



- (51) **International Patent Classification:**
F41H 5/08 (2006.01)
- (21) **International Application Number:**
PCT/SE2016/050324
- (22) **International Filing Date:**
15 April 2016 (15.04.2016)
- (25) **Filing Language:** Swedish
- (26) **Publication Language:** English
- (30) **Priority Data:**
1550462-4 17 April 2015 (17.04.2015) SE
- (71) **Applicant:** SAINTPRO AB [SE/SE]; Trotzgatan 54, 791 72 Falun (SE).
- (72) **Inventor:** YAKOUB, Raed Roro; Järlindsvägen 11, 791 31 Falun (SE).
- (74) **Agent:** L-O LUNDQUIST PATENTBYRÅ AB; Box 80, SE-651 03 Karlstad (SE).
- (81) **Designated States** (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) **Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

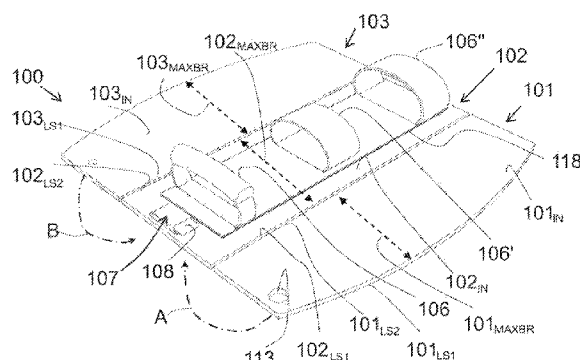
(54) **Title:** FOLDABLE SHIELD

Fig. 1A

(57) **Abstract:** Foldable shield (100) which can be brought from an extended use position to a folded transport position and vice versa, and comprising shield plates (101, 102, 103) and spring loaded hinge means (104, 105) connecting the shield plates, restraint devices (106, 106', 106'') for holding the shield to a user's forearm during use, and a release device (107) for releasing the cooperating locking means (108) so that the hinge devices brings the shield plates from the transport position to the extended use position. The shield is brought to the transport position by folding (A) of the first shield plate (101) toward the second shield plate (102) and folding (B) of the third shield plate (103) against the first shield plate (101). The first shield plate has a maximum width (101_MAXBR) between the long sides that is less than the corresponding widths (102_MAXBR, 103_MAXBR) of the other two shield plates for sufficient clearance for the folding (B) of the third shield plate (103), so that the shield plates (101, 102, 103) are located on top of each other in the form of a substantially flat package in the transport position.

FOLDABLE SHIELD

TECHNICAL FIELD

5 The present invention relates to a foldable shield that can be brought from an extended use position to a folded transport position and vice versa. The shield is intended for use by people with work tasks where they need to protect themselves against various weapons, blows and thrown objects.

10 BACKGROUND

Police officers and members of similar professions often have assignments where they may need a protective shield to protect them against various weapons, blows and thrown objects, for example in connection with riots and the like, or when violent offenders are to be monitored or arrested.

15 A shield for use by e.g. police officers is previously known from FR 462049. The described shield comprises three shield plates of elongated shape. The plates are made of suitable metal having suitable thickness and properties, and is preferably covered with textile or similar material. The middle plate is in its central part provided with a handle, on which a small rocker arm is pivotally mounted. The rocker passes through an opening in the center plate and is
20 normally held uplifted by a leaf spring to function as a release mechanism for the unfolding of the shield. The plates of the shield are joined by spring hinges, which are arranged on the opposite side of the handle. The springs of the hinges striving to hold the plates unfolded to form a strong, flat surface. If the unfolded shield is to be folded, the first side plate is folded down
25 against the center plate and then the other side plate is folded down against the already folded in first side plate. If a person carrying the folded shield wants to use it, it is sufficient if he/she presses the proximal end of the rocker arm, causing the side plates to fold out immediately under the influence of the springs in the hinges. As described in FR 462049 the folded shield occupies no more space than the surface of the center plate.

30 US 4412495 discloses a foldable full-body shield. In one embodiment, the disclosed shield has a rectangular upper panel part and a lower panel part which are both made of bullet-proof, flexible material. Each of the panel parts are framed by rigid frames, which are pivotally joined to each other by a hinge between them. The foldable shield has three handles mounted directly on the top
35 panel portion that the user can use to hold the shield when it is unfolded and additionally a separate carrying handle to make it possible to use the shield when it is folded.

There are high demands on a shield of the current type, because it should be able to protect the user against several different types of possible attacks, such as blows with or without weapons, knife wounds, bullets from handguns and/or thrown objects. The shield plates of the shield should be close together and able to provide the user with both impact and puncture protection, and preferably also a ballistic protection. Even though such shield plates are made of very strong materials the risk that a shield plate is damaged by e.g. a blow or a shot during use is quite large and the shield plates should therefore be easily replaceable to prevent the undamaged parts of the shield from being replaced unnecessarily. If the shield is needed in an emergency, it must be folded out immediately and reliably when the user activates a trigger device, which should be located within reach of the user when wearing the shield. The unfolding of the shield should not be able to happen accidentally, as this can lead to problems and in the worst case to accidents or injuries if the shield is, for example, accidentally unfolded in a confined space such as inside a police car. It should also be possible to fold the shield into a folded transport position as quickly as possible, to not expend unnecessary time when the task requires the user to move to another location, either on foot or in a vehicle. It is important that the shield takes up as little space as possible in the folded transport position, both to make the folded shield more manageable to carry around for the user when traveling and to enable that a greater number of shields can be stored in a storage space and/or transported in a police car or other vehicle. It is also important that the folded shield shows no protruding edges or similar that can get caught in another shield during storage or transportation, or in other objects when the user is carrying the shield in the folded transport position. It is also important that the shield is smooth and light and not perceived as provocative by other people when carried by the user in the transport position, i.e. that the shield can be carried in such a way and has such an appearance in the folded transport position that it is not too conspicuous or perceived as a weapon, which could provoke aggression or anger unnecessarily. The previously known shields do not appear to meet these requirements and therefore there is a clear need for an improved foldable shield.

SUMMARY OF THE INVENTION

A first object of the present invention is therefore to provide a foldable shield with a shape that ensures that the shield can be made smooth and easy to carry for the user and is made to occupy a small space in the folded transport position, and that makes the folded shield non-provocative to others and additionally handy to bring during travel and transport.

This first object is achieved by a foldable shield according to claim 1, which can be brought from an extended use position to a folded transport position and vice versa, and comprising a first, a second and a third shield plate, each of which has an elongated shape and an inside, an outer surface, a first long side, a second side edge, a first short side and second short side, wherein the

shield further comprises a first spring loaded hinge arrangement interconnecting the first shield plate's second long side with the second shield plate's first long side, a second spring loaded hinge mechanism which connects the second shield plate's second long side with the third shield plate's first long side, wherein said hinge assemblies are arranged so that the shield can be brought from the use position to the folded transport position by folding the first shield plate with its outside surface against the outside surface of the second shield plate and by subsequently folding the third shield plate with its outside surface against the inside surface of the already folded first shield plate, retaining devices which are arranged on the inside of the second shield plate for holding the shield by a user's forearm during use, a release device placed within reach of the user from said holding means and adapted, when actuated by the user, to release first and second cooperating locking means of the shield that are adapted to keep the shield plates folded against each other in the transport position, against spring force from said hinge assemblies, wherein said spring force upon release of the locking means brings the shield plates from the transport position to the unfolded use position, wherein the first shield plate is designed with a maximum width between its long sides that is smaller than the corresponding width of the second and of the third shield plate, respectively, so that a sufficient clearance for folding the third shield plate against the first shield plate is provided so as to allow the shield plates to be brought to rest on top of each other in the form of a substantially flat package in the transport position.

Thanks to the first shield plate of the shield according to the invention being designed with a maximum width between its long sides that is less than the corresponding width of the second and of the third shield plate so that a sufficient clearance for the folding of the third shield plate to the first shield plate is provided to allow the shield plates to lie on top of each other in the form of a substantially flat package in the transport position, the folded shield becomes smaller and also more manageable to carry for the user during transportation, and a larger number of shields may be carried in the luggage space of e.g. a police car than what would be the case with shields according to the prior art, where shield plates tend to lie on top of each other in non-parallel planes after folding. By having the shield plates of the shield being able to be made to form a substantially flat package with a small size in the transport position the folded shield becomes smooth and easy to carry discreetly along the forearm of the user, which means that other people will experience the shield as a natural, non-provocative part of the user's forearm, work clothes or normal working equipment.

A second object of the present invention is to provide a foldable shield with a dimensioning of the shield plates which ensures that the shield plates can be brought into a very compact and flat "packet form" in the folded transport position, in which the three folded shield plates are located

in substantially parallel planes on top of each other and where no edge of any of the shield plates protrude beyond the outer contours of the flat pack form.

This second object is achieved by a foldable shield according to claim 2, wherein the first shield plate has a maximum width between its long sides which is at most 90% of the corresponding width of the second and of the third shield plate. By dimensioning the first shield plate in such a way in relation to the other two shield plates it is ensured that the shield can be made as compact as possible in the folded transport position and the risk of the protruding edges of any of the folded shield plates getting caught on other items when the shield is transported in a vehicle or carried by the user in the folded transport position is eliminated.

A third object of the present invention is to provide a foldable shield where the shield plates are easily replaceable if they happen to be damaged during use.

This third object is achieved by a foldable shield according to claim 6, further comprising frame members in which the respective shield plates can be inserted and fixed, said spring loaded hinge assemblies connect the shield plates through said frame member. Thanks to such a design it is possible to easily replace one or more damaged shield plates and avoid that the undamaged parts of the shield must be replaced unnecessarily.

Other objects and advantages of the invention, as well as the features which allow it to achieve these aims and advantages, will become apparent in the following description with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in a number of different embodiments with reference to the accompanying drawings, wherein

Fig. 1A is a perspective view of the inside of a foldable shield according to a first embodiment of the invention, wherein the shield is shown in an extended use position,
Fig. 1B is a view seen in the direction of the bottom of the shield according to Fig. 1A,
Fig. 1C is a side view of the shield according to Fig. 1A,
Fig. 1D is a plan view of the inside of the shield according to Fig. 1A,
Fig. 2A is a perspective view of the inside of a foldable shield according to a second embodiment of the invention, wherein the shield is shown in an extended use position,
Fig. 2B is a view seen in the direction of the bottom of the shield according to Fig. 2A,
Fig. 2C is a side view of the shield according to Fig. 2A,
Fig. 2D is a plan view of the inside of the shield according to Fig. 2A,

Fig. 2E is a plan view of the outside of the shield according to Fig. 2A,

Fig. 2F is a perspective view showing the shield according to the second embodiment in a partially folded position,

Fig. 3A is a perspective view of the inside of a foldable shield with frame members

according to a third embodiment of the invention, wherein the shield is shown in an extended position before any shield plates have been incorporated in the frame members,

Fig. 3B is a bottom side view of the shield without the shield plates according to Fig. 3A,

Fig. 3C is a side view of the shield without the shield plates according to Fig. 3A,

Fig. 3D is a plan view of the inside of the shield without the shield plates according to Fig.

3A,

Fig. 4A is a perspective view of the inside of a foldable shield with frame members

according to a fourth embodiment of the invention, wherein the shield is shown in an extended position before any shield plates are incorporated in the frame members,

Fig. 4B is a view seen in the direction of the bottom of the shield without the shield plates according to Fig. 4A,

Fig. 4C is a side view of the shield without the shield plates according to Fig. 4A,

Fig. 4D is a plan view of the inside of the shield without the shield plates according to Fig. 4A,

Fig. 4E is a plan view of the exterior of the shield with shield plates according to Fig. 4A,

Fig. 4F is a plan view of the outside of the shield according to the fourth embodiment after three shield plates have been inserted into and fixed to the respective frame members,

Fig. 4G is a perspective view showing the shield of the fourth embodiment, but in a partially extended position,

Fig. 5A is a plan view of the inside of a foldable shield according to a particularly

advantageous embodiment of the invention, wherein the shield is shown in an extended use position,

Fig. 5B is a view seen in the direction of the bottom of the shield according to Fig. 5A,

Fig. 5C is a side view of the shield according to Fig. 5A,

Fig. 5D is a plan view of the outside of the shield according to Fig. 5A,

Fig. 5E is a plan view of a first coupling part belonging to a rotary plate of the shield Fig. 5A,

Fig. 5F is a plan view of a second coupling part, intended to cooperate with the first coupling part of Fig. 5E using the rotary plate of the shield according to Fig. 5A,

Fig. 5G is a side view illustrating how the coupling members of Fig. 5E and 5F interact when the turntable is mounted between a second shield plate and a bottom plate for the holding means of the shield according to Fig. 5A,

Fig. 6A is a perspective view of a foldable shield according to the invention in an embodiment where the hinge assemblies have been provided with a particularly advantageous embodiment, wherein the shield is shown in an extended use position, FIG. 6B is a view seen in the direction of the bottom of the extended shield of Fig. 6A illustrating that each joint gap formed between adjacent long sides of the two shield plates, which are connected by a respective hinge assembly extends perpendicularly between the outside and the inside of the shield in this embodiment, Fig. 7 is a view corresponding to Fig. 6B, but of an alternative embodiment of the shield where each joint gap extends obliquely inwardly from its hinge joint on the outside of the shell to the inside of the shield instead, Fig. 8 is a view corresponding to Fig. 7, but of an alternative embodiment of the shield where each joint gap extends obliquely outwards from its hinge joint on the outside of the shell to the inside of the shield instead, Fig. 9 is a view corresponding to Fig. 8, but of an alternative embodiment of the shield where each joint gap extends inwards in a step-like manner from its hinge joint on the outside of the shield to the inside of the shield instead, Fig. 10 is a view corresponding to Fig. 9, but of an alternative embodiment of the shield where each joint gap extends outwards in a step-like manner from its hinge joint on the outside of the shield to the inside of the shield instead, Fig. 11A is a perspective view of a folded shield according to an alternative embodiment where both hinge assemblies comprise first and second hinges which are integrated parts of adjacent long sides of the shield plates which the hinge assemblies hold attached to each other, Fig. 11 B is a cropped detail view of the second shield plate showing two first hinges protruding from a long side edge provided with a chamfer, and FIG. 11C is a cropped detail of the second the shield plate showing two other hinges protruding from another long side edge provided with a chamfer.

DESCRIPTION OF EMBODIMENTS OF THE INVENTION

In the following a number of embodiments of the invention will be described in more detail with reference to Figures 1A to 11C of the accompanying drawings.

Figure 1A shows a perspective view of the inside of a foldable shield 100 according to a first embodiment of the invention, wherein the shield is shown in an extended use position. The shield 100 can be brought from an unfolded use position, as shown in Figs. 1A-1D, to a folded transport position (not shown) and vice versa.

The shield according to the invention includes a first 101, a second 102 and a third 103 shield plate, each of which has an elongated shape and an inner surface, an outer surface, a first long side, a second side edge, a first short side and second short side.

5

The shield 100 according to the invention further comprises a first spring loaded hinge mechanism 104 that connects the first shield plate's second long side 101_{LS2} with the second shield plate's first long side 102_{LS1}, and a second spring loaded hinge mechanism 105 that connects the second shield plate's second long side 102_{LS2} with the third shield plate's first long side 103_{LS1}.

10

Various types of spring loaded hinge means, so called spring hinges, are previously known and available on the market. The spring loaded hinge devices 104, 105 of the shield 100 according to the invention may hence be composed of pivotally interconnected metal profiles with coil springs providing a spring force that is large enough to unfold the shield plates and hold them in the extended position during use, but not greater than that a single person can fold up the shield again. It is particularly advantageous that each of the spring loaded hinge devices 104, 105 have at least two cooperating springs to achieve a sufficiently rapid unfolding of the shield. By using at least two suitably arranged spring means in each hinge device it is also possible to provide a function of the shield where the shield plates can be folded out to an only partially extended position, but where the shield plates still provide a resilient resistance to impact and shock from the shield's outside, which can be an advantage if the shield is used by a person in a lying position.

15

20

25

The shield 100 according to the invention further includes restraint devices 106, 106', 106" which are provided on the second shield plate's inside 102_{IN} for holding of the shield on one forearm of a user during use.

30

The shield 100 according to the invention also comprises a triggering device 107 positioned within reach of the user from said holding devices 106, 106', 106" and arranged to upon activation by the user release the first 108 and second 109 cooperating locking means of the shield, which are arranged to, against the spring force of the hinge devices 104, 105, hold the shield plates folded against each other in the transport position. After release of the locking means 108, 109 the spring force of the spring hinges brings the shield plates from the transport position to the extended use position.

35

In the foldable shield 100 according to the invention, the hinge devices 104, 105 are arranged so that the shield can be moved from the use position to the folded transport position by folding A (see Fig. 1A) of the first shield plate 101 with its outside 101_{UT} against the outside 102_{UT} of the second shield plate 102 and by subsequent folding B (see Fig. 1A) of the third shield plate 103 with its outer surface 103_{UT} towards the inside 101_{IN} of the already folded first shield plate 101, whereby the first shield plate is formed with a maximum width 101_{MAXBR} (see Fig. 1A) between its long sides that is less than the corresponding width of the second 102_{MAXBR} (see Fig. 1A) and of the third 103_{MAXBR} (see Fig. 1A) shield plate so that a sufficient clearance for the inset B of the third shield plate 103 to the first shield plate 101 is provided to allow the shield plates 101, 102, 103 to lie on top of each other in the form of a substantially flat package in the transport position. Thanks to the first shield plate 101 being formed with a maximum width between its long sides that is less than the corresponding width of the second 102 and of the third 103 shield plate, the first folded (A) first shield plate 101 constitutes no obstacle for the subsequent folding (B) of the third shield plate 103, so that the third shield plate 103 can be brought into lying substantially flat against the already folded first shield plate 101. Such dimensioning of the width of the first shield plate 101 relative to the width of the other two shield plates 102, 103, allows the shield plates to lie on top of each other in the form of a substantially flat package in the folded transport position, making the folded shield more manageable to carry around for the user during transportation, and a larger number of shields than what would otherwise be the case can be transported in a luggage compartment of e.g. a police car.

The first shield plate 101 of the shield 100 according to the invention preferably has a maximum width 101_{MAXBR} between its long sides which is at most 90% of the width of the second 102_{MAXBR} and of the third 103_{MAXBR} shield plate. The first shield plate may for example have a maximum width 101_{MAXBR} between its long sides that is approximately 85% of the corresponding width of the second 102_{MAXBR} and of the third 103_{MAXBR} shield plate. Such dimensioning of the shield plates 101, 102, 103 ensures that the shield plates can be folded into a very compact and flat "packaged form" where the shield plates are located in substantially parallel planes on top of each other and no edge of any of the shield plates protrude beyond the outer contours of the flat pack form when the shield is in the folded transport position.

In several advantageous embodiments of the invention, particularly illustrated in Figures 3A-3D and 4A-4F, the shield 300, 400 also comprises frame elements 310, 311, 312, 410, 411, 412, in which the respective shield plates 401, 402, 403 can be inserted and fixed, wherein the spring loaded hinge devices 304, 305, 404, 405 connect the shield plates through the frame elements. The frame elements in the embodiments shown in Figures 3A-3D and 4A-4F are profile elements of steel, with predrilled holes for fixing the shield plates with screws. In the context of

the invention, it is also possible to use profile elements of other materials and with different configuration than what is shown in the Figures. Thanks to the provision of such frame elements, it becomes possible to easily replace one or more damaged shield plates and avoid that undamaged parts of the shield must be replaced unnecessarily.

5

In other advantageous embodiments of the foldable shield 100, 300 according to the invention, the first shield plate 101 (see Figs. 1A-1D) and/or the first shield plate's frame member 310 (see Figs. 3A-3D) comprises at least one through hole 113, 313 or a recess to allow the implementation of a projecting end portion 109, 309 of one of said locking means provided on the second or third shield plate 103 or on the second or third shield plate frame member 312.

10

In other advantageous embodiments of the foldable shield 200, 400 according to the invention (see Figs. 2A-2F, 4A-4G, and 5A-5G), the third shield plate 203, 403, 503 and/or the third shield plate's frame element comprises at least one through hole 214, 414, 514 or a recess to allow physical and/or magnetic contact between said cooperating locking means 208, 209, 408, 409, 508, 509 of the shield.

15

By, like in the embodiments described above, provide at least one through hole or a recess in one of the shield plates or in one of the shield plates' frame members, only two cooperating locking means for retaining the shield in the folded transport position are needed in most cases, since a first locking member which is arranged on a shield plate or a frame member can pass through the hole or recess of an adjacent shield plate or an adjacent frame member to engage on the other side with a second locking means arranged on/in/at another shield plate or another frame member.

25

The cooperating locking means of the foldable shield according to the invention most preferably contain a female member 108, 208, 308, 408, 508 in or on one of the shield plates 102, 203, 403, 503 or in or on one of the frame elements 311, which female member is provided for receiving and releasable locking of a male member 109, 209, 309, 409, 509 on another one of the shield plates 103, 201, 501 or at another one of the frame members 312, 410.

30

In a particularly preferred embodiment of the invention, the cooperating locking means comprise magnet means 108, 109, 208, 209, 308, 309, 408, 409, 508, 509. By providing magnetically acting locking means it will become easier to find the right position for the locking means when the shield is to be locked in the folded position. Any for the purpose suitable type of known magnetic means may be used in the shield of the invention.

35

In a first alternative embodiment of the invention, the shield's 100, 300 trigger device comprises a release button 107, 307, which is arranged to during the operation of the user release the first and second locking means 108, 109, 308, 309 from each other to bring the shield plates to the extended use position. In the embodiment shown in the figures of this embodiment, the user can, with the thumb of the hand holding the handle 106, 306, press the release button 107, 307 to the side when the shield is folded, thus releasing a male member on the third shield plate 103 or on the third frame member 312 in the form of a magnet screw whose head end 109, 309 is locked in a female member in the form of a hole 108, 308 in the second shield plate 102 or in the second frame member 311 adjacent to the release button 107, 307 so that head end of the magnet screw 109, 309 is released from the retention hole 108, 308 next to the release button 107, 307 and the spring force of the spring hinges 104, 105, 304, 305 may bring the shield plates 101, 103 or the frame members 310, 312 with inserted shield plates to the extended use position. It should be understood that within the scope of the invention it is also possible with other designs and constructions where the trip device of the shield includes a release button different from that described above and shown in the Figures.

In a second alternative embodiment of the invention, the shield's 200, 400, 500 trigger device comprises a release strap 207, 407, 507, which is arranged to during the operation of the user release said first and second locking means 208, 209, 408, 409, 508, 509 from each other to bring the shield plates to the extended use position. In the embodiment shown in the figures of this embodiment, the user may have an end eye of the releasing belt 207, 407, 507 around the thumb of the hand holding the handle 206, 406, 506 and pull the release strap 207, 407, 507 down with the thumb to open a female member in the form of a spring loaded clamp 208, 408, 509 which is integrated in the trigger belt 207, 407, 507 adjacent to the third shield plate 203, 403, 503 to thereby release a male member on the first shield plate 201, 501 or the first frame member 410 in the form of a magnetic angle iron whose protruding end 209, 409, 509 is locked in the spring loaded clamp 208, 408, 508, so that the spring force of the spring hinges 204, 205, 404, 405, 504, 505 may bring the shield plates 201, 203, 501, 503 or frame elements 410, 412 with inserted shield plates for the extended use position. It should be understood that within the scope of the invention it is also possible with other designs and constructions where the trigger device of the shield includes a different release strap than described above and shown in the Figures.

In a preferred embodiment of the invention, the foldable shield 300, 400 according to the invention also comprises at least one locking device 315, 416, which is arranged to prevent release of said cooperating locking means 308, 309, 408, 409, and unfolding of the shield plates until the user disables the interlock device. By providing such a locking device of the shield

according to the invention, the risk of accidental unfolding of the shield and thus the potential for problems, accidents or damage that could be caused by an inadvertent unfolding is minimized.

5 In an advantageous embodiment of the shield of the invention the ratchet comprises one or more screws 315 (see Figs. 3B-3C) arranged to be disabled by the user by unscrewing. In the embodiment shown in Figures 3B-3C, the ratchet 315 is integrated in the locking screw 309. When the shield 300 is in the folded position (not shown in the figures) the locking screw head 309 will protrude slightly from the through hole 308 of the second frame member 311 and partially overlie the release button 307. If the user in this position tightens the locking screw 10 bolts 309 the release button 307 will be fixed in its locking position by the clamping force from the underside of the screw head so that the release button 307 cannot be moved aside unintentionally during movement or transportation. When the user intends to use the shield the ratchet 315 is disabled by unscrewing the locking screw 309 sufficiently for the release button 307 to again be able to move freely and enable rapid precipitation of the shield 300 when 15 necessary.

In another advantageous embodiment of the shield 400 of the invention the ratchet comprises one or more snap locks 416 arranged to be disabled by the user by unsnapping. In the embodiment shown in Figures 4A-4G, each indicated snap lock consists of first pressure switch 20 means 416, which are fixed on suitable positions on the release strap 407 and arranged to cooperate with second push button means (not shown), fixed in appropriate places on the shield's shield plates or frame elements. The first 416 and second button means are placed so that they come in pairs opposite each other when the shield is in the folded transport position and hence can be pressed or snapped together with each other to lock the trigger belt at suitable locations on 25 the outside of the folded shield and thereby prevent that an accidental pulling of the release strap 407 leads to an unwanted release of the male member 409 of the first frame member 410 from its locking in the female member 408 which is integrated in the release strap 407, thereby causing an accidental unfolding of the frame elements 410, 412 and the shield plates of the shield. When the user intends to use the shield the interlock device is deactivated 416 by the user snapping up 30 the required snap locks 416 so that the release strap 407 will again be free to move in its longitudinal direction. After the user has deactivated the ratchet 416 in this way it is sufficient with a relatively light pulling of the end loop 407 of the release strap to release the female member's 408 locking of the male member 409 and make the spring force of the spring hinges 404, 405 to immediately bring the frame members 410, 412 with the shield plates 401, 403 to the 35 extended use position.

In a preferred embodiment of the shield according to the invention, the restraints for securing the shield to the user's forearm are fixed to the inside 102_{IN}, 202_{IN} of the second shield plate or to the inside of the second shield plate's frame member 311_{IN}, 411_{IN}, wherein the restraint system includes a handle 106, 206, 306, 406, which is arranged to be gripped by one hand of the user and at least one strap means 106', 106", 206', 206", 306', 306", 406', 406" which is arranged to enclose the user's forearm when the user carries the shield. In the embodiments shown in the drawings, the handle and the two strap means are attached to a common base plate 118, 218, 318, 418, which in turn is attached to the inside of the second shield plate 102, 202 or the second frame member 311, 411. A great advantage of this embodiment is that the user thanks to the strap means 106', 106", 206', 206", 306', 306", 406', 406" can carry the folded shield strapped to one forearm and ready for use, and if necessary, let the grip of the hand on the handle 106, 206, 306, 406 go to get both hands free for other tasks. The strap means or members can consist of strips of any for the purpose suitable flexible and elastic material, but consists most preferably of a durable and flexible textile material, a nonwoven material, or a material such as neoprene or the like.

In a particularly preferred embodiment of the shield 200 according to the invention (see Figs. 2A-2F and 5A-5C) the above mentioned handle 206, 506 and strap means 206', 206", 506', 506" are fixed to the second shield plate's inside 202_{IN}, 502_{IN}, or the inside of the second shield plate frame elements via intermediate spacers 217, 517 that are designed to provide a gap of at least 1 centimeter between the second shield plate's inside 202_{IN}, 502_{IN} and the user's hand and forearm when the user wears the shield. In the embodiments shown in Figures 2A-2F the spacers consist of six rubber bushings 217 whose one end is glued to the underside of the retaining bodies common base plate 218 at positions under the handle 206 and the two strap means 206', 206", and whose second end is glued to the other shield plate's inside 202_{IN}. In the context of the invention, it is possible to use any kinds of suitable spacers as long as they can provide the desired spacing of at least 1 centimeter between the second shield plate's inside 202_{IN} and the user's hand and forearm when the user wears the shield. Such a spacing has been found to be very beneficial to better protect the user's hand and forearm from shock impact from e.g. bullets and other projectiles, since the force of a bullet that hits the outside 200_{UT} of the shield cannot cause any local and immediate shock action against the user's hand or forearm, but will first in part be absorbed by the shield plate 202 and the rubber bushings 217 and then distributed over a larger area through the bottom plate 218 before the remaining, now greatly reduced power is finally transferred simultaneously to both hand and forearm of the user through the handle 206 and the two strap means 206', 206".

In another particularly preferred embodiment of the shield according to the invention, illustrated in Figures 5A-5G, the handles 506 and the strap means 506', 506" are fixed to the second shield plate's inside 502_{IN}, or the inside of the second shield plate's frame members via at least one intermediate rotary device 519 which is arranged so that said handle and strap means 506, 506', 506" may be rotated together around an axis substantially perpendicular to the second shield plate inside 502_{IN}, to a user-desired rotational position. Thanks to such a design of the shield 500, it becomes possible for the user to turn the protective shield plates 501, 502, 503 of the unfolded shield to different rotational positions relative to the handle and the strap means 506, 506', 506". This can be a great advantage if the user carrying the unfolded shield on one forearm needs to use a rifle, a machine gun or another weapon that requires a large space and the use of both hands for two-handed control of the weapon, as the user of the shield in such a case can turn the shield plates to an optimal position relative to the strap means (and the handle) to create sufficient free space for the handling of the two-handed weapon, without having to take off his shield and lose all the protective effect of the unfolded shield plates. Such pivotal mounting of the handle and the strap means relative to the shield plates may also be advantageous when the user is lying down, or is near a wall, car or another protective object, since the user carrying the shield on the arm in such a case can turn the shield plates in an optimal position to get a better view or more room to fire a shot while retaining as much as possible of the protective effect of the unfolded shield plates.

In a particularly advantageous embodiment, the handle 506 and the strap means 506', 506" are mounted on a top side of a single base plate 518 and the intermediate turning device comprises a turntable 519, which is attached between an underside of the bottom plate 518 and the second shield plate's inside 502_{IN}. In the illustrated embodiment, the pivot plate 519 is secured between the bottom plate 518 and second shield plate's inside 502_{IN} using a screw and nut joints 525, but the attachment of the turning plate 519 can also be achieved with any other type of suitable connection.

In another advantageous embodiment, the turntable 519 comprises a first coupling part 520 which is rotatably coupled to a second coupling part 521, the coupling parts 520, 521 are arranged to slide relative to each other, for example by means of suitable low friction material, upon rotation of said handle and strap means 506, 506', 506" and the coupling parts 520, 521 further comprising mutually cooperating locking means 522, 523 which are arranged to permit the coupling parts 520, 521 to be locked to each other at the desired rotational position so that said handle and strap means 506, 506', 506" are retained in the user-desired rotational position during use of the shield 500.

In a particularly advantageous embodiment, the first coupling part 520 comprises at least one locking means in the form of a spring loaded, preferably rotatable ball 522, while the second coupling part 521 is provided with a plurality of, along a ring shape disposed, notches 523 or holes which predefine a plurality of possible torsional and locking positions for the rotary plate 519. The spring loaded ball or balls 522 is/are arranged to be pressed by the spring force in part in one or more of said recesses 523 or holes when the turntable 519 is rotated to any one of said predefined possible twisting and locking positions so that the turntable 519 is locked against unintentional rotation and handle and the strap means 506, 506', 506" are held in the user-desired pivot position during the use of the shield 500. Thanks to the provision of locking means as described above, or other locking bodies with a similar function, the user can rotate the handle and the strap means to different incremental rotary and locking positions or "notches" in relation to the second shield plate, making the shield easy to use.

In another advantageous embodiment, the first coupling part 520 is coupled with the second coupling part 521 with a screw/nut joint 525, which after tightening has a small clearance in the screw length direction (not shown the figures), a spring means (not shown in the figures) is arranged in the screw/nut joint 525 to take up said clearance when the coupling parts 520, 521 are locked relative to each other and to allow the user to release the locking of the turning plate 519 by pressing said spring members of the screw/nut joint 525, so that the gap between the coupling parts 520, 521 becomes larger and the locking means 522, 523 are released from each other so that the turntable 519 and said handle and strap means 506, 506', 506" can be brought into another desired rotational position of the user. By providing the locking members 522, 523 as described above, or other devices with similar function, the user can thus turn the handle and the strap means to different incremental rotary and locking positions or "notches" in relation to the other shield plate. The provision of a screw/nut joint with a small clearance and a suitably matched spring means can, together with the shield plates' intrinsic weight/inertia, provide a function of the pivot plate 519 that enables the user to, by pulling the handle 506 and/or the strap means 506', 506" towards themselves and quickly changing the angle of the forearm in relation to the shield plates, cause the locking means 522, 523 to both be released from one another and slide to a new rotational position and lock automatically in this new position by the spring action of the spring loaded ball or balls. In such an embodiment, the user can by repeating such twitches and changes of the angle of the forearm gradually bring the handle and the strap means to the angular position that is optimal for the current situation. It should be understood that the shield according to the invention in other embodiments may include other suitable devices and arrangements which provide similar features and advantages as the above described turntable.

In another particularly advantageous embodiment of the shield 200 according to the invention (see Figs. 2A-2E), each of the spring loaded hinge assemblies 204, 205 are arranged such that it, seen from the outside 200_{UT} of the shield 200 in the extended use position, substantially fully and completely covers the gap between the long sides of the shield plates 201, 202 and 202, 203 or the frame elements with inserted shield plates that the hinge device (204 and 205) interconnects. The hinge assemblies 204, 205 in such an embodiment are advantageously, but not necessarily made of steel and preferably have a thickness of at least 2 mm in the area where they cover the gap between the shield plates. Such a design of the hinge devices 204, 205 reduces the risk of bullets and other projectiles penetrating into some of the interstices between the shield plates.

The shield plates may consist of different materials depending on the intended use of the shield according to the invention. During certain missions, for example in connection with sporting events and the like, it is a minimum requirement that the shield has good impact and stick resistance and at the same time a relatively low weight, since the user may need to carry the shield ready for use for a long time, up to several hours. The shield plates of a shield for such use may consist of an impact resistant transparent plastics material such as polycarbonate, preferably with a thickness of about 4 mm, but the thickness may vary depending on the type of mission.

During other types of missions it is very likely that the user of the shield according to the invention also needs protection against bullets and other projectiles. An example of such missions is when members of a task force are going to capture and incapacitate a suspect armed criminal. The shield plates of a shield for such use must therefore also be bulletproof, i.e. be reinforced with a suitable ballistic material.

In an advantageous embodiment of the invention the shield plates of the foldable shield consists of at least one punch and stick protective material reinforced with at least one ballistic material. The impact and stick protective material can advantageously be polycarbonate sheets with a thickness selected with regard to the protection requirements and the maximum weight of the shield that is acceptable for the intended type of mission. The ballistic material can be a shot constricting fabric, e.g. consisting of any of the materials with the brands Kevlar, Dyneema or Spectra, which has been glued or laminated together with the punch and stick protective material to form the shield plates. Within the scope of the invention, it is however possible to use any known materials and material combinations for the shield plates to achieve the protective effect required for the intended use of the shield. The shield plates of the shield according to the invention would thus also be able to include shield plates that are not composed of polycarbonate, or include bulletproof material that does not contain material with the brands Kevlar, Dyneema or Spectra, or include sheet metal or plastics reinforced with wire, fiber,

thread, particles or engineered textiles, multilayer materials, laminate materials, pre-preg based materials of suitable composition or sandwich panels, or various combinations or composites made from such materials.

5 The various embodiments described above have advantageously a maximum thickness of the plates/frame elements of no more than about 18-20 mm, so that the shield may be folded to a flat package. Where a shield with a larger thickness is desired, it is advantageous to on the third shield plate/shield plate's frame member's first long side build up the shield plate/shield plate's frame member under the hinge mechanism so that under the hinge device, a shape of the spacing
10 of the order of a few millimeters, typically 2 -8 mm is created. The distance means that when the third shield plate is to be folded over the first shield plate a space is created between the first shield plate's inside and the outside of the third shield plate which allows the shield to be folded into a flat pack despite the thicker plates. The distance may be a separate part arranged under the hinge mechanism, alternatively the distance can form an integral part of the shield plate/shield
15 plate's frame elements.

The present invention has in the above been described by means of a number of different embodiments and with reference to the accompanying drawings. It must however be understood that the invention is not limited to the described embodiments and to what is shown in the
20 drawings, but that one can also imagine other embodiments within the scope of the invention as defined by the appended claims. An alternative way to achieve a substantially flat package in the folded transport position is to provide the respective hinge devices with a suitable dimensioning. This is to be understood as that the hinge devices of the shield can be fixed and dimensioned in different ways in different embodiments of the invention. In embodiments where the shield
25 plates are relatively thin and flexible, the first and second hinge means can be substantially identical and in the folded state have equal "thickness" or "height" in the folded shield plates' total thickness direction, since the shield plates' thinness and flexibility still allow them to be bent and caused to lie on top of each other in the form of a substantially flat package and be locked in this form in the folded transport position. In embodiments where the shield plates have
30 a high thickness and/or stiffness or are attached via rigid frame members or the like, it will be realized that the width of the first shield plate can be adjusted in relation to the thickness of the frame member so that the width is reduced if the thickness of the frame member, i.e., the width of the first shield plate may need to be less than the above width of 85% in the example above. For example, the width of the first shield plate may be at most 80% or down to at most 50%.
35 Also, the respective hinge devices may preferably be sized differently, so that the first hinge means between the first and second shield plate in folded condition have a smaller "thickness" or "height" in the folded shield plates' total thickness direction than the corresponding "thickness"

or "height" of the folded second hinge device between the second and the third shield plate, so that the relatively thick, rigid and/or in the rigid frame member attached shield plates still can be brought to lie on top of each other in the form of a substantially flat package and be locked in this form in the folded transport position. For example, the edges, in particular on the first shield plate or the first shield plate's frame member could be chamfered to create more space for the third shield plate to be folded on to form a flat package. Workers will recognize that through a combination of the above mentioned alternative embodiments, adjustments of the shield can be made within the scope of the invention.

In an advantageous embodiment of the foldable shield 600, 700, 800, 900, 1000, illustrated in Figs. 6A-10, the spring-loaded hinge assemblies thus includes a respective hinge joint, wherein the hinge joint of the first spring-loaded hinge assembly 604, 704, 804, 904, 1004 has an outer diameter which is smaller than the corresponding outer diameter of the hinge joint of the second spring-loaded hinge assembly 605, 705, 805, 905, 1005. Such a design also enables the relatively thick, stiff and/or rigid shield plates, with any frame members, can be brought to lie on top of each other in the form of a substantially flat package and locked in this form in the folded transport position.

In another advantageous embodiment of the shield 600 of the invention, illustrated in Figs. 6A and 6B, each of the spring loaded hinge assemblies 604, 605 includes a pair of first and second fastening plates pivotably held together by a respective hinge joint. The first fastening plate of the second hinge assembly 605 is fixed to the second shield plate 602 while its second fastening plate is fixed to the third shield plate 603, wherein the first fastening plate of the second hinge assembly 605 has a recess adapted to the outer contour of the first shield plate 601 to allow the fitting of at least a portion of the outer contour of the first shield plate 601 in the recess in the first fastening plate of the second hinge assembly 605 when folding of the first shield plate 601 with its outside 601_{UT} against the outside of the second the shield plate 602. Also the second fastening plate of the second hinge assembly 605 has a recess adapted to the outer contour of the first shield plate 601 to allow the fitting of at least a portion of the outer contour of the first shield plate 601 in the recess in the second fastening plate of the hinge assembly 605 at subsequent folding of the third shield plate 603 with its outside against the inside 601_{IN} of the already folded first shield plate 601. Thanks to such a design one can avoid that surface mounted fastening plates of the hinge assemblies contributes to the total thickness of the shield in the folded transport position, so that the folded shield can be as thin as possible in the transport position.

In yet another advantageous embodiment, illustrated in Figs. 6A-10, that the shield, when in the unfolded use position, exhibits joint gaps formed between adjacent long sides of the two shield

plates connected by the first 604, 704, 804, 904, 1004 and the second hinge assembly 605, 705, 805, 905, 1005, respectively, wherein the two spring-loaded hinge assemblies 604, 605, 704, 705, 804, 805, 904, 905, 1004, 1005 cover the openings of the two joint gaps 626, 627, 726, 727, 826, 827, 926, 927, 1026, 1027 on the outside surface 601_{UT}, 701_{UT}, 801_{UT}, 901_{UT}, 1001_{UT} of the shield. By such a design of the hinge assemblies a protection against penetration by projectiles or sharp objects in the hinge gaps is obtained when the shield is used. To protect the user even better, the shield can also, as is shown particularly clearly in Figs. 6A-10, preferably comprise a protective plate 618, 718, 818, 918, 1018, mounted on the inside surface of the shield, which covers the openings of the two joint gaps 626, 627, 726, 727, 826, 827, 926, 927, 1026, 1027 on the inside surface 601_{IN}, 701_{IN}, 801_{IN}, 901_{IN}, 1001_{IN} of the shield. Such a protective plate of suitable material may minimize the risk that a projectile or a sharp object, which nevertheless penetrates through a joint gap, reaches and damages the user when using the shield.

In an advantageous alternative embodiment of the foldable shield 700, 800, 900, 1000, illustrated in Figs. 7-10, the spring-loaded hinge assemblies includes a respective hinge joint, wherein the shield, when in the unfolded use position, exhibits joint gaps formed between adjacent long sides of the two shield plates connected by the first 704, 804, 904, 1004 and the second hinge assembly 705, 805, 905, 1005, respectively, wherein the adjacent long sides have a geometric shape such that each joint gap 726, 727, 826, 827, 926, 927, 1026, 1027 extends from an opening directly under its respective hinge joint on the outside surface 701_{UT}, 801_{UT}, 901_{UT}, 1001_{UT} of the shield to a second opening, displaced laterally relative to the hinge joint, on the inside surface 701_{IN}, 801_{IN}, 901_{IN}, 1001_{IN} of the shield. Thanks to such a design, the extended shield may provide better protection against such particularly dangerous projectiles or sharp objects that hit the outside of the shield perpendicularly or essentially perpendicularly against the plane of the shield than what would be the case if the joint gaps run perpendicularly against the plane of the shield.

Such an advantageous displacement of the openings of the joint gaps on the outside and the outside of the shield respectively can be obtained in various ways, for example as illustrated in Fig. 7 and 8, wherein the adjacent long sides have a geometric shape such that at least one of the joint gaps 726, 727, 826, 827 extends obliquely inwards or outwards from its hinge joint on the outside surface 701_{UT}, 801_{UT} of the shield to the inside surface 701_{IN}, 801_{IN} of the shield.

In another particularly advantageous embodiment, illustrated in Fig. 9 and 10, the spring-loaded hinge assemblies each comprise a respective hinge joint, wherein the shield, when in the unfolded use position, exhibits joint gaps formed between adjacent long sides of the two shield plates connected by the first 904, 1004 and the second hinge assembly 905, 1005, respectively,

wherein the adjacent long sides have a geometric shape such that at least one of the joint gaps 926, 927, 1026, 1027 extends in a step-like manner from its hinge joint on the outside surface 901_{UT}, 1001_{UT} of the shield to the inside surface 901_{IN}, 1001_{IN} of the shield. Such step-like manner minimize the risk that a projectile or a sharp object penetrates a joint gap independent of at what angle the projectile or object hits the outside of the shield.

In another advantageous embodiment of the invention, illustrated in Figs. 11A-11C, each of the spring-loaded hinge assemblies 1104: 1105 comprises a plurality of first 1128', 1128'', 1130' and a plurality of second 1129', 1129'', 1131', 1131'' pivot members pivotally connected together by a respective hinge joint, wherein the first 1128', 1128'', 1130' and second 1129', 1129'', 1131', 1131'' pivot members are integrated parts of the adjacent long sides of the two shield plates 1101, 1102, 1102, 1103 connected together by the respective hinge joint. In such an embodiment it is advantageous that at least some of the first 1128', 1128'', 1130' and second pivot members 1129', 1129'', 1131', 1131'', respectively, are arranged alternately along and at least partially surrounding the circumference of a pivot pin being part of the respective hinge joint. The pivot pin may, in such an embodiment, consist of any suitable material, for example metal or plastics.

In an embodiment illustrated in Figs. 11A-C each of the first and the second pivot members, respectively, projects from an edge of a long side of its respective shield plate, wherein said edge preferably is provided with a chamfer 1132, 1133 (see Figs. 11B and 11C) so as to provide sufficient clearance for pivoting the pivot members 1128', 1128'', 1130' of one shield plate 1101, 1103 relative to the pivot members 1129', 1129'', 1131', 1131'' of another shield plate 1102 when folding and unfolding the shield 1100.

The pivot members 1128', 1128'', 1129', 1129'', 1131', 1131'', 1130' are particularly advantageously cast or moulded in one piece with their respective shield plate 1101, 1102, 1103 in one and the same casting or moulding process, so that the pivot members and the shield plate consist of one and the same material. The material in the shield plate and its pivot members can be any of the previously mentioned materials which are suitable for hinges and shield plates, provided that the material is suitable for simultaneous casting or forming of a shield plate and its associated pivot members, but embodiments are conceivable where the material in the shield plate and its associated pivot members comprise other materials, for example embodiments where the material in the shield plate and its associated pivot members consists of an alloy, thermoplastics, thermosetting plastics or composite materials, or consist of a material comprising graphene.

By integration of the pivotal members comprised in the hinge assemblies in the shield plates as described above and shown in Figs. 11A-C the number of components in the shield can be reduced so the manufacture and assembly of the shield becomes easier and consequently cheaper. Such a design will additionally give good basis for further reduction of the weight.

C L A I M S

1. A foldable shield (100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 1100), which
5 can be brought from an unfolded use position to a folded transport position and vice versa, and
which comprises

a first (101), a second (102) and a third (103) shield plate, each of which has an
elongated shape and an inside surface, an outside surface, a first long side, a second long side, a
first short side and a second short side, wherein the shield further comprises

10 a first spring-loaded hinge assembly (104) connecting the second long side
(101_{LS2}) of the first shield plate to the first long side (102_{LS1}) of the second shield plate,

a second spring-loaded hinge assembly (105) connecting the second long side
(102_{LS2}) of the second shield plate to the first long side (103_{LS1}) of the third shield plate, wherein
15 said hinge assemblies (104, 105) are arranged so that the shield can be brought from the use
position to the folded transport position by folding (A) the first shield plate (101) with its outside
surface (101_{UT}) against the outside surface (102_{UT}) of the second shield plate (102) and by
subsequently folding (B) the third shield plate (103) with its outside surface (103_{UT}) against the
inside surface (101_{IN}) of the already folded first shield plate (101),

20 holding means (106, 106', 106'') disposed on the inside surface (102_{IN}) of the
second shield plate for securing the shield to a forearm of a user when in use,

a release device (107) placed within reach of the user from said holding means
(106, 106', 106'') and adapted, when actuated by the user, to release first (108) and second (109)
cooperating locking means of the shield that are adapted to keep the shield plates folded against
each other in the transport position, against spring force from said hinge assemblies (104, 105),
25 wherein said spring force upon release of the locking means (108, 109) brings the shield plates
from the transport position to the unfolded use position, **characterized in** that the first shield
plate is designed with a maximum width (101_{MAXBR}) between its long sides that is smaller than
the corresponding width of the second (102_{MAXBR}) and of the third (103_{MAXBR}) shield plate,
respectively, so that a sufficient clearance for folding (B) the third shield plate (103) against the
30 first shield plate (101) is provided so as to allow the shield plates (101, 102, 103) to be brought
to rest on top of each other in the form of a substantially flat package in the transport position.

2. The foldable shield (100) according to claim 1, **characterized in** that the first
shield plate (101) has a maximum width (101_{MAXBR}) between its long sides that is no more than
35 90 % of the corresponding width of the second (102_{MAXBR}) and of the third (103_{MAXBR}) shield
plate, respectively.

3. The foldable shield (600, 700, 800, 900, 1000) according to any one of the preceding claims, **characterized in** that the spring-loaded hinge assemblies each comprise a respective hinge joint, wherein the hinge joint of the first spring-loaded hinge assembly (604, 704, 804, 904, 1004) has an outer diameter that is smaller than the corresponding outer diameter of the hinge joint of the second spring-loaded hinge assembly (605, 705, 805, 905, 1005).

4. The foldable shield (600, 700, 800, 900, 1000) according to any one of the preceding claims, **characterized in** that the shield, when in the unfolded use position, exhibits joint gaps formed between adjacent long sides of the two shield plates connected by the first (604, 704, 804, 904, 1004) and the second hinge assembly (605, 705, 805, 905, 1005), respectively, wherein the two spring-loaded hinge assemblies (604, 605, 704, 705, 804, 805, 904, 905, 1004, 1005) cover the openings of the two joint gaps (626, 627, 726, 727, 826, 827, 926, 927, 1026, 1027) on the outside surface (601_{UT}, 701_{UT}, 801_{UT}, 901_{UT}, 1001_{UT}) of the shield.

5. The foldable shield (600, 700, 800, 900, 1000) according to claim 4, **characterized in** that it comprises a protective plate (618, 718, 818, 918, 1018), mounted on the inside surface of the shield, which covers the openings of the two joint gaps (626, 627, 726, 727, 826, 827, 926, 927, 1026, 1027) on the inside surface (601_{IN}, 701_{IN}, 801_{IN}, 901_{IN}, 1001_{IN}) of the shield.

6. The foldable shield (300, 400) according to any one of the preceding claims, **characterized in** that the shield further comprises frame members (310, 311, 312, 410, 411, 412), into which the respective shield plates (401, 402, 403) can be inserted and fixed in place, wherein said spring-loaded hinge assemblies (304, 305, 404, 405) connect the shield plates via said frame members.

7. The foldable shield (700, 800, 900, 1000) according to any one of the claims 1-6, **characterized in** that the spring-loaded hinge assemblies each comprise a respective hinge joint, wherein the shield, when in the unfolded use position, exhibits joint gaps formed between adjacent long sides of the two shield plates connected by the first (704, 804, 904, 1004) and the second hinge assembly (705, 805, 905, 1005), respectively, wherein the adjacent long sides have a geometric shape such that each joint gap (726, 727, 826, 827, 926, 927, 1026, 1027) extends from an opening directly under its respective hinge joint on the outside surface (701_{UT}, 801_{UT}, 901_{UT}, 1001_{UT}) of the shield to a second opening, displaced laterally relative to the hinge joint, on the inside surface (701_{IN}, 801_{IN}, 901_{IN}, 1001_{IN}) of the shield.

8. The foldable shield (700, 800) according to any one of the claims 1-6, **characterized in** that the spring-loaded hinge assemblies each comprise a respective hinge joint,

wherein the shield, when in the unfolded use position, exhibits joint gaps formed between adjacent long sides of the two shield plates connected by the first (704, 804) and the second hinge assembly (705, 805), respectively, wherein the adjacent long sides have a geometric shape such that at least one of the joint gaps (726, 727, 826, 827) extends obliquely inwards or
5 outwards from its hinge joint on the outside surface (701_{UT}, 801_{UT}) of the shield to the inside surface (701_{IN}, 801_{IN}) of the shield.

9. The foldable shield (900, 1000) according to any one of the claims 1-6, **characterized in** that the spring-loaded hinge assemblies each comprise a respective hinge joint,
10 wherein the shield, when in the unfolded use position, exhibits joint gaps formed between adjacent long sides of the two shield plates connected by the first (904, 1004) and the second hinge assembly (905, 1005), respectively, wherein the adjacent long sides have a geometric shape such that at least one of the joint gaps (926, 927, 1026, 1027) extends in a step-like manner from its hinge joint on the outside surface (901_{UT}, 1001_{UT}) of the shield to the inside surface
15 (901_{IN}, 1001_{IN}) of the shield.

10. The foldable shield (600) according to any one of the claims 1-6, **characterized in** that each of the spring-loaded hinge assemblies (604, 605) comprises a pair of first and second fixing plates articulately connected together by a respective hinge joint, wherein the first fixing
20 plate of the second hinge assembly (605) is fixed to the second shield plate (602), whereas its second fixing plate is fixed to the third shield plate (603), wherein the first fixing plate of the second hinge assembly (605) exhibits a cutout adapted to the outline of the first shield plate (601) so as to allow accommodation of at least a portion of the outline of the first shield plate (601) into the cutout in the first fixing plate of the second hinge assembly (605) when folding the
25 first shield plate (601) with its outside surface (601_{UT}) against the outside surface of the second shield plate (602), and wherein the second fixing plate of the second hinge assembly (605) also exhibits a cutout adapted to the outline of the first shield plate (601) so as to allow accommodation of at least a portion of the outline of the first shield plate (601) into the cutout in the second fixing plate of the second hinge assembly (605) when subsequently folding the third
30 shield plate (603) with its outside surface against the inside surface (601_{IN}) of the already folded first shield plate (601) .

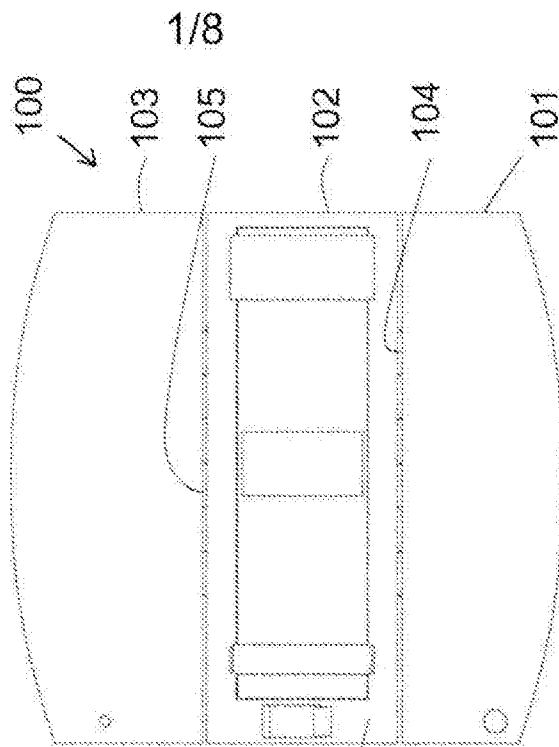
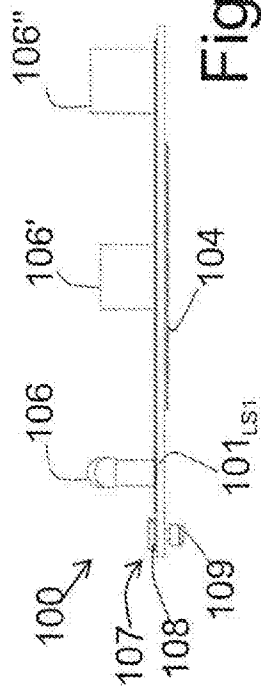
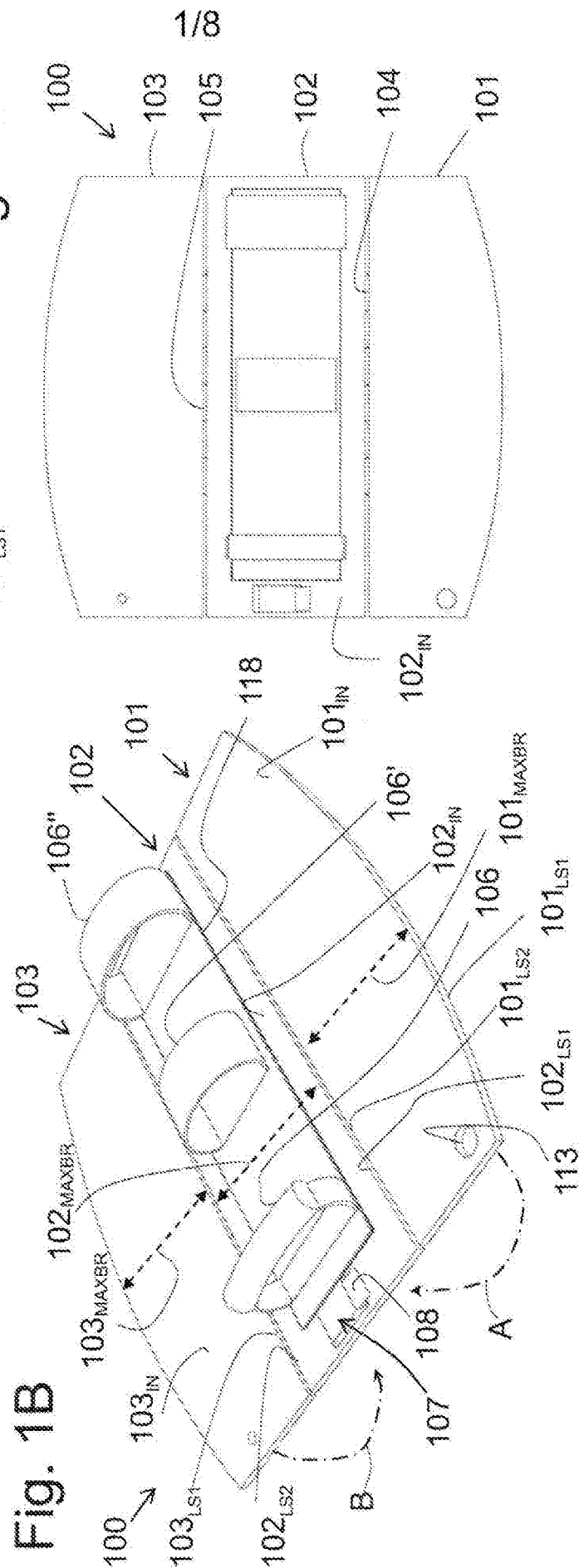
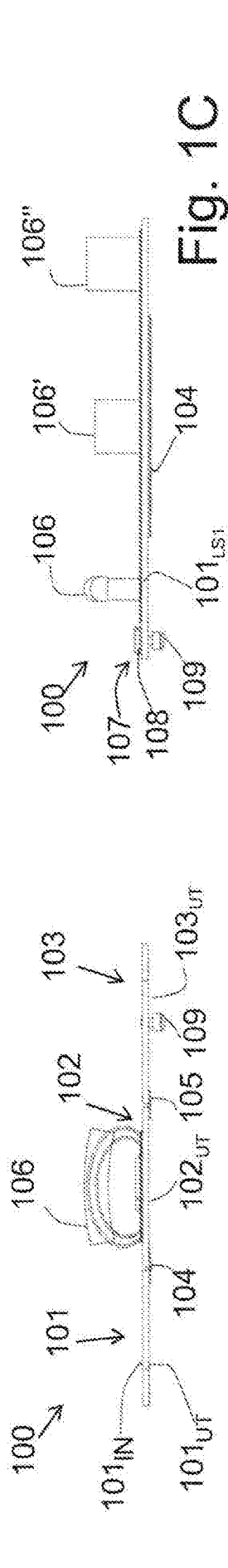
11. The foldable shield (1100) according to any one of the claims 1-5, **characterized in** that each of the spring-loaded hinge assemblies (1104, 1105) comprises a plurality of first
35 (1128', 1128'', 1130') and a plurality of second (1129', 1129'', 1131', 1131'') pivot members pivotally connected together by a respective hinge joint, wherein the first (1128', 1128'', 1130') and second (1129', 1129'', 1131', 1131'') pivot members are integrated parts of the adjacent long

sides of the two shield plates (1101, 1102, 1102, 1103) connected together by the respective hinge joint.

12. The foldable shield (1100) according to claim 11, **characterized in** that at least some of the first (1128', 1128", 1130') and second pivot members (1129', 1129", 1131', 1131"), respectively, are arranged alternately along and at least partially surrounding the circumference of a pivot pin being part of the respective hinge joint.

13. The foldable shield (1100) according to claim 11 or 12, **characterized in** that each of the first and the second pivot members, respectively, projects from an edge of a long side of its respective shield plate, wherein said edge is provided with a chamfer (1132, 1133) so as to provide sufficient clearance for pivoting the pivot members (1128', 1128", 1130') of one shield plate (1101, 1103) relative to the pivot members (1129', 1129", 1131', 1131") of another shield plate (1102) when folding and unfolding the shield (1100).

14. The foldable shield (1100) according to any one of the claims 11 to 13, **characterized in** that said pivot members (1128', 1128", 1129', 1129", 1131', 1131", 1130') are cast or moulded in one piece with their respective shield plate (1101, 1102, 1103) in one and the same casting or moulding process, so that the pivot members and the shield plate consist of one and the same material.



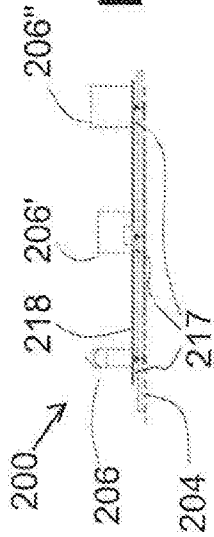
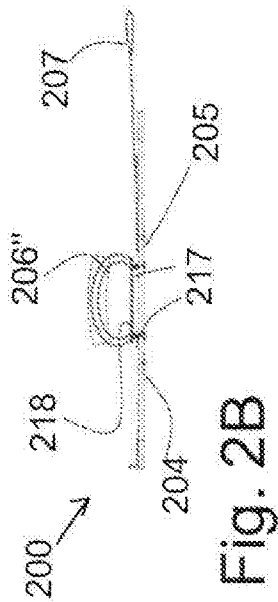


Fig. 2B

Fig. 2C

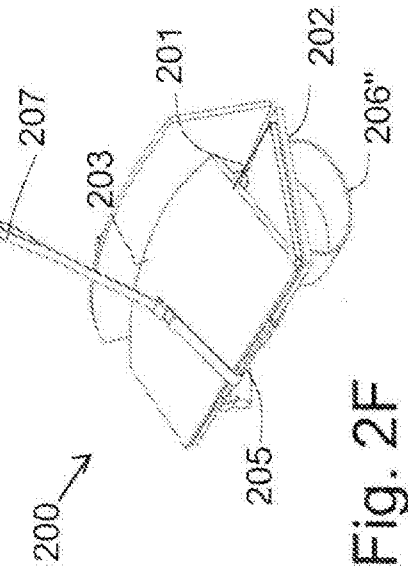
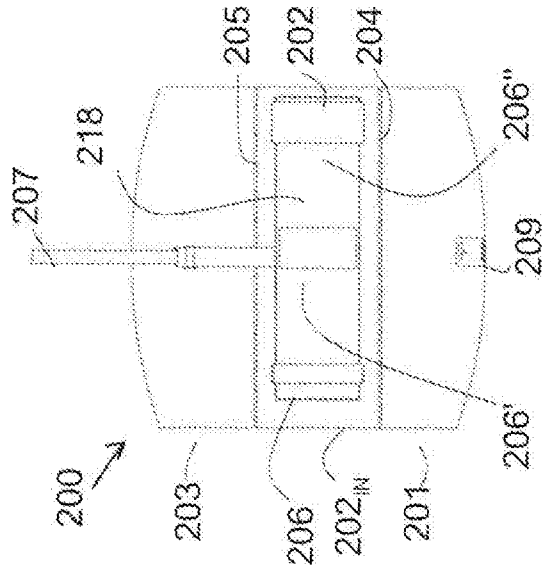
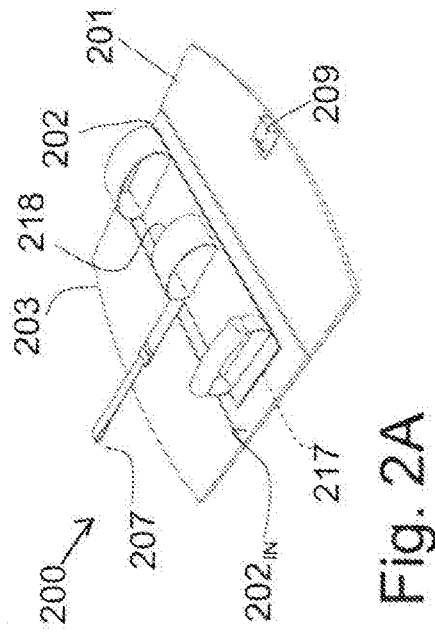


Fig. 2D

Fig. 2E

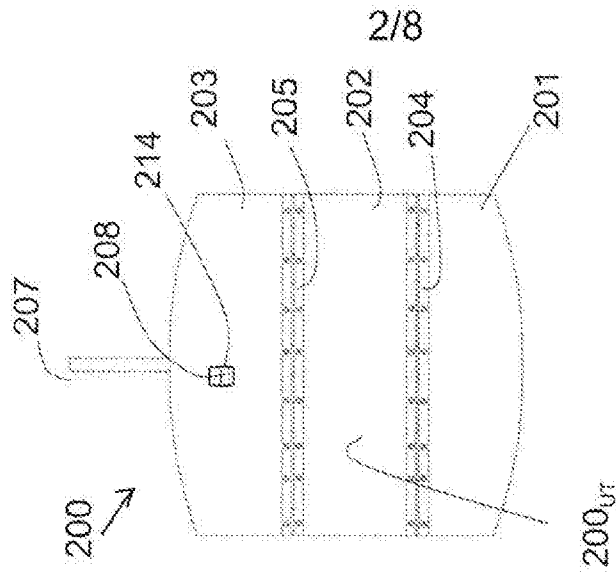


Fig. 2F

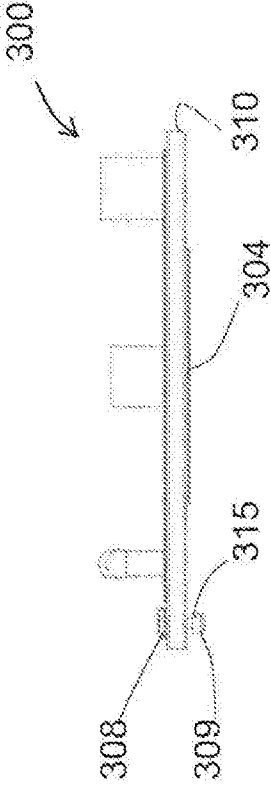


Fig. 3C

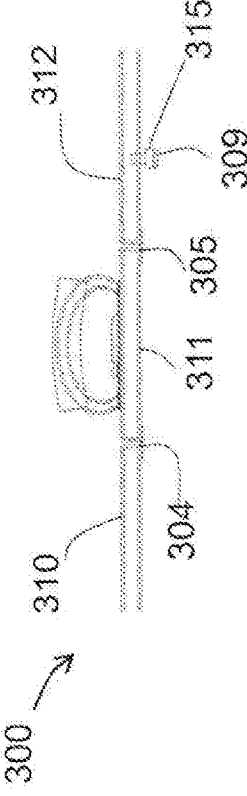


Fig. 3B

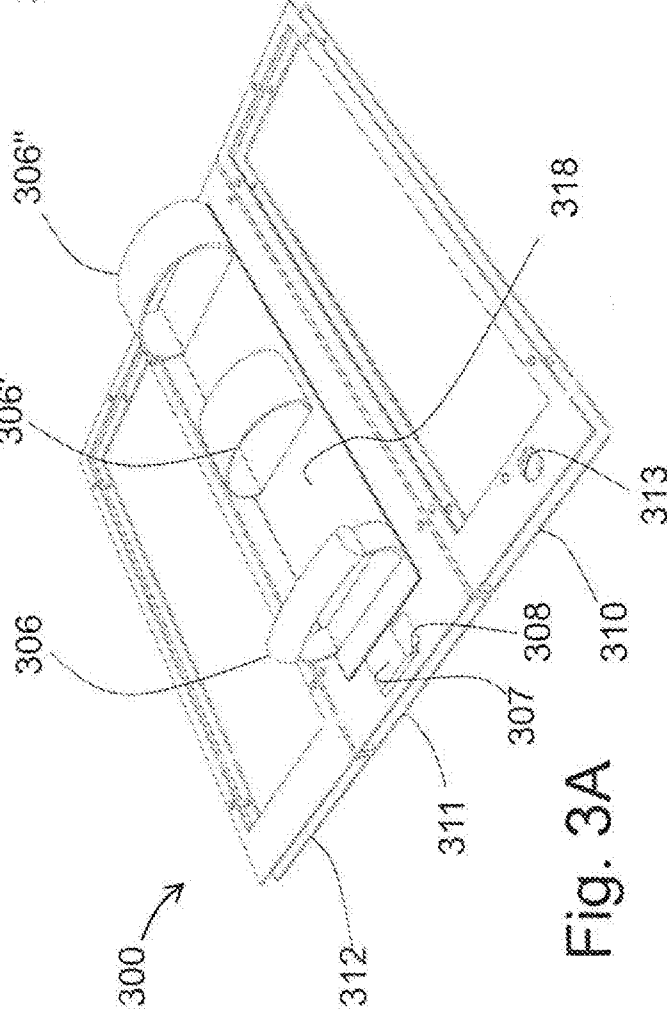


Fig. 3A

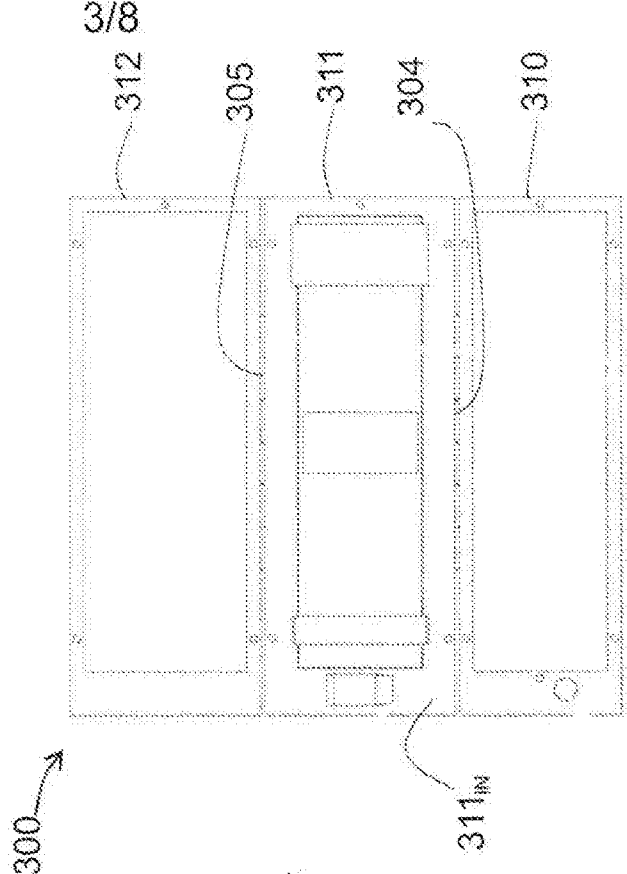
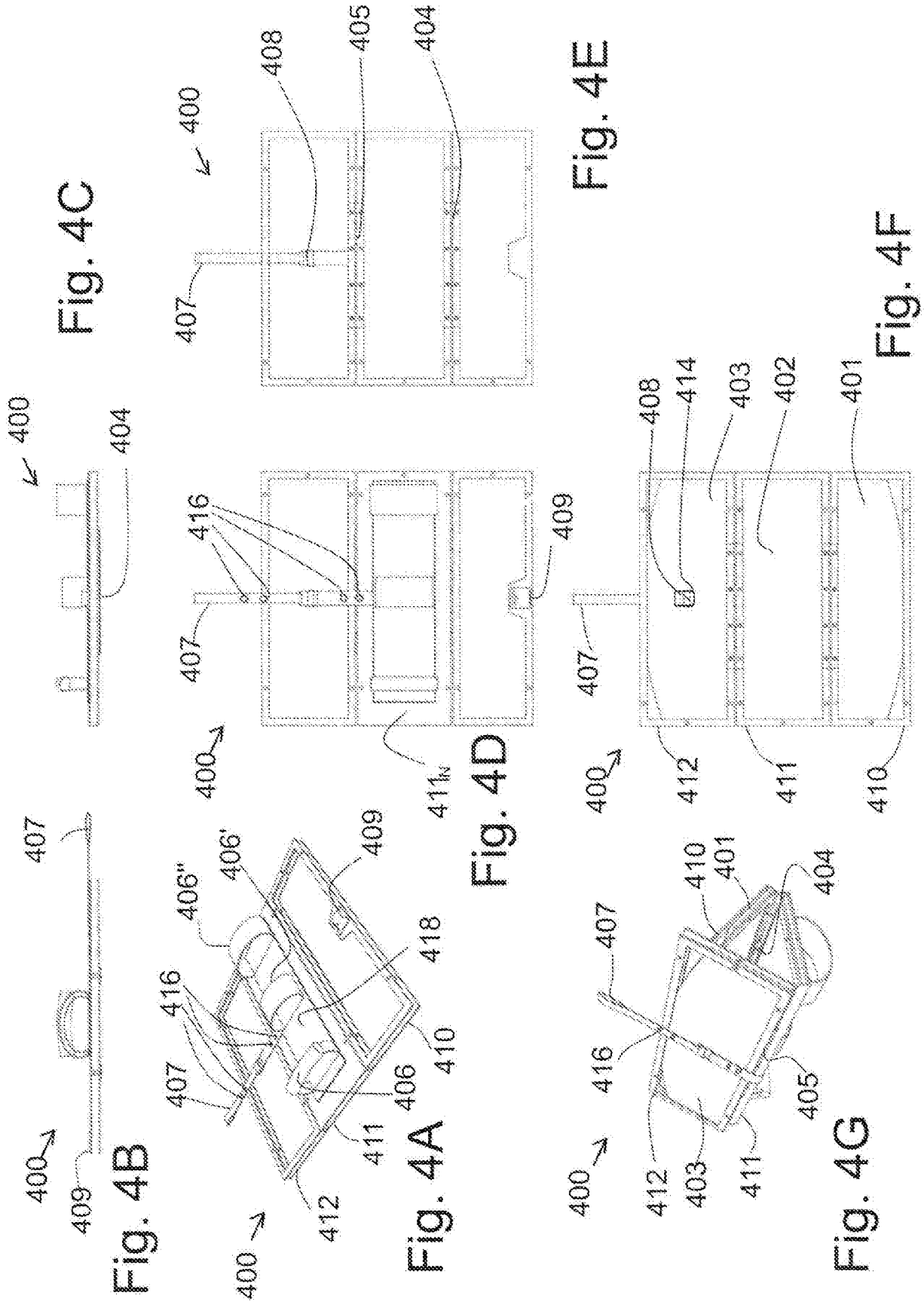
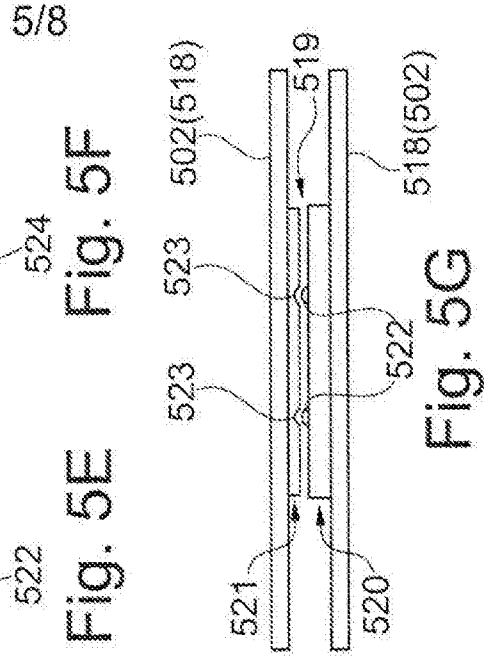
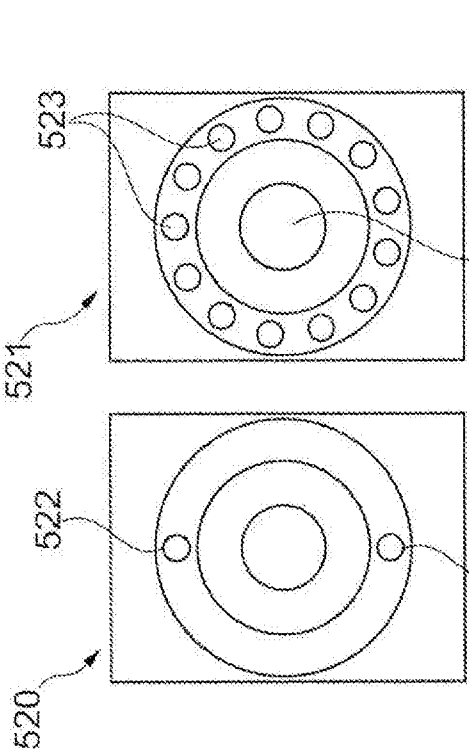
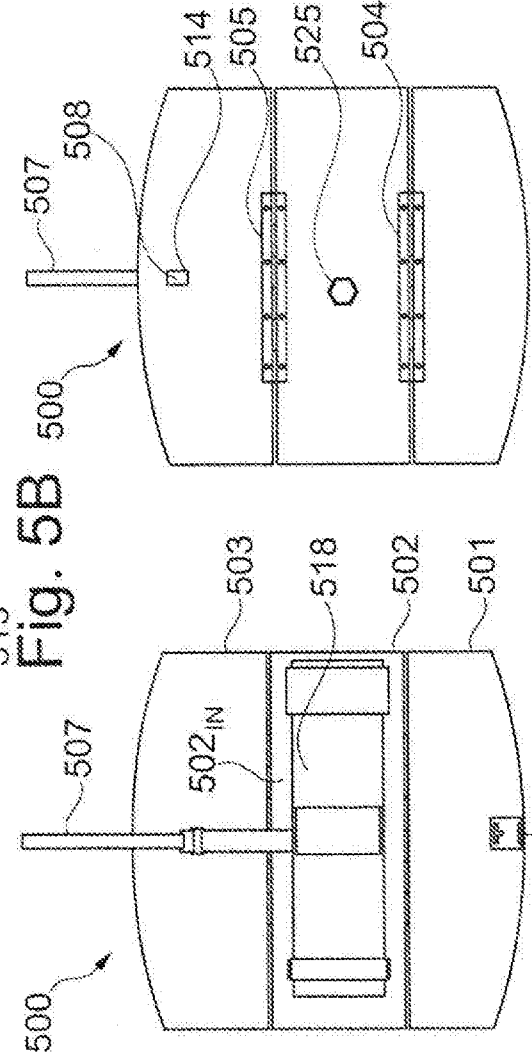
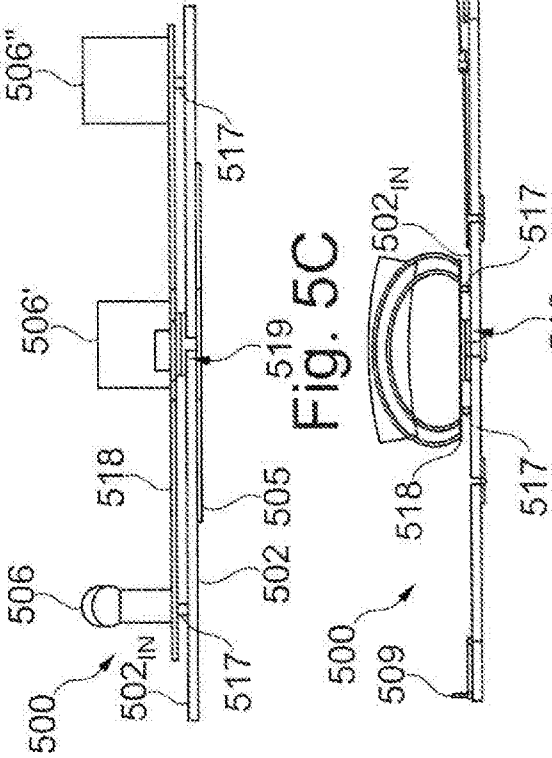


Fig. 3D





6/8

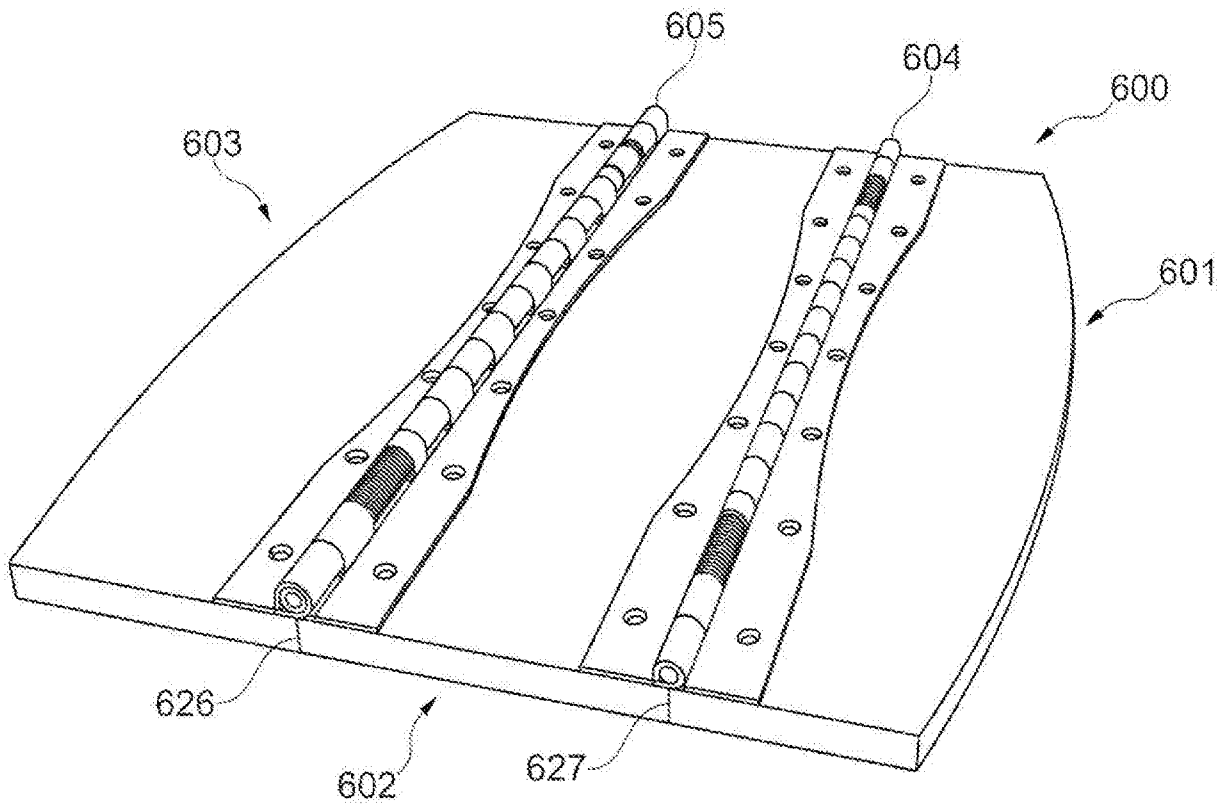


Fig. 6A

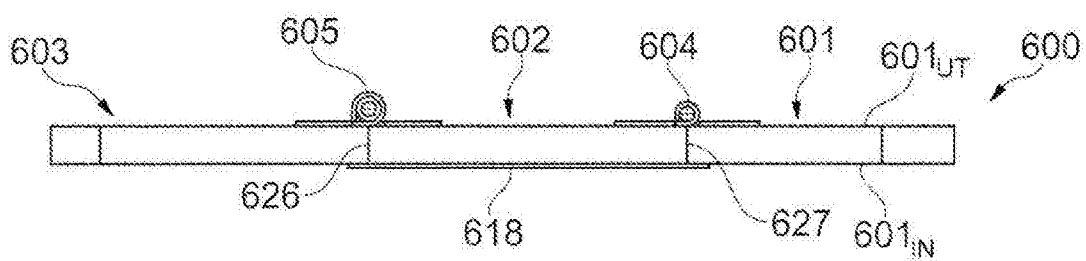


Fig. 6B

7/8

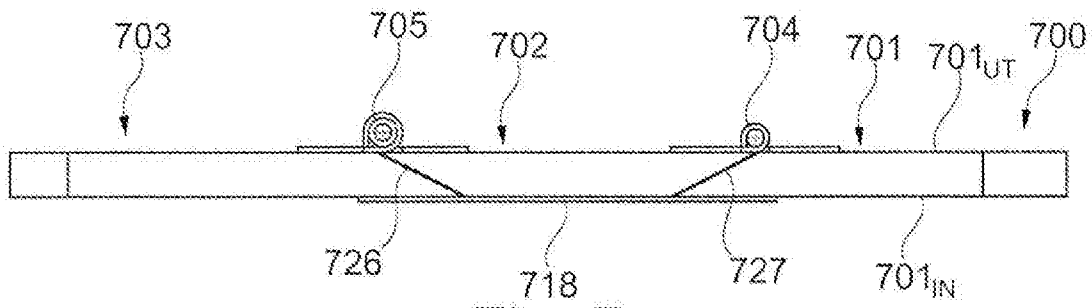


Fig. 7

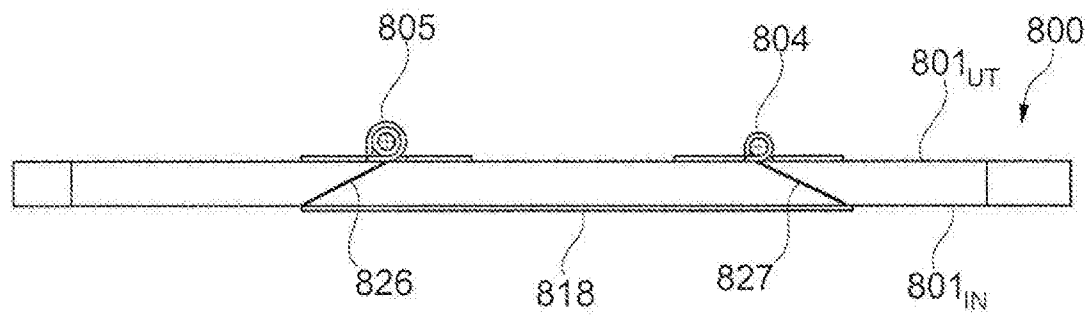


Fig. 8

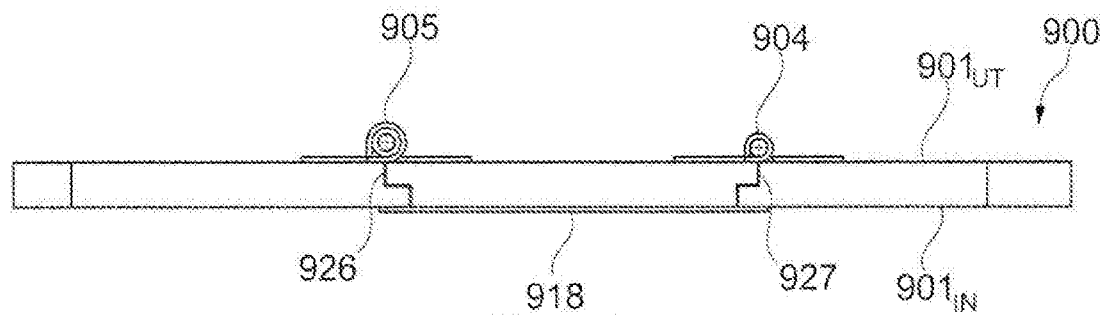


Fig. 9

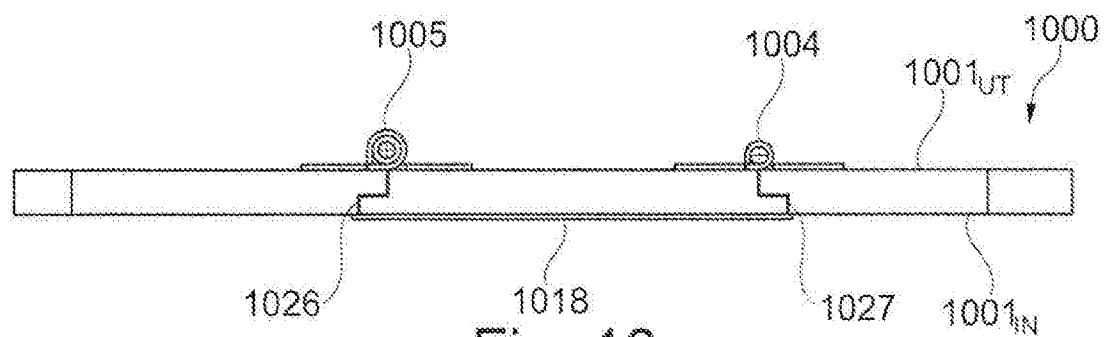


Fig. 10

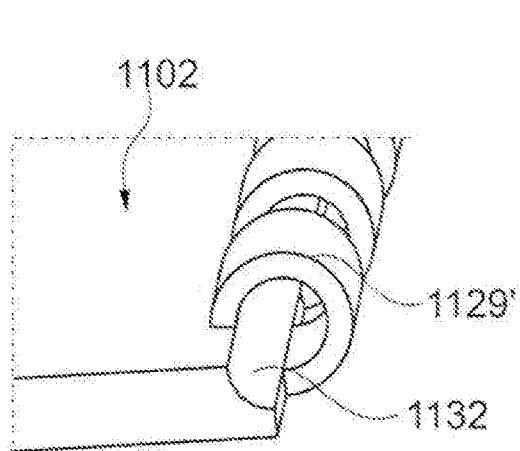


Fig. 11B

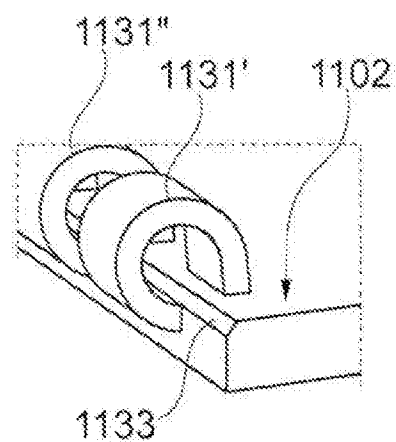


Fig. 11C

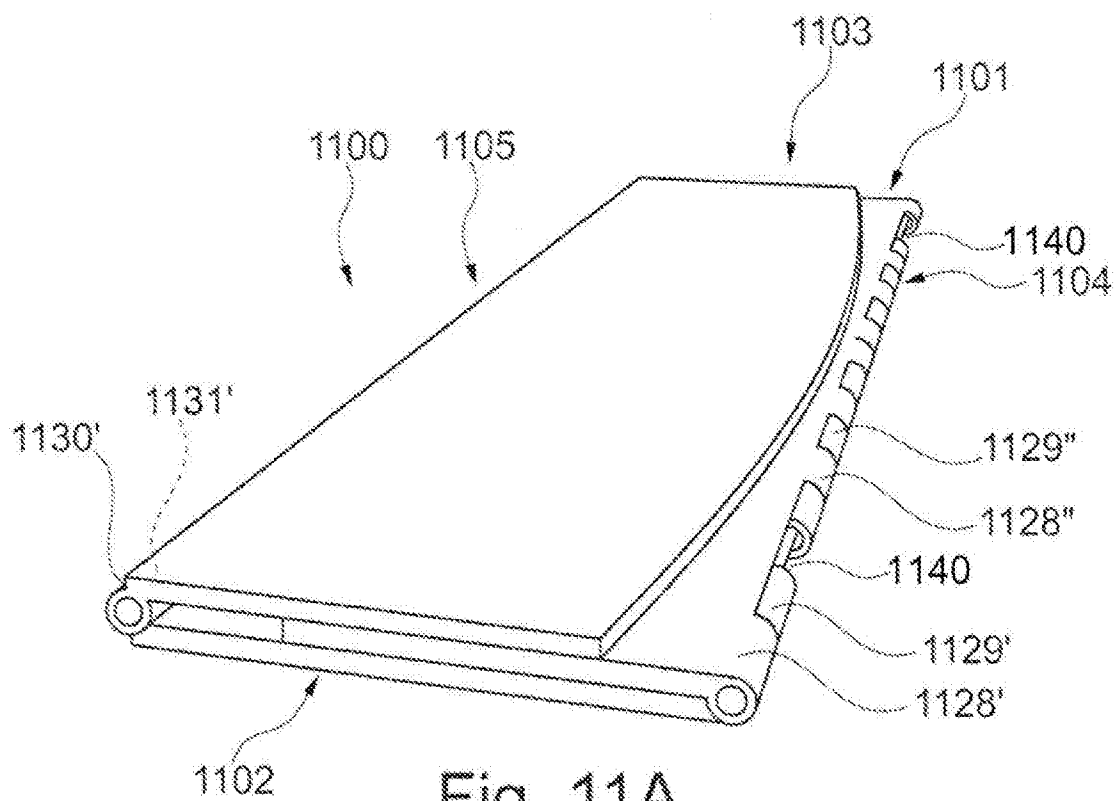


Fig. 11A

INTERNATIONAL SEARCH REPORT

 International application No.
 PCT/SE2016/050324

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: F41H

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

SE, DK, FI, NO classes as above

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

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	FR 462049 A (LOUIS PRENERON), 17 January 1914 (1914-01-17); page 1, line 36 - page 2, line 47; figures --	1-4, 6, 11-14
Y	DE 3709035 A1 (ROEMER GMBH), 19 November 1987 (1987-11-19); abstract; column 4, line 34 - column 5, line 56; figures --	1-4, 6, 11-14
A	US 4412495 A (SANKAR WILFRED A), 1 November 1983 (1983-11-01); abstract; column 2, line 20 - line 25; figures --	6
A	US 2020702 A (SAMUEL RUSSELL), 12 November 1935 (1935-11-12); column 1, line 51 - column 2, line 34; figures --	1-14

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority 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

22-06-2016

Date of mailing of the international search report

22-06-2016

Name and mailing address of the ISA/SE

Patent- och registreringsverket

Box 5055

S-102 42 STOCKHOLM

Facsimile No. + 46 8 666 02 86

Authorized officer

Erik Dahlblom

Telephone No. + 46 8 782 28 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2016/050324

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6807890 B1 (FUQUA CHARLES), 26 October 2004 (2004-10-26); abstract; column 5, line 51 - column 6, line 12; figures 5,6 -- -----	1-14

Continuation of: second sheet
International Patent Classification (IPC)
F41H 5/08 (2006.01)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SE2016/050324

FR	462049 A	17/01/1914	NONE
DE	3709035 A1	19/11/1987	NONE
US	4412495 A	01/11/1983	NONE
US	2020702 A	12/11/1935	NONE
US	6807890 B1	26/10/2004	NONE