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(54) **DOOR INTEGRATED LOCK CYLINDER FASTENING**

(57) A door (410) is provided comprising a first side portion (250), a second side portion (260) and an intermediate portion (270) located between the first (250) and the second (260) portion. The door (410) further comprises a cylinder cavity (220) extending through at least a part of at least one of the first side portion (250), the second side portion and the intermediate portion (270) such that an outer surface (260a) of the second side portion (260) is unaffected. Additionally, a lock plate cavity (420) is formed in connection with the cylinder cavity (220), and a lock plate (520) arranged in the lock plate cavity (420).

In addition to this, a kit is provided comprising the door (410) and the lock plate (520).

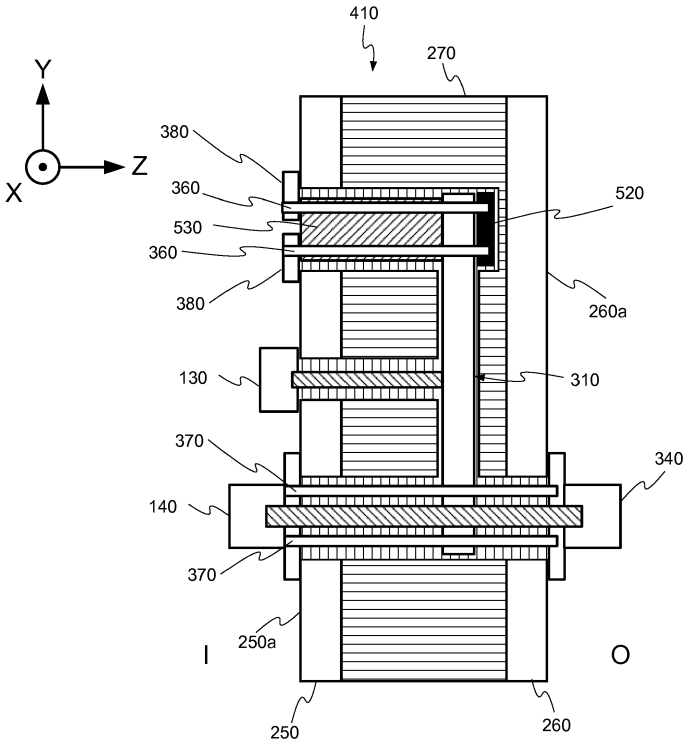

Fig. 5

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Description

TECHNICAL FIELD

[0001] The present invention relates to a lock plate, and more precisely to a door comprising such plate for fastening of door locks and drill guards, as well as a kit of a door and a lock plate.

BACKGROUND

[0002] A typical keyed door lock system is lockable and unlockable from both the inside and the outside using keys. This is accomplished by fitting lock cylinders to engage either side of a lock case arranged inside the door leaf. Some systems have a thumb turn or latch turn on the inside. If a burglar was to remove the outer lock cylinder, he or she would have direct access to the lock case and would be able to unlock the door with any suitable tool e.g. a flathead screwdriver. Keyed locks typically have drill guards around the outer lock cylinder to protect against such attacks. Both the drill guard and the outside cylinder are kept in place by screws extending through the door leaf from the inside to the outside.

[0003] One problem arises when electronic locks are introduced or in arrangements when there is no outer lock cylinder. These locks are forced to use a similar fastening structure as keyed locks since the doors are constructed with openings and cavities adapted for the keyed locks. This limits the design freedom of e.g. the electronic lock and the door leaf.

[0004] Further to this, the tight design of many electronic locks makes it difficult, or impossible, to fit a drill guard. Some vendors of electronic locks have tried to solve this by inserting a metal drill guard sheet in the narrow cavity of the door that houses the lock case. One problem with this system is that the physical constraints of the cavity makes the metal sheet very thin. Consequently, the metal sheet offers little or no protection when subject to a drill.

[0005] One possible way of fastening a lock cylinder is presented in CN 101 446 167 A. In this publication, a metal door is adapted to hold a lock cylinder in place. However, this system is only applicable to metal doors and it still comprises an opening on the outside of the metal door to admit a key.

[0006] From the above it is understood that there is room for improvements.

SUMMARY

[0007] An object of the present invention is to provide a lock plate which is improved over prior art and which eliminates or at least mitigates the drawbacks discussed above. More specifically, an object of the invention is to provide a lock plate that is configured to be arranged in a lock plate cavity of a door which enables the arrangement, anchorage and alignment of the lock case in the door. These objects are achieved by the technique set forth in the appended independent claims with preferred embodiments defined in the dependent claims related thereto.

[0008] In a first aspect, there is provided a lock plate configured to be arranged in a lock plate cavity of a door. The lock plate comprises one or more lock plate openings that are arranged to receive one or more cylinder bolts. The cylinder bolts extend through one or more lock case openings of a lock case arranged in the door. The benefit of this solution is that enables the arrangement, anchorage and alignment of the lock case in e.g. a door without an outside lock cylinder.

[0009] In one embodiment of the lock plate, the lock plate openings are threaded lock plate openings. Threaded lock plate openings enable utilization of standard cylinder bolts for fastening.

[0010] The lock plate may further comprise a reinforcement portion. The reinforcement portion is in one embodiment arranged such that drill protection of at least one lock cylinder engagement opening of the lock case is achieved when the lock plate is arranged in the lock plate cavity of the door. The reinforcement portions allow for a combined lock case anchorage and drill protection. The hidden arrangement of the lock plate, i.e. drill protection, further complicates forcing an unlocking of the door.

[0011] In one embodiment, the lock plate is shaped with at least two thicknesses. One of the thicknesses, a first thickness, is greater than a second thickness. The first thicknesses is formed at a portion of the lock plate substantially in line with the lock cylinder engagement opening and/or the thumb turn engagement opening of the lock case when the lock plate is arranged in the lock plate cavity of the door. The greater thickness will provide additional drill protection and it will also enable the lock plate to be shaped such that it is very difficult to center a drill in line with the lock cylinder engagement opening and/or the thumb turn engagement opening of the lock case.

[0012] In another embodiment, the one or more lock plate openings are two lock plate openings formed with a center to center spacing of 20 mm to 40 mm, preferably 30 mm. One benefit of this embodiment is that it allows for compatibility with lock cases fulfilling relevant parts of the Swedish Standard 817375:2018 concerning "Wood doorsets - Mortices for one-bolt spring locks and striking plates".

[0013] In one embodiment, the lock plate openings are blind holes. The blind holes extend through more than one third of the thickness of the lock plate at the location of the lock plate openings. Such a configuration of the lock plate openings allow for a smooth outer surface of the lock plate with no openings in the lock plate for burglars to target when drilling.

[0014] As an alternative to the previous embodiment, in one embodiment the lock plate openings are through holes. This embodiment is beneficial since it reduces the tolerance requirements for the length of the cylinder bolts.

[0015] In another aspect, there is provided a door, comprising a first side portion, a second side portion and an intermediate portion located between the first and the second portion. Additionally, the door comprises a cylinder cavity extending through at least a part of at least one of the first side portion, the second side portion and the intermediate portion such that an outer surface of the second side portion is unaffected. Also, it comprises a lock plate cavity formed in connection with the cylinder cavity and a lock plate arranged in the lock plate cavity. The benefit of this solution is that is enables a door with a smooth outer surface that has no openings for mechanical picking of locks and is better protected against weather.

[0016] In one embodiment of the door, the cylinder cavity extends at least partly through the intermediate portion of the door. One benefit of this is that a cavity is formed that may hold e.g. a lock cylinder, a thumb turn, electronics, batteries or other devices comprisable in the door.

[0017] In yet another embodiment of the door, the cylinder cavity extends through the first side portion and at least partly through the intermediate portion. This is beneficial at least because it allows fastening and positioning of an internal lock cylinder, thumb turn or other devices comprisable in a door requiring access from the inside of the door.

[0018] In a further embodiment, the cylinder cavity comprises a first end portion located in the vicinity of the first side portion of the door and a second end portion located opposite the first end portion. The lock plate cavity is formed in connection with the second end portion. This arrangement allows for straightforward placement of the lock plate and the forming of the cavities may be easily done by machines.

[0019] In a further embodiment, the lock plate cavity has a larger extension in a plane of the second side portion compared to the cylinder cavity. This embodiment allows for a floating arrangement of a lock case, since the force exerted when tightening the cylinder bolts is not exerted between the lock plate and the lock case but between the lock plate and the door.

[0020] In one embodiment, the door further comprises a lock case cavity arranged with a lock case. The lock case comprises one or more lock case openings. The arrangement of the lock case is such that at least one of the lock plate openings of the lock plate is aligned with at least one of the lock case openings of the lock case. This embodiment enables a door assembly where the lock plate is used to correctly position and arrange the lock case in the door.

[0021] In one further embodiment, the cylinder cavity is provided with an inner lock control means arranged to be connected to the lock case by means of one or more cylinder bolts. The cylinder bolts extend through the inner lock control means and the lock case and are attached to the lock plate. One benefit of this embodiment is that is allows the alignment and arrangement of the inner lock control means together with the lock case.

[0022] In yet another embodiment, the lock case cavity is provided with an electronic lock case. The electronic lock case is beneficial since it enables electronic control of the lock case when e.g. no outside lock cylinder is present.

[0023] In one embodiment,the cylinder cavity is provided with an electronic lock cylinder. The electronic lock cylinder is beneficial since it enables electronic control of the lock case when e.g. no outside lock cylinder is present.

[0024] In a further embodiment, the door further comprises an electronic authentication means arranged on or in the second side portion. This is beneficial since it enables the electronic control of the door from the outside.

[0025] In a third aspect, a kit is provided comprising a lock plate and a door. The door comprises a first side portion, a second side portion and an intermediate portion located between the first and the second portion. Further to this, the door comprises a cylinder cavity extending through at least a part of at least one of the first side portion, the second side portion and the intermediate portion such that an outer surface of the second side portion is unaffected. Additionally, the door comprises a lock plate cavity formed in connection with the cylinder cavity wherein the lock plate is arrangeable in the lock plate cavity.

[0026] If nothing else is stated, features of different embodiments may be combined with each other.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] Embodiments of the invention will be described in the following; references being made to the appended diagrammatical drawings which illustrate non-limiting examples of how the inventive concept can be reduced into practice.

Fig. 1a is a front view of a prior art door;
Fig. 1b is a detail view of a the door in Fig. 1a;
Fig. 1c is a front view of a prior art lock case;
Fig. 2 is a cross section side view detailing the internal cavities of a prior art door;
Fig. 3 is a cross section side view of a prior art door with typical part of a prior art lock assembly arranged in cavities of the door;
Fig. 4 is a cross section side view of a door according to one embodiment;
Fig. 5 is a cross section side view of a one embodiment of a door according to an embodiment;
Fig. 6 is a cross section side view of a door according to one embodiment;
Fig. 7 is a cross section side view of a door according to one embodiment.
Fig. 8 is a cross section side view of a door according to one embodiment;
Fig. 9 is a cross section side view of a door according to one embodiment;

Fig. 10 is a cross section side view of a door according to one embodiment;
Fig. 11 is a cross section side view of a door according to one embodiment;
Fig. 12a is a top view of a lock plate according to one embodiment;
Fig. 12b is a top view of a lock plate according to one embodiment;
Fig. 12c is a top view of a lock plate according to one embodiment;
Fig. 13a is a side view of a lock plate according to one embodiment;
Fig. 13b is a side view of a lock plate according to one embodiment;
Fig. 13c is a side view of a lock plate according to one embodiment;
Fig. 13d is a side view of a lock plate according to one embodiment;
Fig. 13e is a side view of a lock plate according to one embodiment;
Fig. 14a is a cross section side view of a door according to one embodiment; and
Fig. 14b is a cross section side view of a door according to one embodiment.

DETAILED DESCRIPTION OF EMBODIMENTS

[0028] Hereinafter, certain embodiments will be described more fully with reference to the accompanying drawings. The invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided by way of example so that this disclosure will be thorough and complete, and will fully convey the scope of the invention, such as it is defined in the appended claims, to those skilled in the art.

[0029] The names of different parts comprising a door and a door lock may vary between countries and regions. Slight design modifications or slight functional changes will, in some cases merit, unique naming. This disclosure makes no attempts at naming all variants. Consequently, it should be understood that the function and/or purpose of a part or design detail is used for definition of a part or design detail, not the name of the part or design detail.

[0030] Fig. 1a shows a view from an inside I of a door 110 according to prior art. Together with Fig. 1a, a 3-axis coordinate system is shown indicating direction of an x-axis, a y-axis and a z-axis. The same coordinate system will be used throughout this disclosure to ease the understanding of the concept. The door 110 has its faces in an x-y-plane, its thickness along a z-axis, and opening of the door 110 would consequently cause a rotation around the y-axis.

[0031] Fig. 1a further details an inner lock cylinder 120, a thumb turn 130 and an inner handle 140, all known in the art. Variants of the door 110 are available in the art, where e.g. no inner lock cylinder 120 is present and the thumb turn 130 is in the position corresponding to the inner lock cylinder 120 in Fig. 1a.

[0032] Fig. 1b shows a close up of a portion of the door 110 further detailing a dead bolt 150 and a latch bolt 160.

[0033] A lock case 310 is presented in Fig. 1c detailing a lock cylinder engagement opening 20, a thumb turn engagement opening 30 and a handle engagement opening 40. Further to this, four lock case openings 10 and two handle bolt openings 170 are shown. The lock case 310 looks substantially the same if viewed from other side, or an outside O, i.e. rotated 180° around the y-axis or x-axis. One exception is the thumb turn engagement opening 30 which, in some variants, is only available on the inside I of the lock case 310. The lock cylinder engagement opening 20 is what the lock cylinders 120, 320 engage with to control the lock status of the lock case 310. The lock cylinder engagement opening 20 is available also on the outside O and this is what needs to be protected by e.g. a drill guard and/or a highly durable outer lock cylinder 320. Failing to protect the lock cylinder engagement opening 20 will enable unauthorized opening of the door 310 by means of e.g. a drill and a screwdriver. The thumb turn engagement opening 30 is engageable by the thumb turn 130 to lock/unlock the lock case from the inside I. The handle engagement opening 40 is engageable by the handles 140, 340 to retract the dead bolt 150 and the latch bolt 160. The lock case openings 10, shown as four openings in Fig. 1c, may in some embodiments be fewer or more than four. The lock case openings 10 are arranged to position and hold the lock cylinders 120, 320 in place by cylinder bolts 360. The cylinder bolts 360 extend through the lock case openings 10 to ensure that the lock cylinders 120, 320 are in connection with the lock case 310. The handle bolt openings 170 are arranged such that handle bolts 370 can be arranged through them, keeping the handles 140, 340 in position and in connection with the lock case 310 through the handle engagement opening 40.

[0034] In Fig. 2, a cross sectional view of the door 110 according to prior art is shown. The structure of the door is such that it is made up of a first side portion 250, a second side portion 260 and an intermediate portion 270. Also shown is an outer surface 260a, this is the surface of the second side portion 260 facing the outside O. A corresponding inner surface 250a is shown as the surface of the first side portion 250 facing the inside I. The different portions, 250, 260, 270 may be made from the same or different materials but the intention of the definition of the portions 250, 260, 270 is to ease the understanding of the disclosure and should not be construed as different materials or parts the door 110, 410. However, the different portions 250, 260, 270 may very well comprise different materials. Each portion 250, 260, 270 may be a separate material, a mix of materials or the same material as one or more of the other portions 250, 260, 270. The actual materials used for the different portions of the door 110 is out of the scope of this disclosure and are well known in the art. There may of course be more or fewer materials comprised in the door 110, the

door may be made from e.g. solid wood or layered with several different materials. All variants and constructions of a door 110 are considered covered by this disclosure although only a few are used when explaining the inventive concept.

[0035] The door 110 in Fig. 2 comprises four cavities 210, 220, 230, 240. A lock case cavity 210 is adapted to fit the lock case 310, a cylinder cavity 220 is adapted to fit the lock cylinders 120, 320 arranged with the door 110, a thumb turn cavity 230 is adapted to fit the thumb turn 130 and a handle cavity 240 is adapted to fit the handles 140, 340. Both the cylinder cavity 220 and the handle cavity 240 extend through the entire thickness of the door, i.e. along the z-axis in Fig. 2. In order to better detail the solutions presented, the cylinder cavity 220 is defined to comprise a first end portion 220a located in the vicinity of the first side portion 250 of the door 110 and a second end portion 220b located opposite the first end portion 220a, i.e. in the vicinity of the second end portion 220b of the door. Basically, these portions 220a, 220b are the end regions of the cylinder cavity 220.

[0036] Fig. 3 illustrates the same prior art door 110 as shown in Fig. 2 but with the addition of a prior art lock assembly arranged in the cavities 210, 220, 230, 240 of the door 110. The lock case cavity 210 is fitted with the lock case 310, the cylinder cavity 220 is fitted with the inner lock cylinder 120 and an outer lock cylinder 320. The outer lock cylinder 320 is protected by a drill guard 350 arranged around the circumference of the outer lock cylinder 320. The handle cavity 240 is fitted with the inner handle 140 and an outside handle 340. The thumb turn cavity 230 is fitted with the thumb turn 130. The lock assembly is arranged such that the handles 140, 340 control the latch bolt 160 comprised in the lock case 310. The lock cylinders 120, 320 and the thumb turn 130 may control the dead bolt 150, also comprised in the lock case 310. The control of latches and bolts is well known in the art. The lock cylinders 120, 320 are kept in connection with the lock case 310 by means of one or more lock cylinder bolts 360. The cylinder bolts 360 extend from a lock cylinder cover 380, mounted around the circumference of the inside cylinder 120, through the lock case 310 and the outer lock cylinder 320 and are fastened in the drill guard 350. The handles 140, 340 are kept in connection with the lock case 310 in a similar manner by one or more handle bolts 370.

[0037] Naturally, there are other variants of doors available but the general concept of the construction is similar between the variants. There are for instance assemblies that have no inside lock cylinder 120 and the thumb turn 130 may be fitted in the cylinder cavity 220 if no thumb turn cavity is present.

[0038] When electronic lock assemblies are replacing traditional keyed lock assemblies, one way may be to keep the same door 110 and arrange the electronic lock assembly in a manner similar to the arrangement of the traditional keyed lock. This greatly reduces the flexibility of the design of the electronic lock assembly and the burglary protection with e.g. drill guards may be difficult to fit.

[0039] In Fig. 4 a design of a novel door 410 for a lock assembly not requiring an outside cylinder 320 is shown. The novel door 410 is arranged such that there is no through hole forming the cylinder cavity 220, i.e. the second end portion 220b does not affect the outer surface 260a of the second side portion 260. This allows for the second side portion 260 to completely cover the cylinder cavity 220 presenting a flat, and/or continuous, outer surface 260a. The continuous outer surface 260a allows for greater design freedom in placing e.g. an electronic authentication means on the outside O of the novel door 410. The authentication means of an electronic lock may be described as corresponding to the outer lock cylinder 320 of a keyed lock assembly. It may be any kind of suitable authentication means e.g. one or more keypads with any number of keys or buttons, touch panels or screens, biometric readers, RFID readers, smart card readers or any combinations of these control means. Further to this, keyed lock assemblies without an outer lock cylinder 320 may be used without having to cover the opening created in the second side portion 260 by the cylinder cavity 220. The cylinder cavity 220 is terminated in a lock plate cavity 420 that extends along the z-axis, from the end of the cylinder cavity 220 towards the second side portion 260.

[0040] In Fig. 5 the novel door 410 is shown with a lock assembly without an outer lock cylinder 320 arranged in the cavities 210, 220, 230, 240 of the novel door 410. The inner lock cylinder 120 is replaced with an inner lock control means 530. The inner lock control means 530 may comprise e.g. the inner lock cylinder 120, a thumb turn actuator, a motor arranged to engage the lock cylinder engagement opening 20 or any other means suitable to engage the lock cylinder engagement opening 20.

[0041] Naturally, the lock assembly without an outer lock cylinder 320 may be any kind of lock assembly not requiring a through opening in line with the inner lock control means 530 e.g. an electronic lock assembly. In case of an electronic lock assembly, the inner lock cylinder may be an electronic lock cylinder and/or the lock case 310 may be an electronic lock case 310. Introduced together with the novel door is a lock plate 520 arranged in the lock plate cavity 420. The lock plate 520 allows for fastening of the cylinder bolts 360 when no outer lock cylinder 320 is present. The lock plate 520 may be any kind of plate arranged such that it enables the fastening of the cylinder bolts 360 and may comprise different materials and may be shaped in any size or form suitable for the lock plate cavity 420.

[0042] One variant of the lock plate 520 may be made of metal such that it protects the lock case 310 and acts as a drill protection or drill guard. This results in a combined drill protection and inner lock control means 530 fastening means, i.e. dual functionality of the lock plate 520.

[0043] As mentioned, the lock plate 520, and also the lock plate cavity 420, may be shaped in any size or form.

If the lock plate cavity 420 is shaped such that it extends beyond the cylinder cavity 220 and/or the lock case cavity 210, it is possible to arrange the lock plate 520 such that tightening of the cylinder bolts 360 will generate pressure between the lock plate 520 and a portion of the intermediate portion 270 rather than between lock plate 520 and the lock case 310. This is beneficial since it allows the lock case 310 to basically hang on the cylinder bolts 360 and the handle bolts 370 and will not be angled or skewed by the tightening of the cylinder bolts 360.

[0044] It should be mentioned, that the arrangement shown in Fig. 5, is shown not to have an intermediate portion 270 between the lock plate 520 and the lock case 310. Although this is true for this cross section in the y-z-plane, it may be that the lock plate cavity 420 and the lock plate 520 extend outside the cylinder cavity 220 along the x-axis. Additionally, the lock plate 520 may be shaped irregularly and may extend beyond the cylinder cavity 220 in other cross section around the x-axis. This will be seen in more detail later in the disclosure when different embodiments of the lock plate 520 is discussed. In the following sections, different, non-limiting, embodiments of novel doors 410 comprising the lock plate cavity 420 will be shown. These embodiments are just some possible implementations and are presented to give the reader a clue of the variability of the novel door 410.

[0045] The above given embodiment of the lock plate 520 configured to be arranged in the lock plate cavity 420 of the door 410 solves at least the before mentioned problems. Further to this, the flat outer surface 260a of the door 410 offers, in addition to improved weather sealing, no opportunity for burglars or alike to use e.g. mechanical lock-picks to pick the lock. Additionally, the flat outer surface 260a may be experienced as more esthetically pleasing compared to a standard prior art door 110.

[0046] With reference to Fig. 6, one embodiment of the novel door 410 is shown. In Fig. 6, the lock plate cavity 420 extends along the y-axis beyond the cylinder cavity 220. The lock plate cavity 420 may also extend outside the cylinder cavity 220 along the x-axis, although this is not shown in Fig. 6. The way the lock plate cavity 420 is formed in Fig. 6, it covers not only the cylinder cavity 220, but also the thumb turn cavity 230. As mentioned earlier, it may be that the thumb turn engagement opening 30 is available on both sides of the lock case 310. If this is the case, extending the lock plate cavity 420 to also cover the thumb turn engagement cavity 230 will enable the lock plate 520 to act as drill protection also for the thumb turn engagement opening 30. This design modification is of course possible to do on all embodiments of the lock plate cavity 420.

[0047] Fig. 7 illustrates one embodiment of the novel door 140, wherein the lock plate cavity 420 extends outside the cylinder cavity 220 in both a positive and a negative direction along the y-axis.

[0048] In Fig. 8 an embodiment of the novel door 410, wherein the lock plate cavity 420 is formed between the cylinder cavity 220 and the second side portion 260. In other words, there is no intermediate portion 270 between the lock plate cavity 420 and the second side portion 260. This arrangement may be easier to produce when compared to embodiments with intermediate portion 270 between the lock space cavity 420 and the second side portion 260. This is especially true if the intermediate portion 270 is of a different material than the second side portion 260.

[0049] Fig. 9 is an embodiment of the novel door 410 wherein the lock plate cavity 420 is formed directly adjacent (along the z-axis) the second side portion 260 and extends outside the cylinder cavity 220 in a positive direction along the y-axis.

[0050] In Fig. 10, the lock plate cavity 420 of the novel door 410 extends outside the cylinder cavity 220 in both a positive and a negative direction along the y-axis directly adjacent (along the z-axis) the second side portion 260.

[0051] Looking at Fig. 11 will reveal an embodiment of the novel door 410, wherein the lock plate cavity 420 extents outside the cylinder cavity 220 in a negative direction along the y-axis.

[0052] It should be pointed out again, that the embodiments of the novel door 410 in Fig. 4 to Fig. 11 are all described with illustrations relating to a y-z-plane. The lock plate cavity 420 may very well extend outside the width of the cylinder cavity 220 along either direction of the x-axis. This is valid for all presented embodiments. Such an arrangement will give rise to further variations and the skilled person understands that these variations are also covered by this disclosure.

[0053] Turning to Fig. 12a, an embodiment of a substantially rectangular lock plate 520 comprising two lock plate openings 1210 is shown. The lock plate 520 has a width w along the x-axis, a height h along the y-axis and a thickness d (not shown) along the z-axis. The lock plate openings 1210 are formed in the lock plate 520 such that the spacing between them, along the x-axis, is the same as corresponding openings in e.g. the inner lock control means 530, the lock case openings 10 and the lock cylinder cover 380. The number of openings in e.g. the inner lock control means 530, the lock case 310 and the lock cylinder cover 380 may very well be different, both from one another and from the number of openings in the lock plate 510. Important is that at least one, but preferably at least two openings of all the parts engaged by the cylinder bolts 360 align in the x-y-plane. The center to center spacing of the lock plate openings 1210 is typically 20 mm to 40 mm and preferably 30 mm with tolerances according to e.g. ISO2768. Having this spacing is beneficial since it makes it possible to fulfill e.g. relevant parts of the Swedish Standard 817375:2018 regarding openings and cavities of wooden doors. The lock plate openings 1210 may be threaded. In this case, the threading is adapted to the threading of the cylinder bolts 360. If the lock plate openings 1210 are not threaded, a nut or similar threaded fastening means may be arranged with the lock plate 520. The cylinder bolts 360 may be formed

with a snap-in connection at the end connecting to the lock plate 520. This type of cylinder bolts 360 may be used both with threaded and unthreaded lock plate openings 1210. The cylinder bolts 360 may alternatively be arranged with a bayonet type fitting and the lock plate openings 1210 adapted to receive a bayonet type fitting. In case the lock plate 520 is made to be arrangeable in a lock plate cavity 420 covering both the cylinder cavity 220 and the thumb turn cavity 230, additional openings may be provided on the lock plate 520 arranged to secure e.g. means to fasten the thumb turn 130.

[0054] As mentioned earlier, the lock plate 520 may be formed in numerous ways and Fig. 12b shows a substantially circular lock plate 520. The spacing of the lock plate openings 1210 is, as earlier described, adapted to fit e. g. the corresponding lock case openings 10.

[0055] The lock plate 520 depicted in Fig. 12b further comprises a reinforcement portion 1220. The reinforcement portion 1220 is a portion of the lock plate 520 made from e.g. a different material than the material of the lock plate 520, the same material as the lock plate 520 but with a different treatment or curing or the same material as the lock plate but with a different thickness. The reinforcement portion 1220 may be of a metal material, but may be of any material other than the material of the lock plate 520. By having the reinforcement portion 1220 arranged in the lock plate cavity 420 such that it is arranged in line with, along the z-axis, the lock cylinder engagement opening 20, the reinforcement portion 1220 will act as drill protection. This is beneficial when e.g. a large lock plate 520 is needed and it is considered too expensive to make the entire piece of a hardened material such as metal, but drill protection is still desired. The reinforcement portion 1220 shown as comprised in the lock plate 520 depicted in Fig. 12b may of course be comprised in any size, form or shape of a lock plate 520. Further to this, it is evident to the skilled person that the shape and form of the reinforcement portion 1220 can be adapted and varied in numerous ways. The reinforcement portion 1220 shown in Fig. 12b is just one of all possible embodiments. The lock plate 520 may be provided with several reinforcement portions. This is beneficial for example if several areas need enhanced protection.

[0056] Fig. 12c illustrates another embodiment of the lock plate 520 with a more irregular shape that may be suitable for some arrangements of the novel door 410. This shape is described with a first width w_1, a second width w_2, a first height h_1 and a second height h_2. It may also include more than one thickness d but this is not shown in Fig. 12c. Further widths and heights and distributions of the widths and heights are possible in other embodiments.

[0057] The lock plate openings 1210 may be openings extending through the lock plate 520 but may also be threaded or unthreaded openings, e.g. blind holes, of a certain depth that is less than the thickness d of the lock plate 520 at the location of the opening. The actual depth will depend on e.g. the threading and the expected force used for tightening the cylinder bolts 360 and the tolerance of the length of the cylinder bolts 360. Typically, the depth of these openings extend at least a portion of the thickness d of the lock plate 520 at the location of the opening. In some embodiments, they are blind holes that extend at least one third of the thickness d of the lock plate 520 at the location of the opening. In some embodiments, they are blind holes that extend at least half of the thickness d of the lock plate 520 at the location of the opening. Having the lock plate openings 1210 shaped as blind holes is beneficial since the lock plate 520 will present a flush outer O surface that is more difficult to e. g. attack with a drill. In some embodiments they extend the full thickness d of the lock plate 520 at the location of the opening, i.e. they are through holes all the way through the lock plate 520. Having the lock plate openings 1210 shaped as through holes is beneficial due to the tolerance of the length of the cylinder bolts 360. Further to this, although the embodiments shown in Figs 12a to 12c all have two lock plate openings 1210, the number of lock plate openings 1210 may vary and should be interpreted as one or more lock plate openings 1210. It may be that the lock plate 520 comprises more lock plate openings 1210 than certain variants of e.g. inner lock control means 530, lock bodies 310 or lock cylinder covers 380. This will allow for the usage of the same lock plate 520 with many different variants of lock assemblies.

[0058] In Fig. 13a, a side view of one embodiment of the lock plate 520 is depicted. The lock plate 520 is, as in previous Figs described with a height h along the y-axis, a thickness d along the z-axis and a width w along the x-axis (not shown). In this embodiment, the lock plate 520 is substantially rectangular in the y-z-plane, which will allow for cheap and easy design and manufacturing.

[0059] In another embodiment, illustrated in Fig. 13b, the lock plate 520 is formed to an substantially conical shape. In this embodiment, the thickness d measures a peak at a center point along the y-axis and declines linearly towards the end points along the y-axis. By arranging the tip of the conical lock plate 520 substantially in line with the cylinder engagement opening 20 of the lock case 310, the drill protection provided by the lock plate 520 is greatly improved since it will be very difficult to center a drill on the tip of the conical lock plate 520. This embodiment will benefit extra from having the lock plate openings 1210 formed as blind holes rather than through holes since it will further increase the difficulty of drilling through the lock plate 520 from the outside O.

[0060] With reference to Fig. 13c, an embodiment of the lock plate 520 is shown where a section of the lock plate 520 is substantially conical. This results in the lock plate 520 having at least a first thickness di and a second thickness d_2, wherein the first thickness di is greater than the second thickness d_2. As with the previous embodiment, this arrangement increases the drill protection but has the further benefit of not having the thickness (along the z-axis) of the lock plate 520 increase with the area (in the x-y-plane) of the lock plate 520. Additionally, it

allows for increased drill protection even with uniform and irregular shapes of the lock plate 520, e.g. the lock plate described with reference to Fig. 12c.

[0061] In embodiments wherein the lock plate 520 and the lock plate cavity 420 are formed and arranged such that the lock plate 520 covers both the cylinder cavity 220 and the thumb turn cavity 230, the lock plate 520 may be arranged with at least a third thickness (not shown). The third thickness is also greater than the second thickness and it will be beneficial to arrange the third thickness substantially in line with the thumb turn engagement opening 30.

[0062] It should be understood that, although the wording thumb turn engagement opening 30 is used, at least in the sections relating to drill protection, this should be interpreted as meaning any additional section of a lock case 310 in need of additional drill protection. This means e.g. protection of certain sensitive pins or parts in mechanical lock cases 310, electrical components in electrical lock cases 310 etc.

[0063] It is not shown in any of the Figs 13a-e, but these lock plates 520 may of course comprise the reinforcement portion 1220. In Fig. 13c, it may be that the region of the lock plate 520 with a greater thickness di is the reinforcement portion 1220 or comprises the reinforcement portion 1220.

[0064] The shapes described with reference to Figs 13b and 13c are described as substantially conical but the skilled person understands that the actual shape of the lock plate 520 can differ in numerous ways. The increased drill protection is achieved with any shape that has a peak in z-axis thickness in line with, or substantially in line with the cylinder engagement opening 20. The variation of the thickness from the peak can be done e. g. linearly like a cone or a pyramid, exponentially in a convex manner like e.g. a partial sphere, see Fig. 13d, or in a concave manner as shown in Fig. 13e.

[0065] Fig. 14a illustrates another embodiment of the novel door 410 where the inner surface 250a covers the cylinder cavity 220. The lock case 310 is protected by a lock plate 520 and the lock plate 520 is used to connect the inner lock control means 530 to the lock case 310 in a similar manner as described before. As described previously with regards to the outer surface 260a with reference to Fig. 4, the arrangement in Fig. 14a with the continuous inner surface 250a allows for greater design freedom in placing e.g. an electronic authentication means on the inside I of the novel door 410.

[0066] A further version along the same design is shown in Fig. 14b, where also the thumb turn cavity 240 is covered by the inner surface 250a.

[0067] It should be noted that several embodiments of the novel door has been shown and some embodiments have cavities that appear to be empty. These cavities may of course be fitted with e.g. electronic devices, batteries etc. They may also be filled with a suitable material and consequently removed.

[0068] Some of the embodiments have been shown as having the lock plate cavity 420 adjacent to the lock case cavity 210. It may very well be that the cylinder cavity extends between the lock case cavity 210 and the lock plate cavity creating a space between the lock plate 520 and the lock case 310. This space may be used to arrange e.g. electronic devices, batteries etc.

[0069] The lock plate cavity 420 and the lock plate 520 may be arranged such that the lock plate 520 is built into the door 410. This would mean that there is no way to remove the lock plate 520 from the lock plate cavity 420 without disassembling the door 410.

[0070] The lock plate cavity 420 may, in any of the mentioned embodiments, be formed such that a lock plate 520 is arrangeable in the lock plate cavity 420 after the door 410 is completed. This may be achieved by e.g. inserting the lock plate 520 into the lock plate cavity 420 through the lock case cavity 210 or the cylinder cavity 220 depending on the shape of the lock plate 520. This will allow for a kit comprising a lock plate 520 arrangeable in a lock plate cavity 420 of a door and a door 410 with a lock plate cavity 420 arranged to receive a lock plate 520 to be provided.

Claims

1. A door, comprising:

   a first side portion (250), a second side portion (260) and an intermediate portion (270) located between the first (250) and the second (260) portion;
   a cylinder cavity (220) extending through at least a part of at least one of the first side portion (250), the second side portion and the intermediate portion (270) such that an outer surface (260a) of the second side portion (260) is unaffected;
   a lock plate cavity (420) formed as a termination of the cylinder cavity (220); and
   a lock plate (520) arranged in the lock plate cavity (420), the lock plate (520) comprising one or more lock plate openings (1210) arranged to receive one or more cylinder bolts (360) extending through one or more lock case openings (20) of a lock case (310) arranged in the door (410).

2. The door according to claim 1, wherein the cylinder cavity (220) extends at least partly through the intermediate portion (270) of the door (410).

3. The door according to claim 3, wherein the cylinder cavity (220) extends through the first side portion (250) and at least partly through the intermediate portion (270).

4. The door according to any of the claims 1-3, wherein the cylinder cavity (220) comprises a first end portion (220a) located in the vicinity of the first side portion

(250) of the door (410), and a second end portion (220b) located opposite the first end portion (220a), and wherein the lock plate cavity (420) is formed in connection with the second end portion (220b).

5. The door according to any of the claims 1-4, wherein the lock plate cavity (420) has a larger extension in a plane of the second side portion (260) compared to the cylinder cavity (220).

6. The door according to any of claim 1-5, further comprising a lock case cavity (210) arranged with a lock case (310), wherein the lock case (310) comprises one or more lock case openings (10), wherein the arrangement of the lock case (310) is such that at least one of the lock plate openings (1210) of the lock plate (520) is aligned with at least one of the lock case openings (10) of the lock case (310).

7. The door according to claim 6, wherein the cylinder cavity (220) is provided with an inner lock control means (530) arranged to be connected to the lock case (310) by means of one or more cylinder bolts (360), wherein the cylinder bolts (360) extend through the inner lock control means (530) and the lock case (310) and are attached to the lock plate (520).

8. The door according to any of claim 6 or 7, wherein the lock case cavity (210) is provided with an electronic lock case.

9. The door according to any of claim 1 to 8, wherein the cylinder cavity (220) is provided with an electronic lock cylinder.

10. The door according to any of claims 8 or 9, further comprising an electronic authentication means arranged on or in the second side portion (260).

11. A kit comprising a lock plate (520) and a door (410), wherein the door (410) comprises:

a first side portion (250), a second side portion (260) and an intermediate portion (270) located between the first (250) and the second (260) portion;
a cylinder cavity (220) extending through at least a part of at least one of the first side portion (250), the second side portion and the intermediate portion (270) such that an outer surface (260a) of the second side portion (260) is unaffected; and
a lock plate cavity (420) formed in connection with the cylinder cavity (220);
the lock plate (520) comprising one or more lock plate openings (1210) arranged to receive one or more cylinder bolts (360) extending through one or more lock case openings (10) of a lock case (310) arranged in the door (410), and wherein the lock plate (520) is arrangeable in the lock plate cavity (420).

12. The kit according to claim 11, wherein the lock plate openings (1210) are threaded lock plate openings (1210).

13. The kit according to claim 11 or 12, wherein the lock plate (520) further comprises a reinforcement portion (1220) arranged such that drill protection of at least one lock cylinder engagement opening (20) of the lock case (310) is achieved when the lock plate (520) is arranged in the lock plate cavity (420) of the door (410).

14. The kit according to any of the claims 11 to 13, wherein the lock plate (520) is shaped with at least two thicknesses (d_1, d_2), wherein a first thickness (d_1) is greater than a second thickness (d_2) wherein the first thicknesses (d_1) is formed at a portion of the lock plate (520) substantially in line with the lock cylinder engagement opening (20) and/or a thumb turn engagement opening (30) of the lock case (310) when the lock plate (520) is arranged in the lock plate cavity (420) of the door (410).

15. The kit according to any of the claims 11 to 14, wherein said one or more lock plate openings (1210) are two lock plate openings (1210) formed with a center to center spacing of 20 mm to 40 mm, preferably 30 mm.

16. The kit according to any of the claims 11 to 15, wherein the lock plate openings (1210) are blind holes extending through more than one third of the thickness (d) of the lock plate (520) at the location of the lock plate openings (1210).

17. The kit according to any of the claims 11 to 15, wherein the lock plate openings (1210) are through holes.

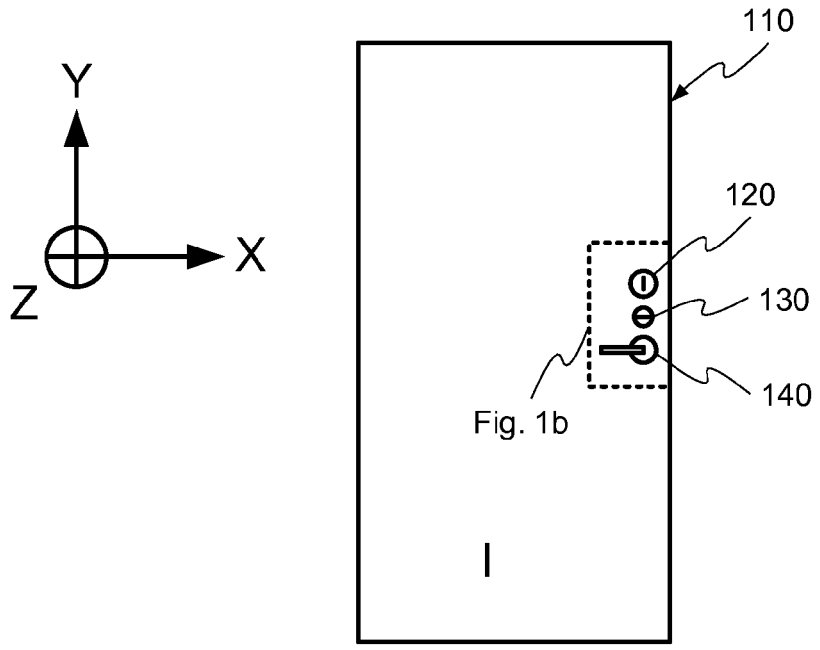

Fig. 1a
(Prior art)

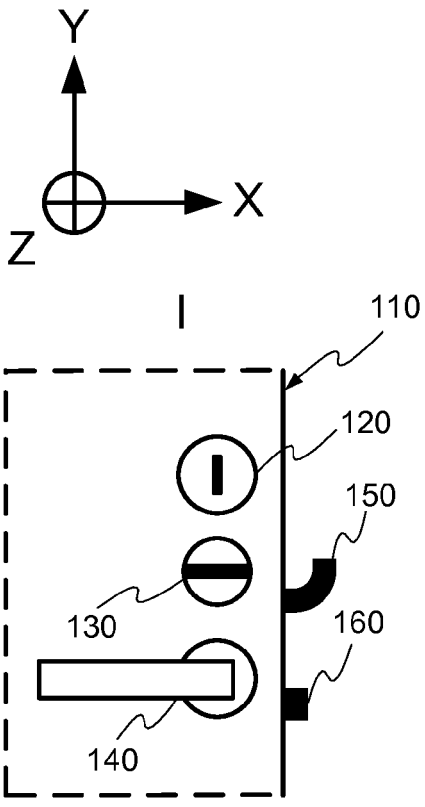

Fig. 1b
(Prior art)

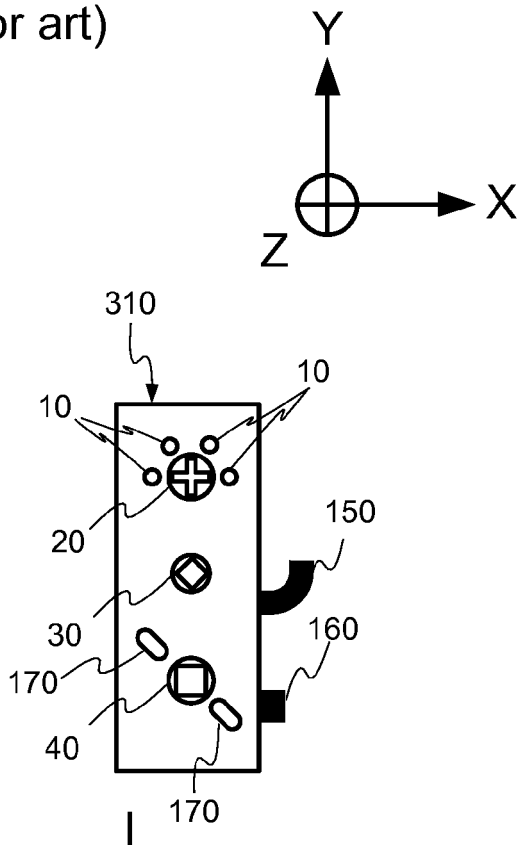

Fig. 1c
(Prior art)

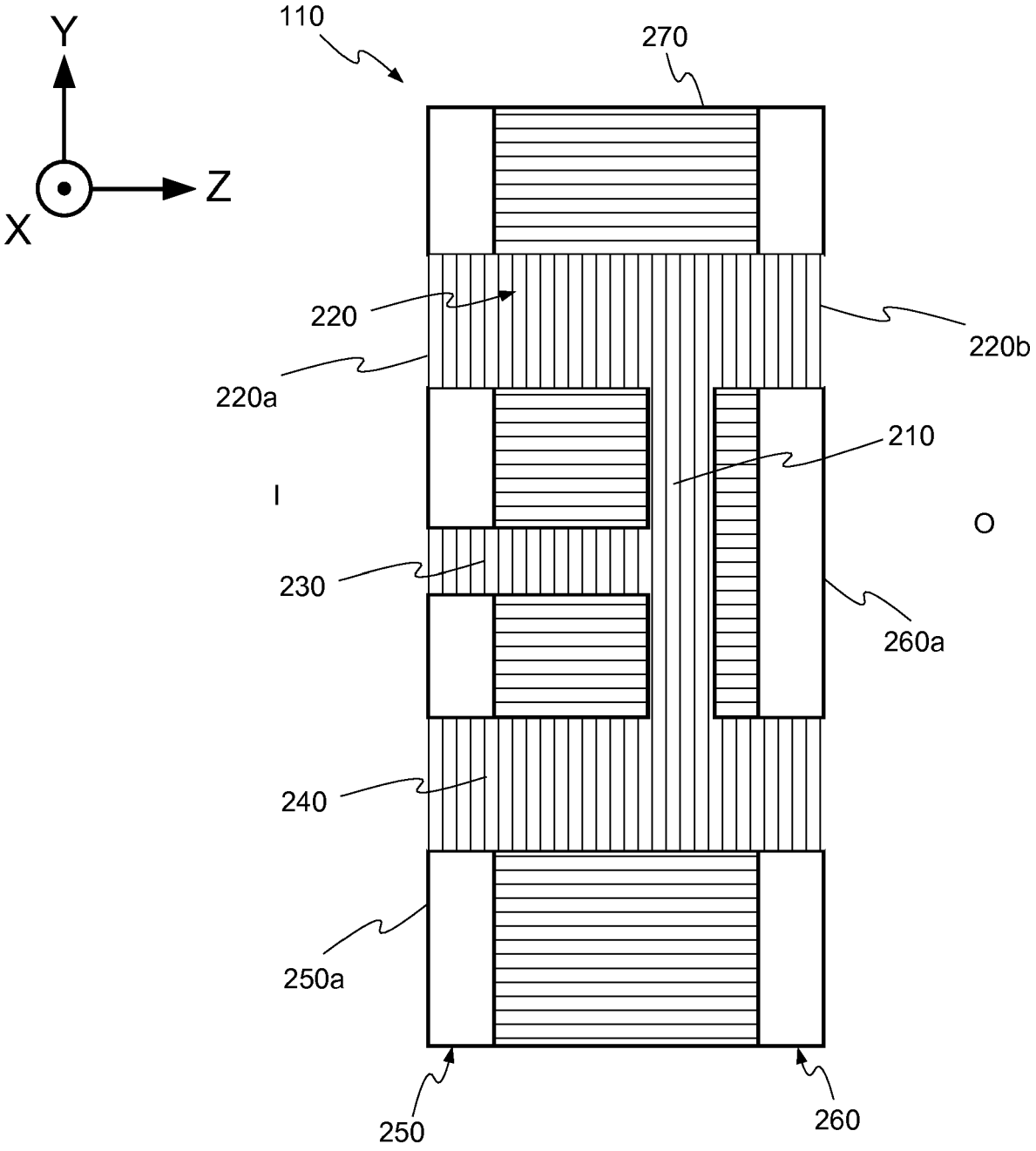

Fig. 2
(Prior art)

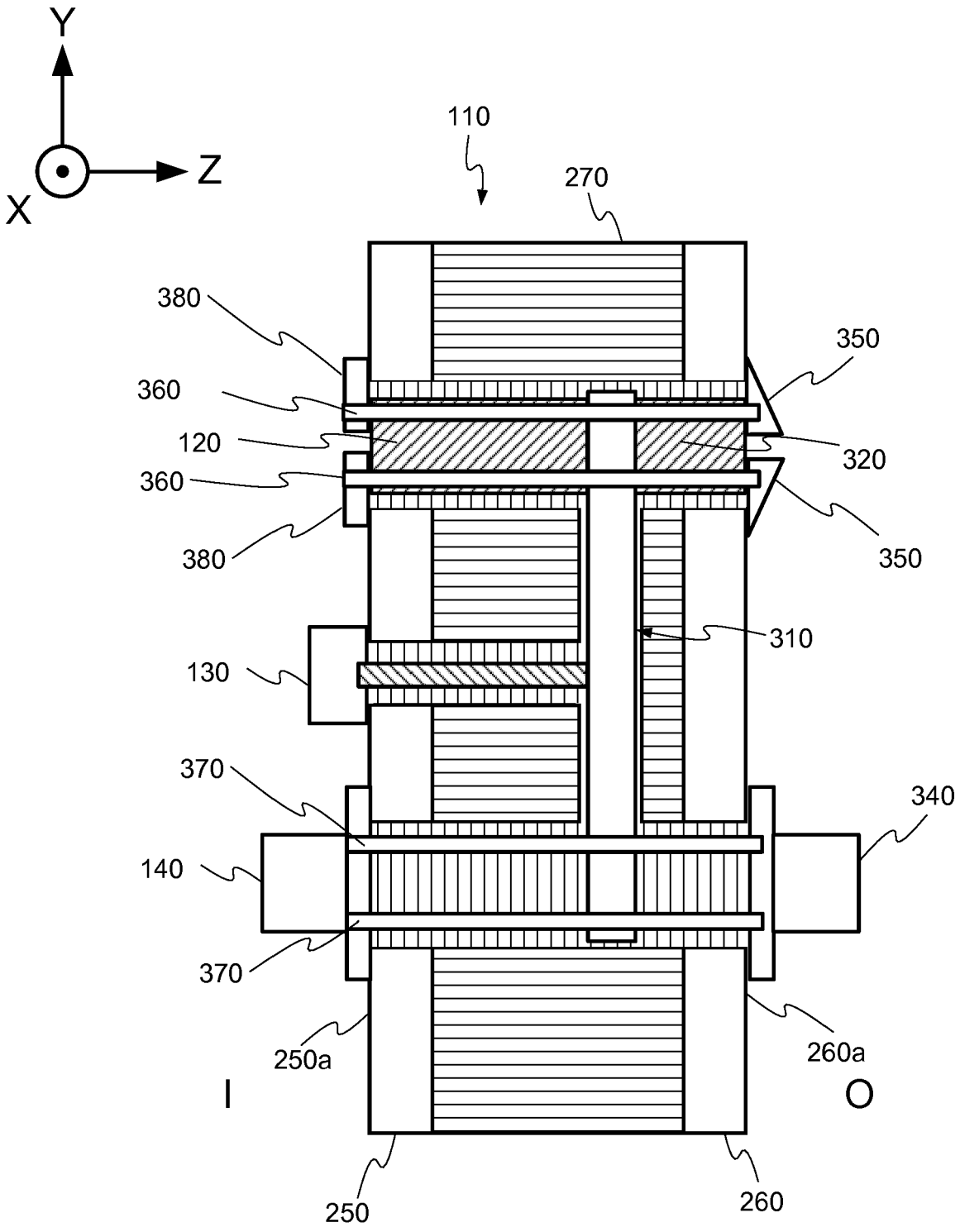

Fig. 3
(Prior art)

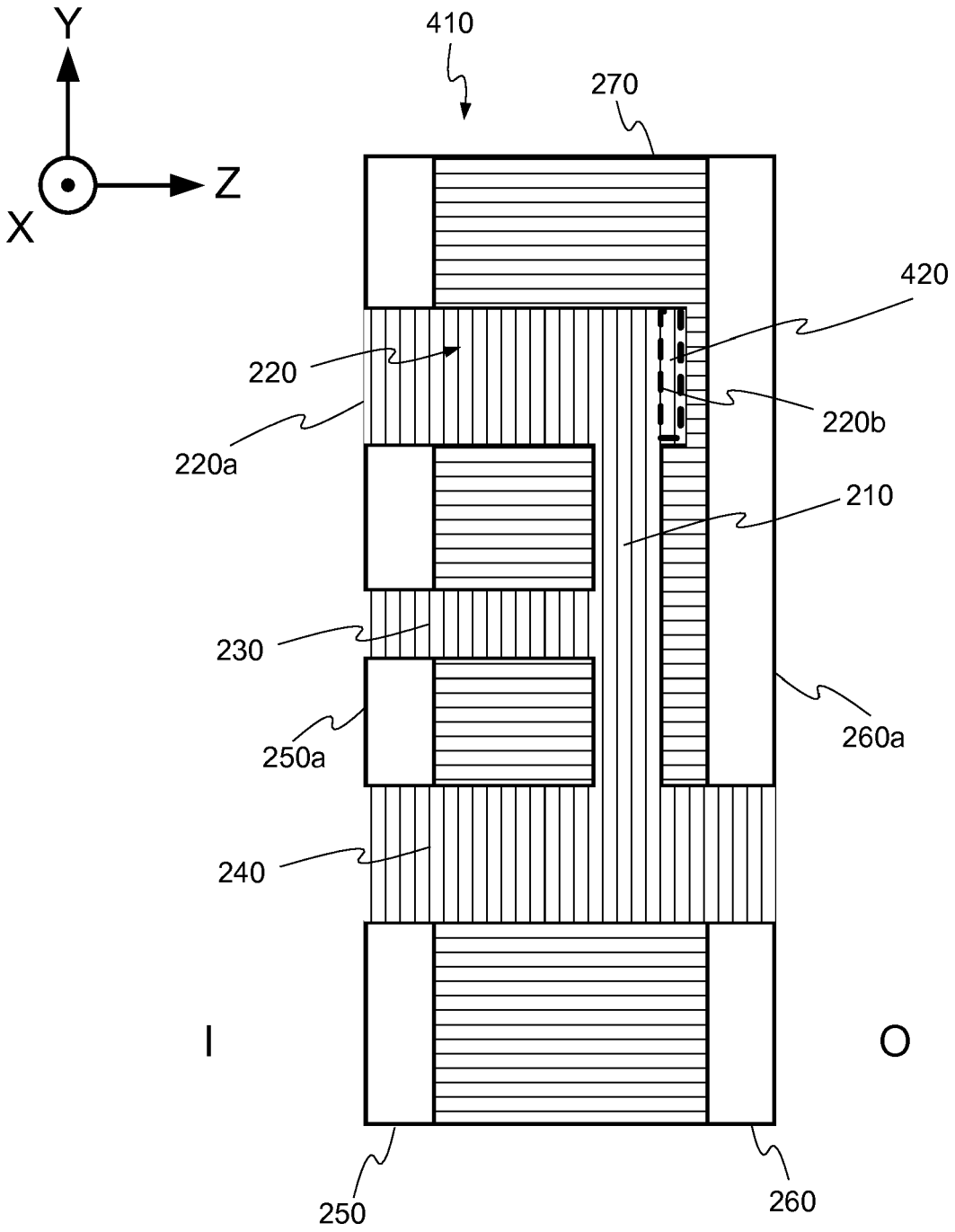

Fig. 4

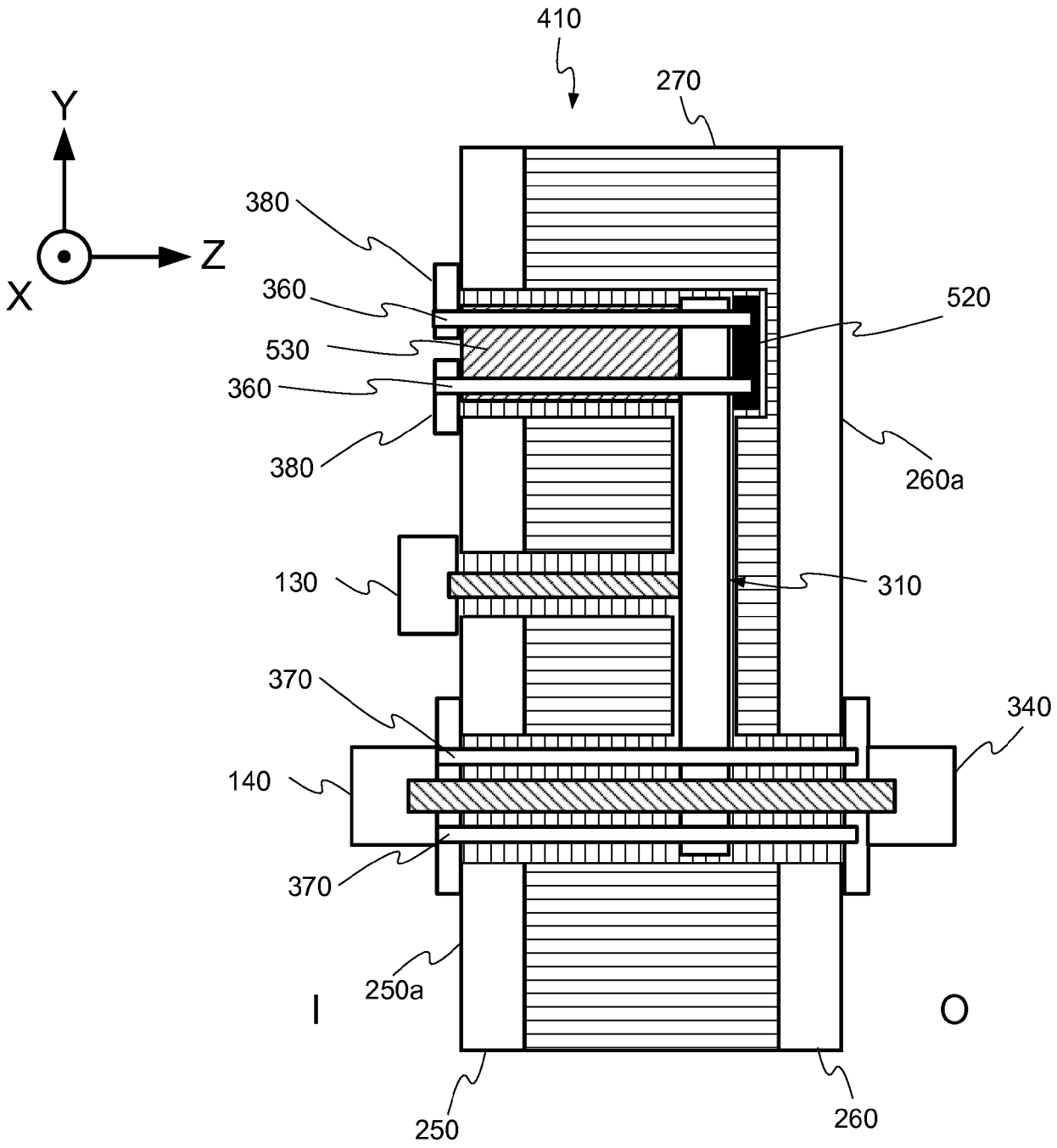
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Fig. 5

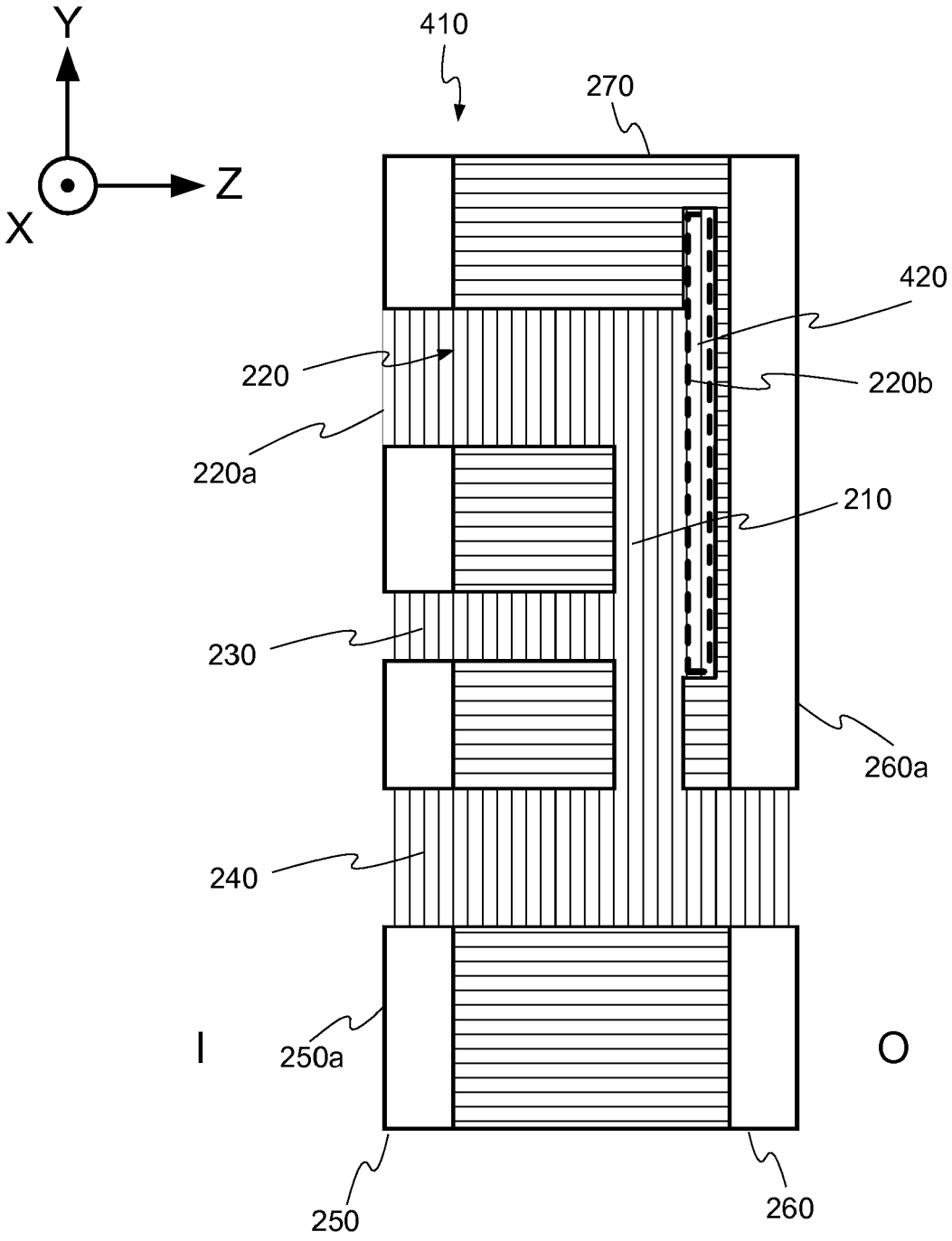

Fig. 6

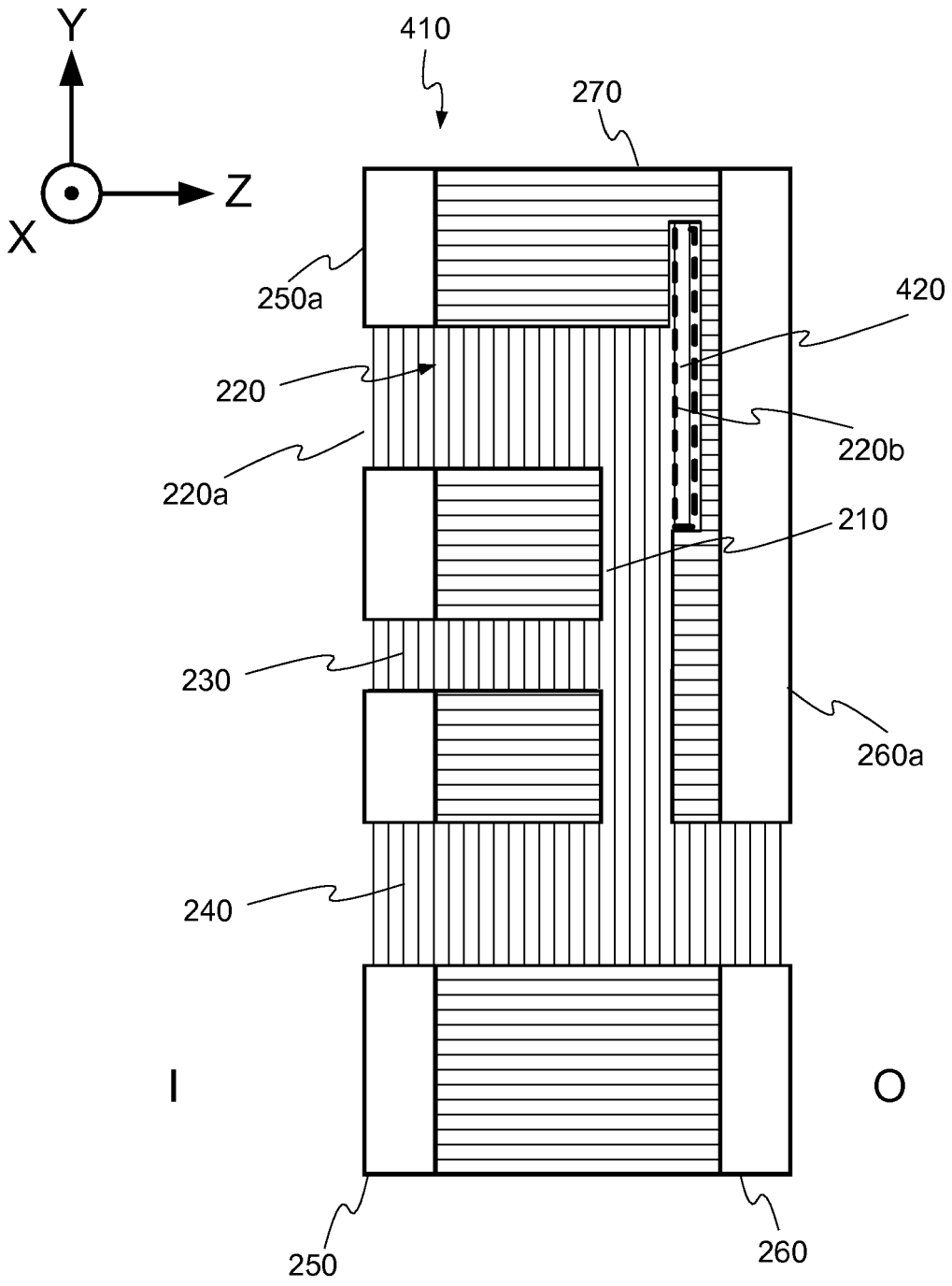

Fig. 7

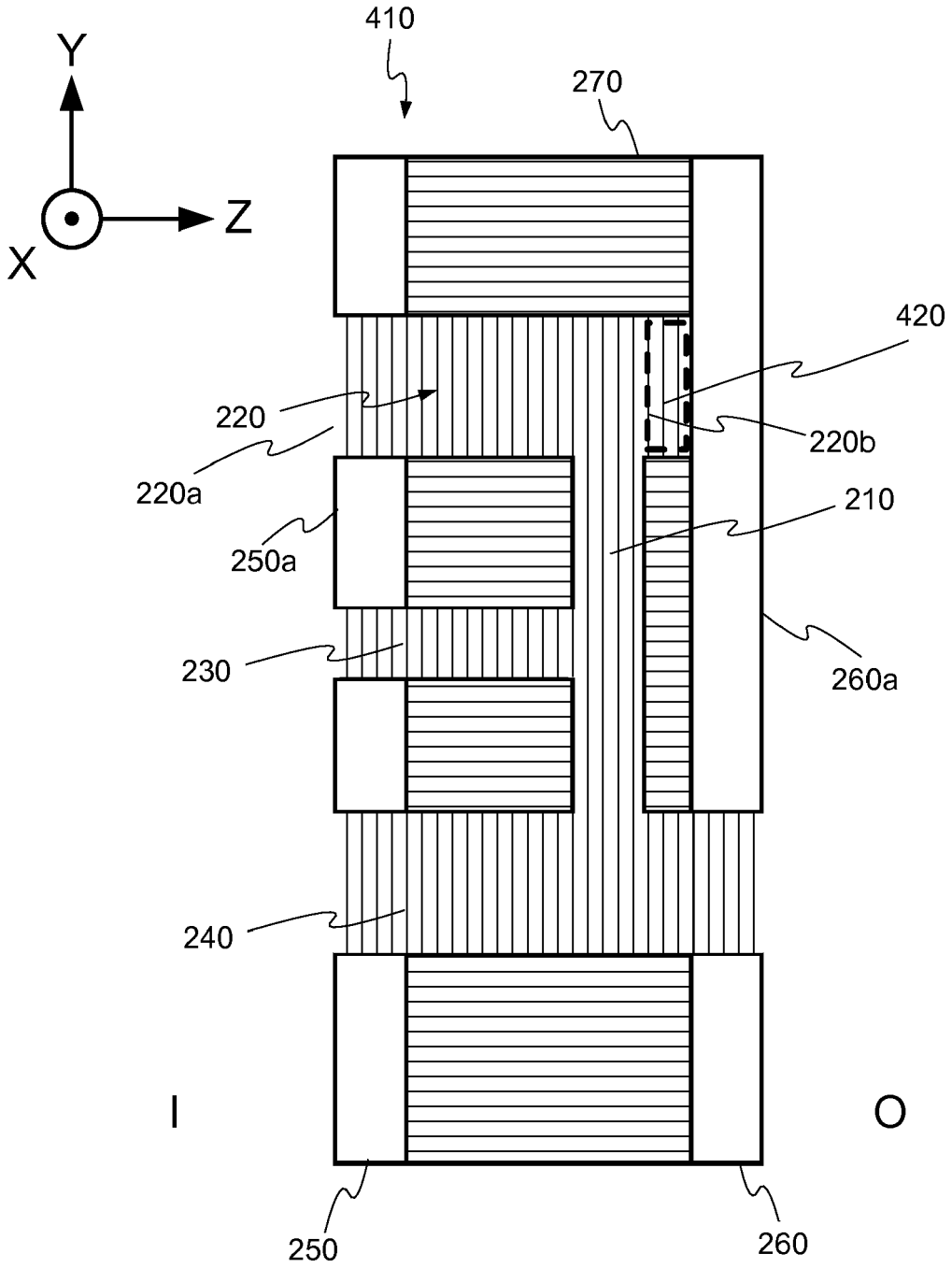

Fig. 8

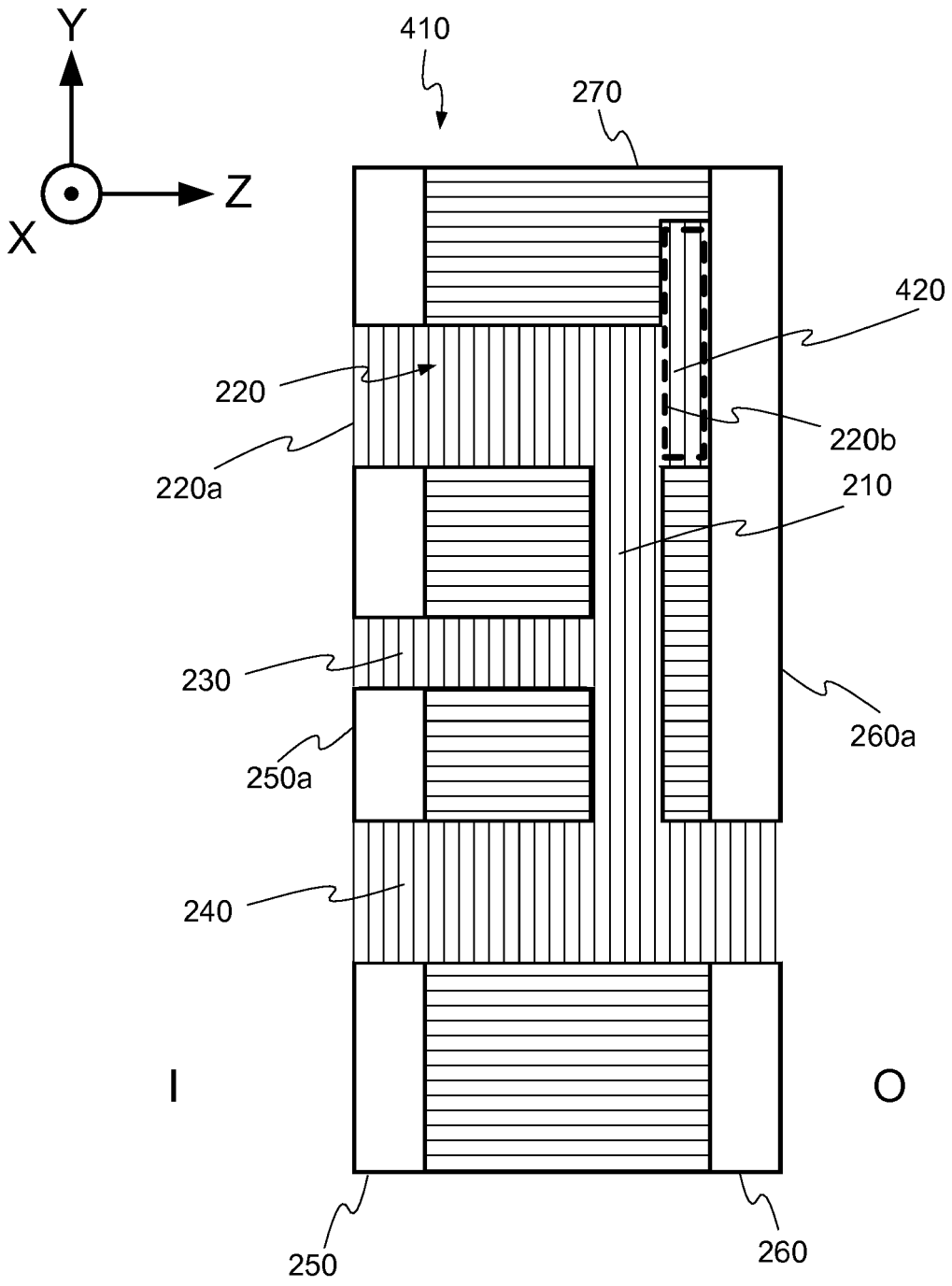

Fig. 9

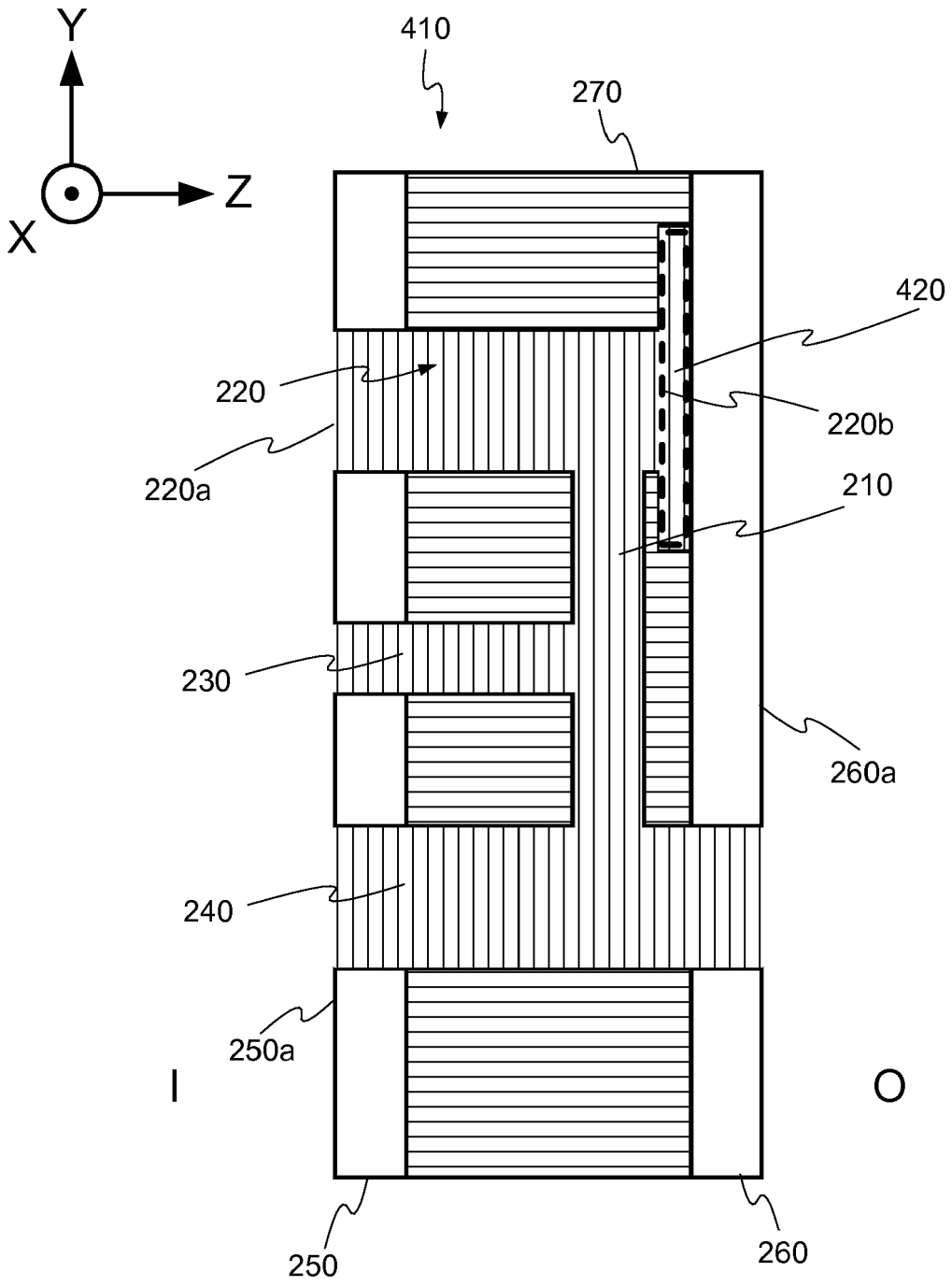

Fig. 10

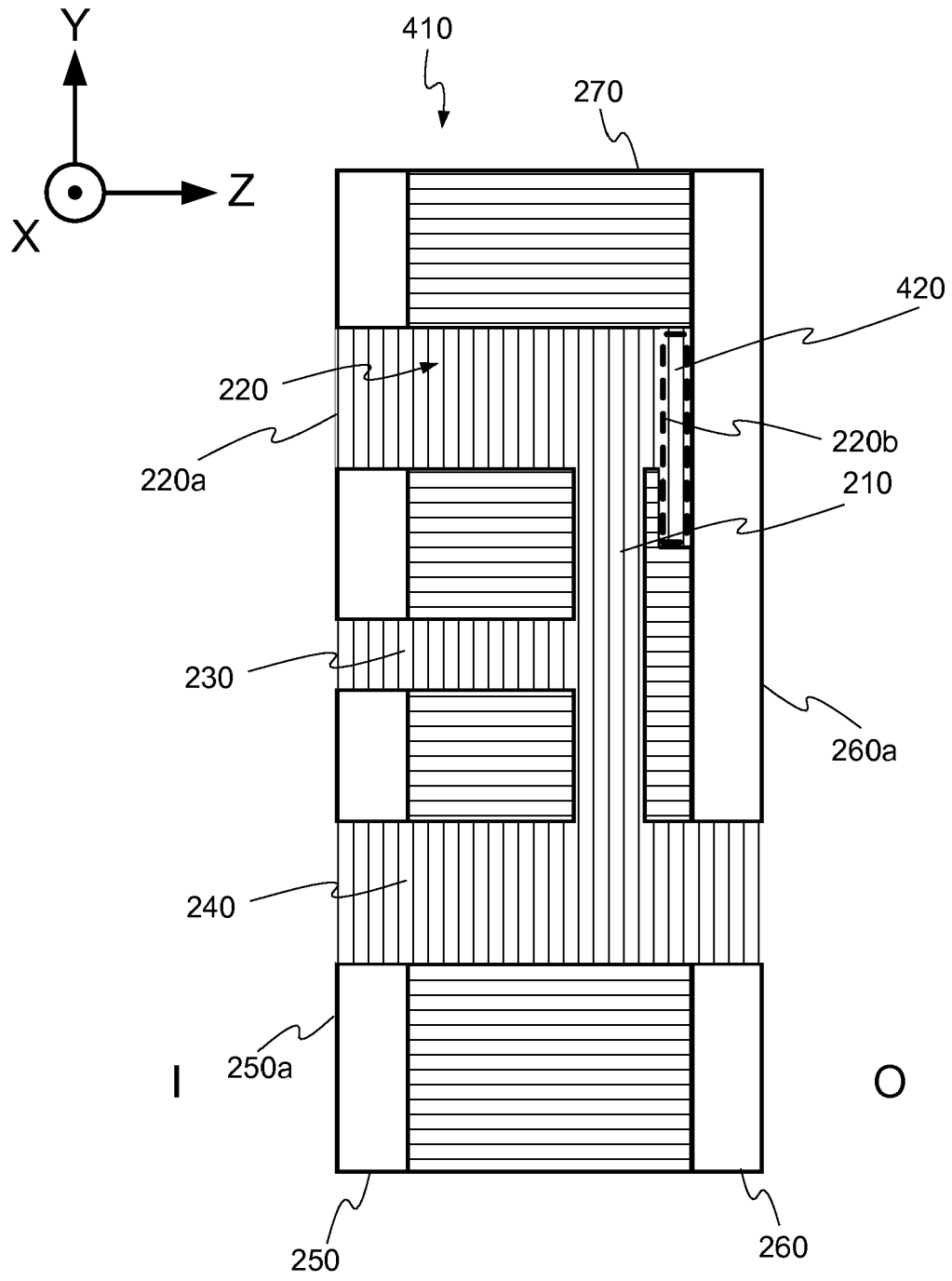

Fig. 11

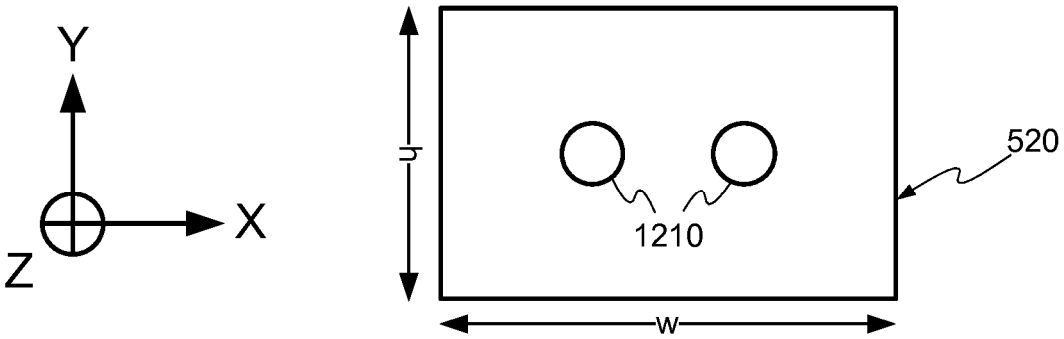

Fig. 12a

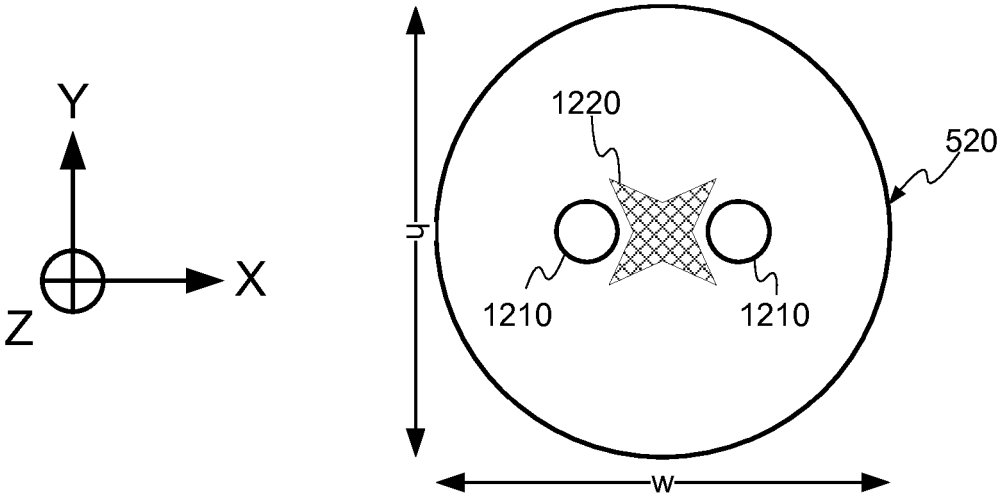

Fig. 12b

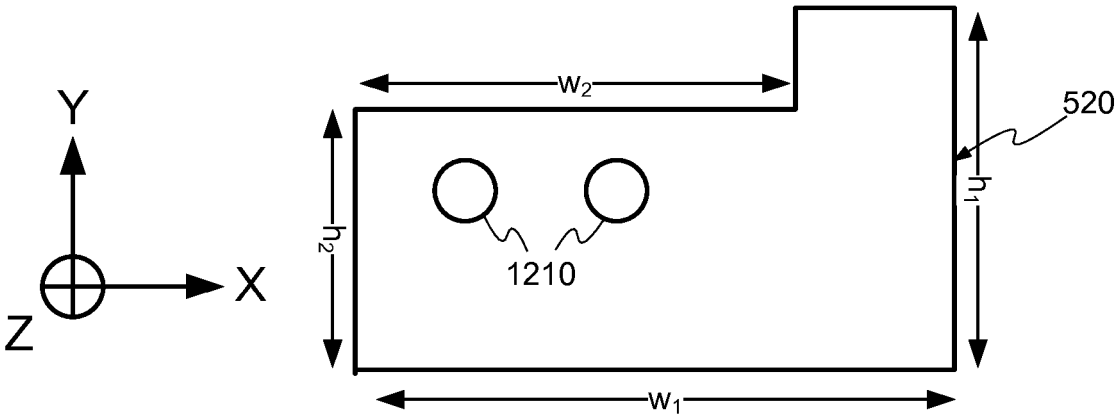

Fig. 12c

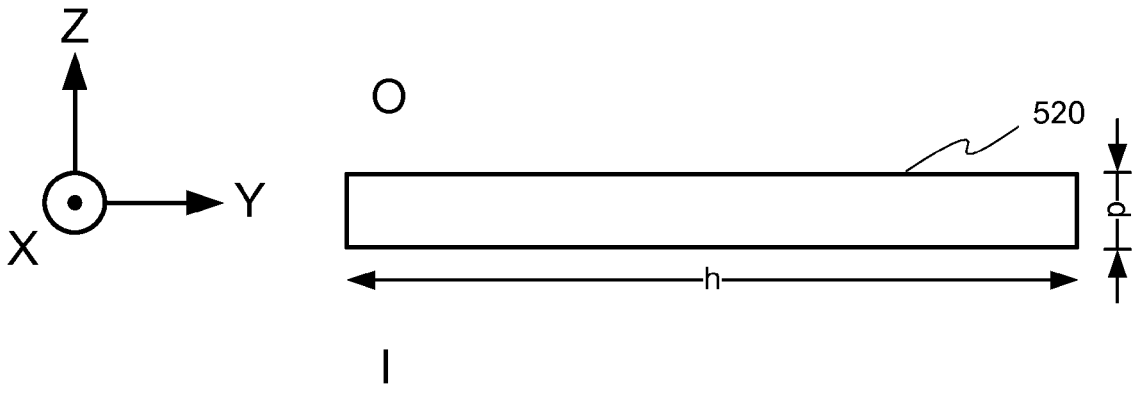

Fig. 13a

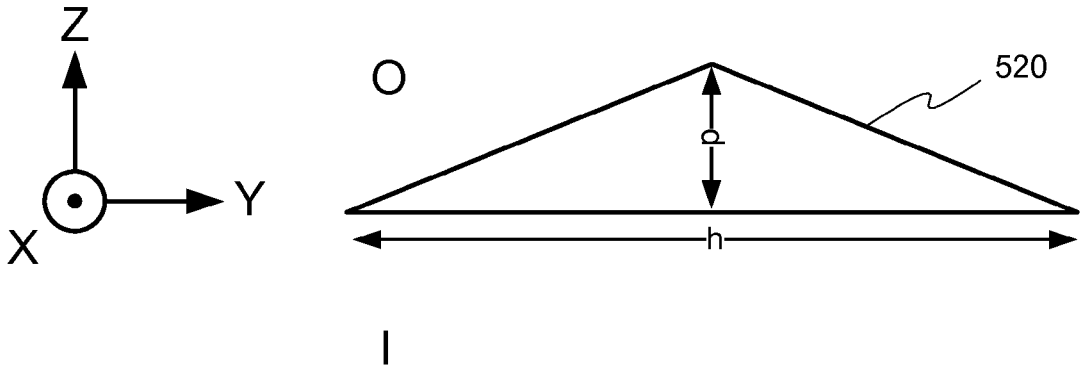

Fig. 13b

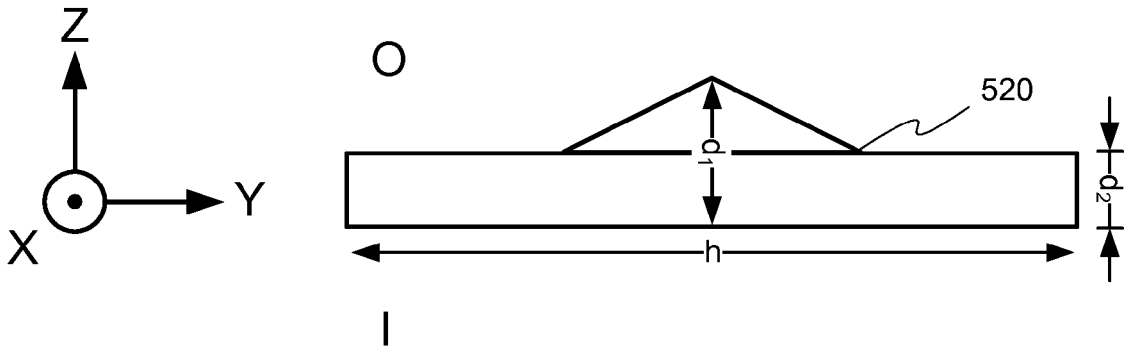

Fig. 13c

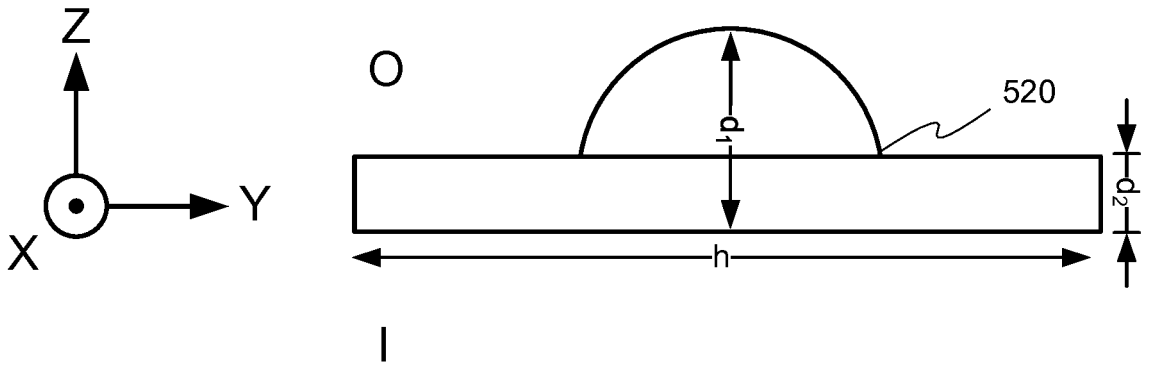

Fig. 13d

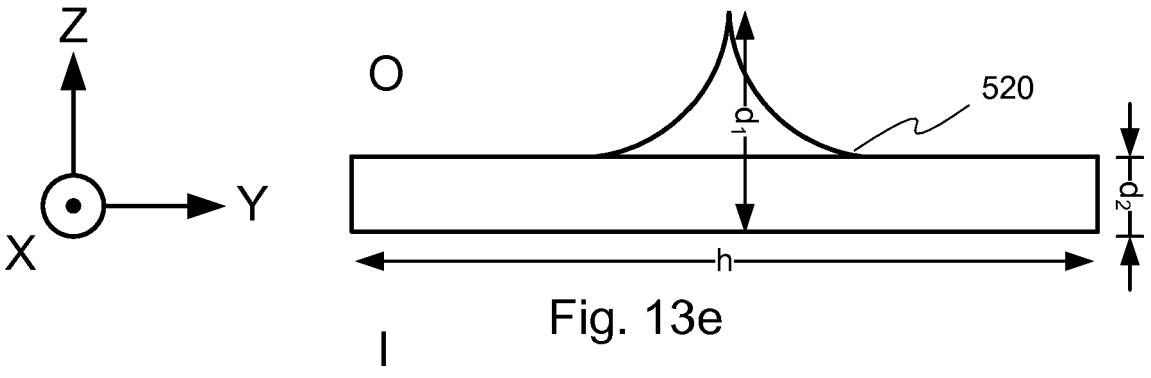

Fig. 13e

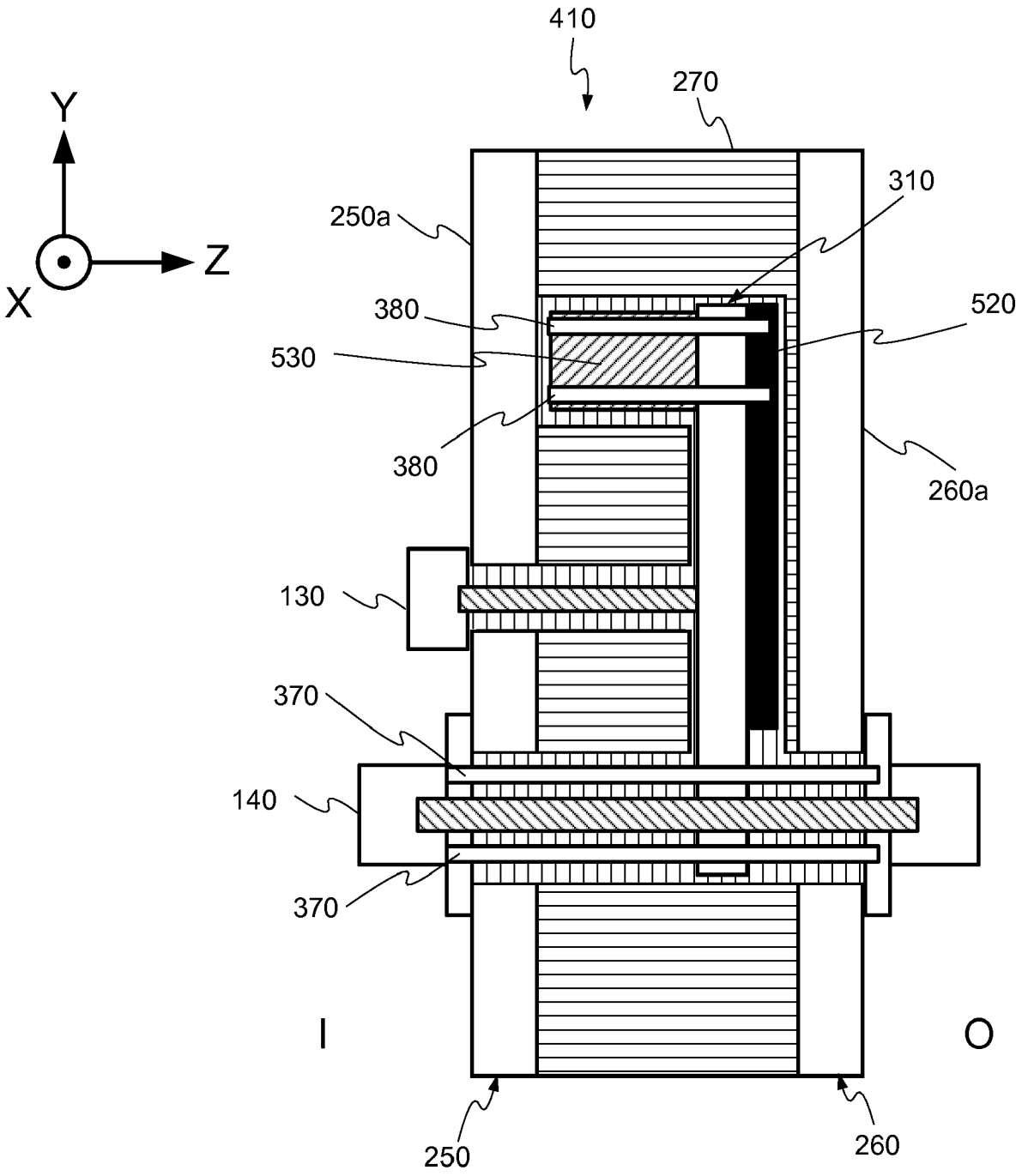
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Fig. 14a

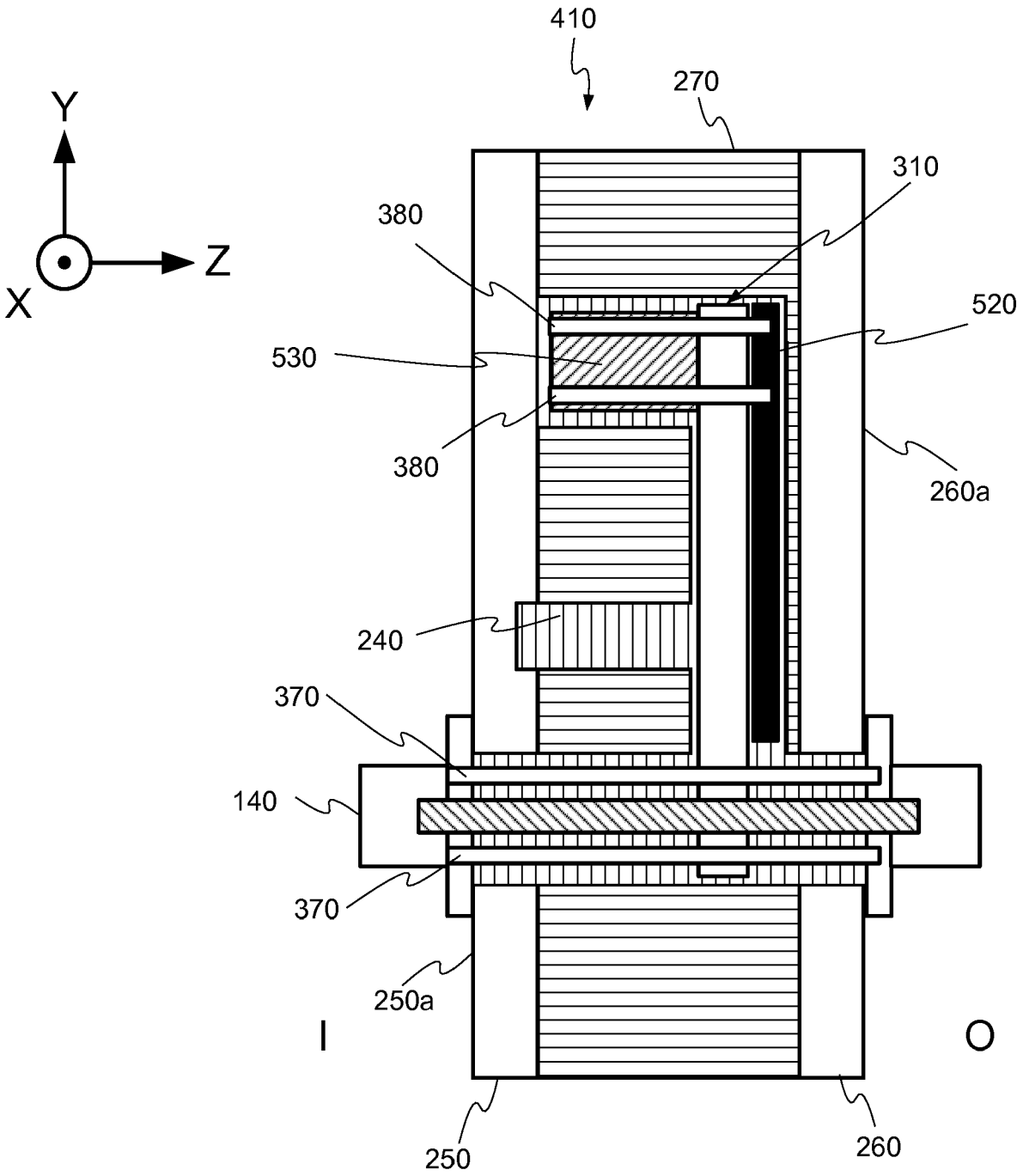
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Fig. 14b

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EUROPEAN SEARCH REPORT

Application Number
EP 19 18 4612

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	FR 491 432 A (VINCENT JOSEPH MARIE ERAS [NL]; HENRICUS JOHANNES JOSEPHUS MAR [NL]) 3 June 1919 (1919-06-03) * the whole document *	1-5, 11-17 6-10	INV. E05B15/16 E05B9/08 ADD. E05B49/00
A	DE 20 2011 106902 U1 (ECO SCHULTE GMBH & CO KG [DE]) 16 February 2012 (2012-02-16) * paragraphs [0027] - [0036]; figures 1-2c * -----	1-17	
A	CH 593 407 A5 (SCHNEIDER FRANZ WESTFAELISCHES) 30 November 1977 (1977-11-30) * the whole document * -----	1-17	
A	GR 1 007 495 B (NIKOLOUDAKIS DIMITRIOS ANTONIOU [GR]) 23 December 2011 (2011-12-23) * abstract; figures 4, 5 * -----	1-17	
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A	GB 2 501 720 A (ASKEW JAMES [GB]) 6 November 2013 (2013-11-06) * abstract; figures 1-7 * -----	1-17	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	27 November 2019	Boufidou, Maria

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27-11-2019

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