BIRKENFELD) 2 August 2007 (2007-08-02)	1-3,13, 14,20, 27,28
A	the whole document	15-19, 23-26

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 29,41

Rule 6.2(a) PCT.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2)PCT declaration be overcome.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2008/003647

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.: 29,41
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:

see FURTHER INFORMATION sheet PCT/ISA/210

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. III 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:

see additional sheet

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

2. ☒ As all searchable claims could be searched without effort justifying an 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 reportcovers 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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1 - 28

Waste compactor for compacting waste contained in a bin, a bin lid and a bin comprising such a waste compactor.

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2. claims: 30 - 40, 42 - 48

Extendable mechanisms.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/GB2008/003647

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 2202514 A	26-07-1973	NONE	
DE 4013107 A	31-10-1991	NONE	
NL 7702575 A	12-09-1978	NONE	
DE 202006004237 U	02-08-2007	NONE	