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Lock.

A lock 2 is described having an escutcheon 4 with a key opening 18 of a first non-circular cross section. A housing 8 is disposed behind the escutcheon 4 and fixed thereto with a fixing stud 12 and fixing socket 14 arrangement secured with bolts. A cylinder 10 is rotatably mounted within the housing 8. The cylinder 10 has a cylinder socket 20 of a non-circular cross section aligned behind the key opening 18. A cylinder stud 40 is positioned within the cylinder socket 20. A key having a key tip 78 shaped to pass through the key opening 18 whilst receiving the cylinder stud 40 within a key socket 84 in the key tip is provided. When the key has been inserted to an appropriate depth, a groove 86 in the key shank 76 aligns with the key opening 28 so that the key may be rotated to rotate the cylinder 10. A deadlocking mechanism is provided by axial movement of the cylinder stud 40 urging locking pins 64 passing radially through the cylinder into and out of engagement with indentations 70 in the housing 8. The lock 2 is particularly suitable for use in outdoor cabinets.

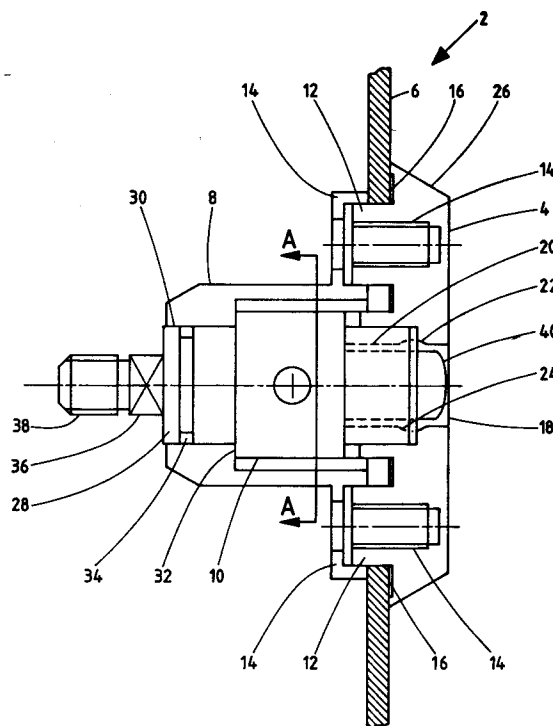


Fig.1

This invention relates to the field of locks.

Lock making is an ancient and mature technical field. There are a large number of different forms of lock known of which many are specially adapted for use in particular situations.

One particularly harsh environment for locks is in use on outdoor cabinets. Such outdoor cabinets are typically situated in exposed roadside positions and house expensive and critical electronic equipment such as digital telephone circuitry and traffic signal control systems. As well as being an environmentally harsh environment requiring high degrees of water and dust resistance, locks used in such situations must be resistant picking and forcing so as to prevent unauthorised access to the contents of the cabinet. The locks must also be resistant to vandalism which would prevent it being opened by an authorised person with the proper key.

Viewed from one aspect this invention provides a lock comprising:

an escutcheon with a key opening of a first non-circular cross-section therethrough;

a housing disposed behind said escutcheon;

a cylinder rotatably mounted in said housing, said cylinder having a cylinder socket of a second non-circular cross-section therein disposed behind said key opening and shaped so as to receive a key having a key tip with an outer periphery of said first non-circular cross-section inserted through said key opening and to engage said outer periphery of said key tip such that rotation of said key urges rotation of said cylinder.

This lock has a particularly low number of moving parts having the effect of making the lock more reliable and robust. Many conventional locks rely on the number and complexity of the interaction of their moving parts to provide the required degree of resistance to picking. In the present case the resistance to picking is provided by the wide variety of unusual non-circular cross-sectional shapes that can be used for the key opening and the cylinder socket.

It will be appreciated that the first non-circular cross-section and the second non-circular cross-section need not necessarily be identical providing the key tip that passes through the first non-circular cross section will rotationally engage the second non-circular cross section. However, as the first non-circular cross section will usually be of a complex shape, the resistance to picking of the lock will be improved if the second non-circular cross section is also of the same complex shape.

A further significant improvement in the degree of resistance to picking can be achieved without the need to introduce vulnerable moving parts by preferred embodiments in which: a cylinder stud of a third cross-section is disposed centrally within

said cylinder socket to fit within a key socket in said key tip.

In order to fit the lock, the key must have the correct outer shape and also an appropriately shaped key socket to accommodate the cylinder stud.

In order to improve the resistance to the insertion of picking tools within the lock, it is preferred that said cylinder stud extends to a position substantially flush with said key opening.

It will be appreciated that whilst the cylinder stud can have a wide variety of complex cross-sectional shapes, manufacturing complexity of both the lock and the keys will be reduced in embodiments in which said third cross-section is circular.

The resistance of the lock to vandalism and forcing is improved in embodiments in which said cylinder stud has a domed tip.

The domed tip makes it more difficult to grip the cylinder stud or chisel against it.

Another potential vulnerability of such locks is to forcing by using a punch to drive out the cylinder backwards along its rotational axis. Preferred embodiments of the lock recognise and address this vulnerability by providing that a reduced diameter portion of said cylinder extends through a rear opening in said housing, an integral rear shoulder in said housing surrounding said rear opening and serving to limit rearward axial movement of said cylinder in said housing.

It is desirable that the lock should have a detent action so as to define predetermined positions of the lock to an operator. However, the provision of such a detent action should not detract from the robustness of the lock. To this end, preferred embodiments of the lock comprise at least one axial cylinder groove in a radially outer surface of said cylinder in contact with an inner surface of said housing, at least one housing groove in said inner surface running parallel to said cylinder groove, and a roller disposed along said cylinder groove and resiliently biased towards said housing so as to provide a detent action when said cylinder groove and said housing groove are aligned.

Desirably such detent action should be provided at both the locked and unlocked positions of the lock.

An advantageous feature of preferred embodiments of the lock that is enabled by the above arrangement is that said locked position housing groove is deeper than said unlocked position housing groove so as to provide a stronger detent action in a locked position than in an unlocked position.

Environmental resistance and resistance to vandalism by introducing fluids, such as glue, into the lock is enhanced in embodiments in which when, in use, said lock is fixed in its working

orientation, said locked position housing groove is position away from a lowest point in said inner surface of said housing.

The mechanism and the smoothness and reliability of the lock action is improved when said at least one housing groove has a substantially semi-circular cross-section.

The resiliently generated biasing forces urging the rollers towards the housing are balanced leading to a smoother action when the lock has two diametrically opposed cylinder grooves and rollers.

Additional resistance against picking and forcing whilst maintaining the relative robustness of the lock is provided by preferred embodiments in which said cylinder stud is axially moveable within said cylinder, axial movement of said cylinder stud by a predetermined amount away from said escutcheon to an undeadlocked position serving to release a deadlocking mechanism that acts to prevent said cylinder rotating in said housing.

The extent of axial movement required to release the deadlocking mechanism is an additional degree of freedom which increases the difficulty in picking the lock. The use of the cylinder stud to provide this additional degree of freedom rather than delicate tumbler pins or levers serves to maintain the robustness of the lock.

Whilst a variety of deadlocking mechanisms could be used, in preferred embodiments deadlocking is achieved with a relatively small number of strong moving parts when said deadlocking mechanism comprises at least one locking pin disposed within a radially extending bore between an outer surface of said cylinder stud and an inner surface of said housing, said locking pin being movable radially outwardly to engage a housing indentation in said inner surface of said housing to prevent said cylinder rotating in said housing and, when said cylinder stud has been axially moved by said predetermined amount, being movable radially inwardly to within a cylinder stud indentation in said outer surface of said cylinder stud to release said locking pin from said housing indentation.

The deadlocked position of the locking pin can be maintained by providing that said cylinder stud is resiliently biased towards said escutcheon into a deadlocked position at which said deadlocking mechanism is engaged.

Resiliently biasing the cylinder stud rather than the locking pin directly makes it possible to avoid the problems of having to provide small and yet strong springs acting directly on the locking pin so as to avoid a disadvantageous increase in the overall dimensions of the lock.

It will be appreciated that the tolerance to which the cylinder indentation must be moved to allow the locking pin to be positioned within it has an effect upon the overall security of the lock. A

very tight tolerance makes it more difficult to pick the lock. However, in preferred embodiments of the invention said cylinder indentation has a ramped edge serving to urge said locking pin radially outwardly into engagement with said housing indentation as said cylinder stud moves to said deadlocked position.

In this way, by sacrificing some of the preciseness to which the cylinder stud has to be positioned, the ramped edge to the cylinder indentation can be made to smoothly and effectively urge the locking pin into the deadlocked position using the resilient biasing force acting upon the cylinder stud.

Smooth disengagement of the locking pin from the housing indentation can be achieved by providing that said locking pin has a domed radially outward end serving to urge said locking pin radially inwardly to within said cylinder stud indentation as said cylinder is rotated away from its locked position.

In an analogous way to the manner in which environmental and vandal resistance of the detent action mechanism is achieved, in preferred embodiments of the deadlocking mechanism when, in use, said lock is fixed in its working orientation, said housing indentation is positioned away from a lowest point in said inner surface of said housing.

The forces acting upon the cylinder can be balanced therefore smoothing the action of the lock by providing two diametrically opposed locking pins and housing indentations.

The dust and water resistance of the lock is inherently high due to the relative simplicity of its construction and few moving parts, but this resistance is further improved by providing O-ring seals between the cylinder stud and the cylinder and between the housing and cylinder.

The mechanical strength of the lock as a unit and therefore its resistance to forcing is improved in embodiments in which a plurality of fixing studs extend from a rear face of said escutcheon for passing through sheet material to which said lock is to be fixed and into matching fixing sockets in said housing, fixing bolts passing through said housing and fixing sockets into tapped blind bores in said fixing studs.

The rearward movement of the cylinder is limited by the integral rear shoulder in the housing. In an analogous manner, attack of the lock by gripping the cylinder and pulling it forwards is resisted by providing that said cylinder abuts an integral front shoulder in said escutcheon surrounding said key opening and serving to limit forward axial movement of said cylinder in said housing.

The complex shapes of the key opening and the key can result in an increased difficulty in inserting and removing the key. To assist in over-

coming this, a rear peripheral edge of said key opening and a front peripheral edge of said cylinder socket are flared.

Another way in which the lock may be forced or vandalised is that the escutcheon can be gripped with a mole wrench or attacked with a cold chisel. In order to improve resistance to such attacks, said escutcheon has a sloped peripheral edge.

A particularly suitable material for making the lock with an advantageous combination of strength and environmental resistance is stainless steel. Accordingly, the components of the lock are desirably made from cast stainless steel.

As previously mentioned, the lock is particularly suitable for use in outdoor cabinets, although other applications requiring high security and environmental and physical robustness are possible.

A complementary aspect of the invention provides a key comprising a key shank joining a key body to a key tip with an outer periphery of a non-circular cross-section, said key shank having reduced diameter cross-section rear of said key tip.

The difficulty in manufacturing the keys can be eased by providing that said reduced diameter portion is a groove in said key shank.

The movable cylinder stud operating the deadlocking mechanism is activated by the key having an axial key socket in said key tip.

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows a partial cross section through a first embodiment of the invention;

Figure 2 shows a front view of the escutcheon of Figure 1;

Figure 3 schematically illustrates the detent action of a lock of Figure 1;

Figure 4 illustrates a second embodiment of a lock according to the invention having a deadlocking mechanism;

Figure 5 illustrates a variation upon the lock of Figure 4;

Figure 6 illustrates the axially movable cylinder stud of the locks of Figure 4 and Figure 5;

Figure 7 illustrates a key for operating the locks of Figures 1, 4 and 5;

Figure 8 illustrates an outdoor cabinet; and

Figure 9 illustrates some variations upon the key and lock cross-sections that can be used.

Figure 1 illustrates a lock 2 having an escutcheon 4 on the front surface of a sheet metal door 6. To the rear of the sheet metal door is a lock housing 8 containing a rotatable cylinder 10.

Fixing studs 12 extend from the rear face of the escutcheon 4 and pass through the sheet metal door 6 into fixing sockets 14 in the housing 8. Each of the fixing studs 12 has a tapped blind bore

running through its centre. A bolt (not shown) passes through an opening in the rear of each of the fixing sockets 14 into the tapped blind bore and serves to clamp the two together and in position on the sheet metal door 6. A gasket recess 16 is provided on the rear face of the escutcheon to receive a weather proofing gasket which is pressed into a weather proof contact with the sheet metal door 6 and the escutcheon 4 by the action of the bolting of the housing 8 to the escutcheon 4.

A key opening 18 is provided through the escutcheon 4 and is aligned with a cylinder socket 20 in the front of the cylinder 10. A cylinder stud 40 is disposed within and extends along the axis of the cylinder socket 20 to a point substantially flush with the key opening 18. A rear peripheral edge 22 of the key opening 18 and a front peripheral edge 24 of the cylinder socket 20 are flared to assist insertion and removal of a key. The peripheral edge 26 of the escutcheon 4 is sloped (at an angle of between 20 and 45 degrees to the normal, but preferably 30 degrees) so as to resist gripping or chiselling in an attempt to vandalise or force the lock 2.

The cylinder 10 has a reduced diameter portion 28 that extends through a rear opening 30 in the housing 8. An integral rear shoulder 32 in the housing 8 surrounds the rear opening 30 and serves to limit rearward movement of the cylinder 10. An O-ring seal (not illustrated) is positioned within an O-ring groove 34 in the reduced diameter portion 28 to provide weather resistance to water and dust penetrating through the lock 2.

A square post section 36 and a threaded stud 38 extend from the rear of the lock. In use, a catch arm with a square opening therein is positioned over the square post 36 and held in place by a nut on the threaded post 38. Rotation of the cylinder 10 serves to move the catch arm to disengage a portion of a door frame and allow the sheet metal door 6 to be opened.

Figure 2 illustrates the front of the escutcheon 4 with its sloped peripheral edge 26. The key opening 18 has a first non-circular cross section that is hexagonal. The cylinder socket 20 positioned behind the key opening has a second non-circular cross-section the same as that of the key opening 18, i.e. a congruent hexagonal cross-section. The cylinder stud 40 positioned within the cylinder socket 20 has a circular cross section. The key to open the lock 2 with the escutcheon 4 as shown in Figure 2 must have a key tip shaped to fit within the shaded region 42 between the cylinder stud 40 and the key opening 18/cylinder socket 20. The key must also be shaped so that once the key tip is inserted within this region the key is able to rotate despite the non-circular cross-section of the key opening 18.

Figure 3 schematically illustrates a section looking along the direction A-A of Figure 1 showing how the detent action of the lock 2 is achieved. The cylinder 10 has a radially outer surface 44 fitted within an inner surface 46 of the housing 8. Two diametrically opposed axial cylinder grooves 48 are provided in the radially outer surface 44. Rollers 50 are disposed within these cylinder grooves 48 and are resiliently biased radially outwardly by leaf springs 52. The inner surface 46 has two diametrically opposed locked position housing grooves 54 and two diametrically opposed unlocked position housing grooves 56. When the cylinder 10 is rotated to an orientation in which the rollers 50 align with either of these housing grooves 54, 56 then the rollers 50 will move radially outwardly under the action of the leaf springs 52 to fit within the housing grooves 54, 56. Extra force will then be needed to rotate the cylinder 10 away from these positions, thus providing a detent action. The depth x of the locked position housing grooves 54 is greater than the depth y of the unlocked position housing grooves 56. This difference in depth makes the detent action at the locked position stronger than at the unlocked position. It is desirable that the detent action should be stronger at the locked position to provide an increased degree of resistance to picking, whilst an unnecessarily strong detent action at the unlocked position would make the lock more difficult to operate.

The locked position housing grooves 54 are positioned such that when the lock 2 is in its working orientation neither of the locked position housing grooves 54 will not be at the lowest point in the inner surface of the housing so that fluids, such as glue inserted by vandals and water from rain will settle around the rollers 50.

Figure 4 illustrates a second embodiment of the invention that incorporates a deadlocking mechanism. The cylinder stud 40 is axially movable within a bore 58 running through the cylinder 10. The cylinder stud 40 is resiliently biased towards the escutcheon 4 by the action of a coil spring (not illustrated) positioned within an annular space 60 between the cylinder stud 40 and the cylinder 10. An O-ring seal 62 serves to prevent weather penetration between the cylinder stud 40 and the cylinder 10. Axial movement of the cylinder stud by a predetermined amount serves to release the deadlocking mechanism. Radially extending locking pins 64 are disposed within bores 66 between an outer surface of the cylinder stud 40 and an inner surface of the housing 8.

With the cylinder stud 40 depressed to the position illustrated in the left hand half of Figure 4, the locking pins 64 align with a cylinder stud indentation 68 (a groove) and are free to move radially inwardly. When the locking pins 64 are in

this radially inward position, the cylinder 10 is free to rotate within the housing 8.

The right hand portion of Figure 4 shows the lock in the deadlocked state. The cylinder stud 40 is biased to its forward position by the coil spring and the cylinder stud indentation 68 is no longer aligned with the locking pin 64. The locking pins 64 are moved radially outwardly into engagement with housing indentations 70. The housing indentations 70 are grooves running along the axial direction of the inner surface of the housing parallel to the axis of the cylinder 10. The housing indentations 70 are positioned such that they are not at the lowest point within the housing when the lock 2 is in its working position. This has the result that any fluid, e.g. superglue entering the lock will not settle around the deadlocking mechanism. With the locking pins 64 engaging the housing indentations 70, the lock 2 is deadlocked against rotation of the cylinder 10.

The domed radially outward ends of the locking pins 64 have the result that when the cylinder stud is depressed to the appropriate depth, rotation of the cylinder 10 will move the locking pins 64 radially inwardly. The ramped edge 72 (between 25 and 45 degrees, but preferably 35 degrees) of the cylinder stud indentation has the effect of pushing the locking pins radially outwardly as the cylinder stud 10 moves towards the escutcheon 4.

Figure 5 illustrates a third embodiment of the lock. This embodiment is the same as that of Figure 4 except that the relative position of the cylinder stud indentation 66 has been moved with the result that the cylinder stud 66 must be depressed by a different amount to release the deadlocking mechanism.

Figure 6 illustrates the cylinder stud 40 in more detail. The cylinder stud 40 has a domed end 74 to resist gripping of the cylinder stud through the key opening 18. The cylinder stud indentation 68 is a groove machined around the cylinder stud 40. The forward edge of the cylinder stud indentation 68 is vertical and the rearward edge 72 is ramped so as to serve to smoothly move the locking pins 64 into the deadlocking position as the cylinder stud 10 moves towards the escutcheon 4.

Figure 7 illustrates a key suitable for operating a lock with an escutcheon 4 and cylinder 40 of the form illustrated in Figure 2. The key has a key shank 76 joining a key tip 78 to a key body 80. The key tip 78 has an outer periphery 82 that is hexagonal so as to fit within the key opening 18. A key socket 84 is drilled within the key tip 78 to receive the cylinder stud 40. A reduced diameter portion 86 (a machined groove) is disposed to the rear of the key tip 78 and serves to provide clearance to enable the key to be rotated within the key opening 18 when the key tip 78 has been fully

inserted. The relative depth of the key socket 84 and the position of the groove 86 control the extent, if any, to which the cylinder stud 10 is depressed when the key reaches a position in which the groove 86 is aligned so that the key may be turned. This degree of freedom is an additional variable that resists picking of the lock. The outer periphery 82 of the key tip 78 and the shape of the key socket 84 can be varied so as to match the shapes of the key opening 18 and cylinder stud 40 respectively.

Figure 8 illustrates an outdoor cabinet of the type in which the lock 2 is particularly useful. The cabinet is made of sheet steel and would typically be positioned in a roadside location housing equipment such as cable television or telephone switching equipment. The value of this equipment and its need for highly reliable operation means that security of the cabinet is a priority. In addition, the environmentally hostile location within which the outdoor cabinet is installed means that it must also have a high degree of environmental resistance. The above described lock is particularly suited for use in this situation.

Figure 9 illustrates various alternative lock and key patterns that may be used. The key opening 18 cross-section the cylinder socket 20 cross-section and the cylinder stud 40 cross-section are illustrated. In example A, all three cross-sections are different. In example B, all three cross-sections are different and the cylinder socket 20 cross-section is partly obscured behind the key opening 18 cross-section. In example C, the key opening 18 cross-section and the cylinder socket 20 cross-section are identical; the cylinder stud 40 cross-section is a similar and smaller triangle. Example D has a circular cross-section cylinder stud 40 and a key opening 18 cross-section that corresponds to a square section key with grooves cut into two of its vertices.

The above described lock is manufactured by lost wax investment casting in stainless steel. This provides a high degree of strength and environmental resistance that is particularly suitable for and complements the other aspects of this lock. The complex shapes of the components of the lock are accurately reproduced with this manufacturing process.

Claims

1. A lock (2) comprising:
 - an escutcheon (4) with a key opening (18) of a first non-circular cross-section therethrough;
 - a housing (8) disposed behind said escutcheon;
 - a cylinder (10) rotatably mounted in said

housing, said cylinder having a cylinder socket (20) of a second non-circular cross-section therein disposed behind said key opening and shaped so as to receive a key having a key tip (78) with an outer periphery of said first non-circular cross-section inserted through said key opening and to engage said outer periphery of said key tip such that rotation of said key urges rotation of said cylinder.

2. A lock as claimed in claim 1, wherein said first non-circular cross-section is substantially identical to said second non-circular cross-section.
3. A lock as claimed in any one of claims 1 and 2, wherein a cylinder stud (40) of a third cross-section is disposed centrally within said cylinder socket to fit within a key socket in said key tip.
4. A lock as claimed in claim 3, wherein said cylinder stud extends to a position substantially flush with said key opening.
5. A lock as claimed in any one of claims 3 and 4, wherein said third cross-section is circular.
6. A lock as claimed in any one of claims 3, 4 and 5, wherein said cylinder stud has a domed tip.
7. A lock as claimed in any one of the preceding claims, wherein a reduced diameter portion (28) of said cylinder extends through a rear opening (30) in said housing, an integral rear shoulder (32) in said housing surrounding said rear opening and serving to limit rearward axial movement of said cylinder in said housing.
8. A lock as claimed in any preceding claim, comprising at least one axial cylinder groove (48) in a radially outer surface (44) of said cylinder in contact with an inner surface (46) of said housing, at least one housing groove (54, 56) in said inner surface running parallel to said cylinder groove, and a roller (50) disposed along said cylinder groove and resiliently biased towards said housing so as to provide a detent action when said cylinder groove and said housing groove are aligned.
9. A lock as claimed in claim 8, having a locked position housing groove (54) and an unlocked position housing groove (56) for each cylinder groove.
10. A lock as claimed in claim 9, wherein said locked position housing groove is deeper than

said unlocked position housing groove so as to provide a stronger detent action in a locked position than in an unlocked position.

11. A lock as claimed in any one of claims 8, 9 and 10, wherein when, in use, said lock is fixed in its working orientation, said locked position housing groove is positioned away from a lowest point in said inner surface of said housing.
12. A lock as claimed in any one of claims 8 to 11, wherein said at least one housing groove has a substantially semi-circular cross-section.
13. A lock as claimed in any one of claims 8 to 12, having two diametrically opposed cylinder grooves and rollers.
14. A lock as claimed in claim 3, wherein said cylinder stud is axially moveable within said cylinder, axial movement of said cylinder stud by a predetermined amount away from said escutcheon to an undeadlocked position serving to release a deadlocking mechanism that acts to prevent said cylinder rotating in said housing.
15. A lock as claimed in claim 14, wherein said deadlocking mechanism comprises at least one locking pin (64) disposed within a radially extending bore (66) between an outer surface of said cylinder stud and an inner surface of said housing, said locking pin being movable radially outwardly to engage a housing indentation in said inner surface of said housing to prevent said cylinder rotating in said housing and, when said cylinder stud has been axially moved by said predetermined amount, being movable radially inwardly to within a cylinder stud indentation in said outer surface of said cylinder stud to release said locking pin from said housing indentation.
16. A lock as claimed in claim 15, wherein said cylinder stud is resiliently biased towards said escutcheon into a deadlocked position at which said deadlocking mechanism is engaged.
17. A lock as claimed in claim 16, wherein said cylinder indentation has a ramped edge (72) serving to urge said locking pin radially outwardly into engagement with said housing indentation as said cylinder stud moves to said deadlocked position.
18. A lock as claimed in any one of claims 15, 16 and 17, wherein said locking pin has a domed radially outward end serving to urge said lock-

ing pin radially inwardly to within said cylinder stud indentation as said cylinder is rotated away from its locked position.

19. A lock as claimed in any one of claims 15 to 18, wherein when, in use, said lock is fixed in its working orientation, said housing indentation is positioned away from a lowest point in said inner surface of said housing.
20. A lock as claimed in any one of claims 15 to 19, having two diametrically opposed locking pins and housing indentations.
21. A lock as claimed in any one of claims 14 to 20, wherein an O-ring seal (62) is provided between said cylinder stud and cylinder.
22. A lock as claimed in any one of the preceding claims, wherein an O-ring seal is provided between said housing and said cylinder.
23. A lock as claimed in any one of the preceding claims, wherein a plurality of fixing studs (12) extend from a rear face of said escutcheon for passing through sheet material (6) to which said lock is to be fixed and into matching fixing sockets (14) in said housing, fixing bolts passing through said housing and fixing sockets into tapped blind bores in said fixing studs.
24. A lock as claimed in any one of the preceding claims, wherein said cylinder abuts an integral front shoulder in said escutcheon surrounding said key opening and serving to limit forward axial movement of said cylinder in said housing.
25. A lock as claimed in any one of the preceding claims, wherein a rear peripheral edge (22) of said key opening and a front peripheral edge (24) of said cylinder socket are flared to assist insertion and removal of said key.
26. A lock as claimed in any one of the preceding claims, wherein said escutcheon has a sloped peripheral edge (26).
27. A lock as claimed in any preceding claim, wherein said lock is made from cast stainless steel.
28. An outdoor cabinet having a lock as claimed in any one of the preceding claims.
29. A key comprising a key shank (76) joining a key body (80) to a key tip (78) with an outer periphery of a non-circular cross-section, said

key shank having reduced diameter cross-section rear of said key tip.

30. A key as claimed in claim 29, wherein said reduced diameter portion is a groove (86) in said key shank. 5

31. A key as claimed in any one of claims 29 and 30, comprising an axial key socket (84) in said key tip. 10

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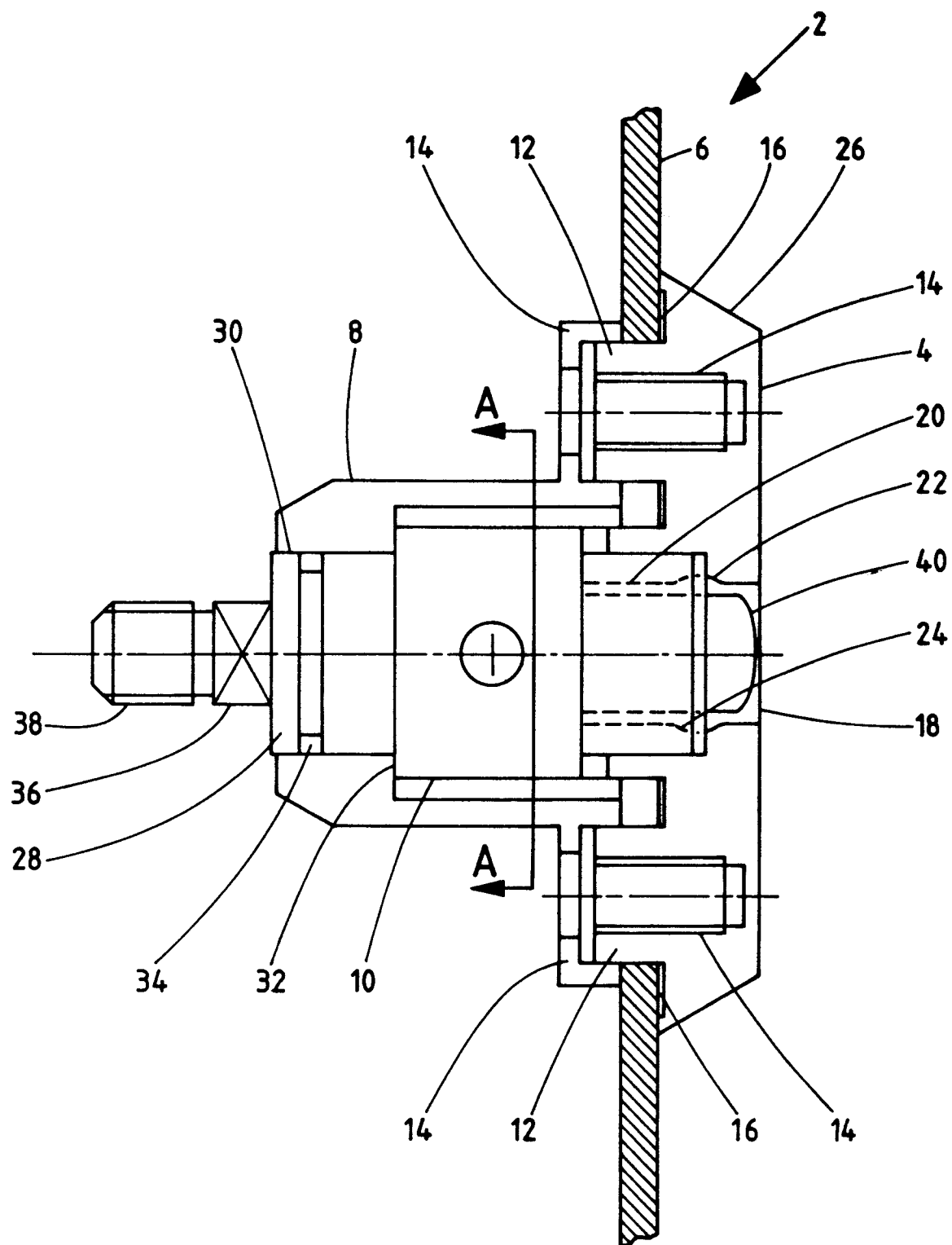


Fig.1

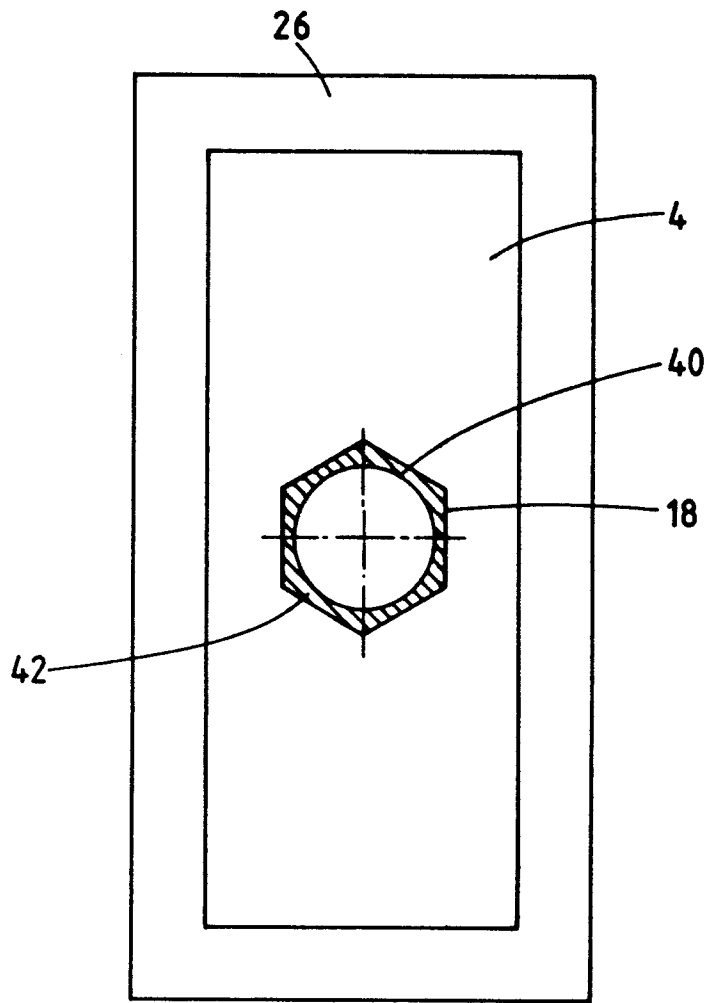


Fig.2

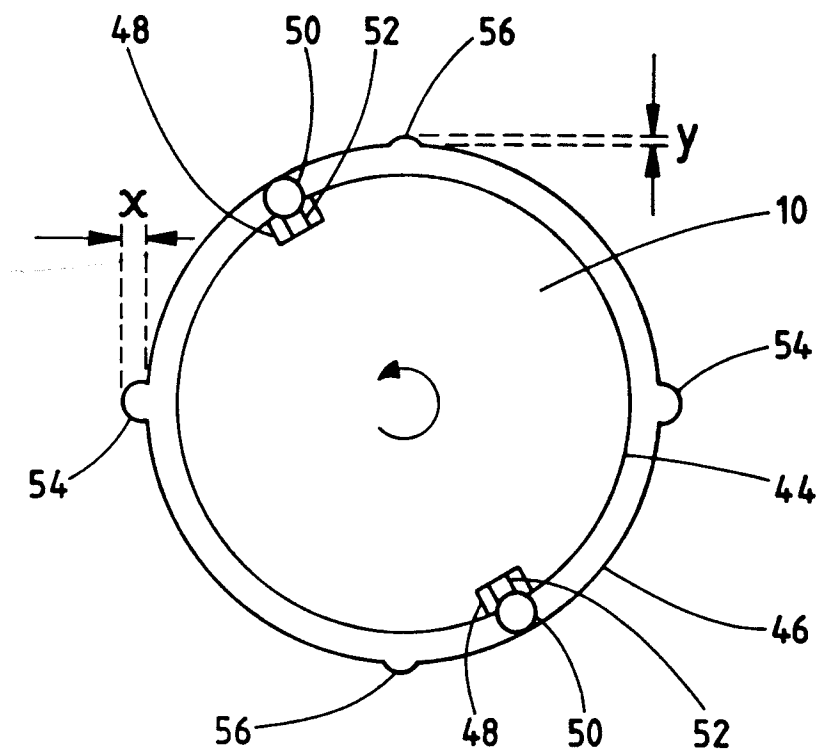


Fig.3

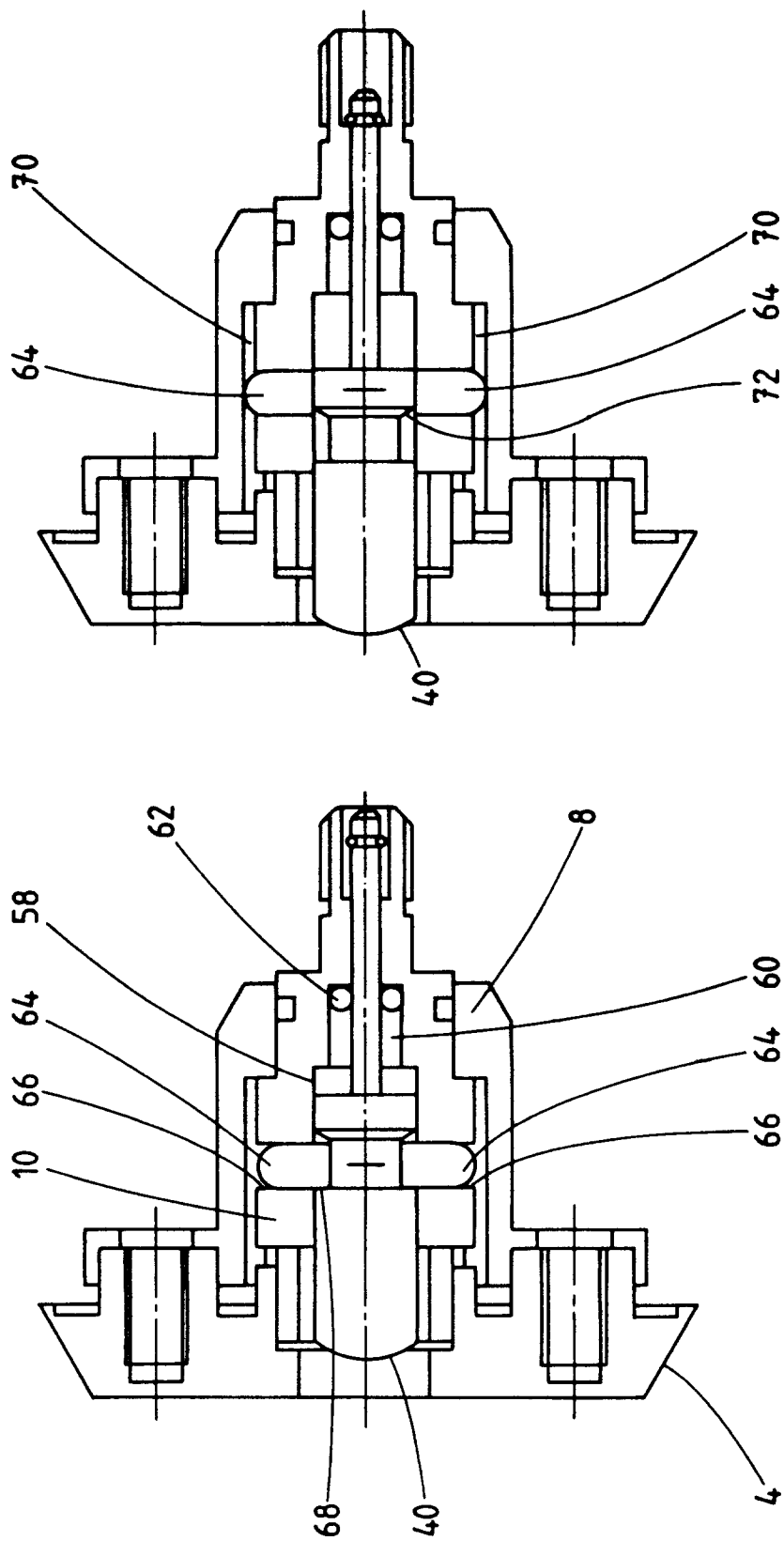


Fig.4

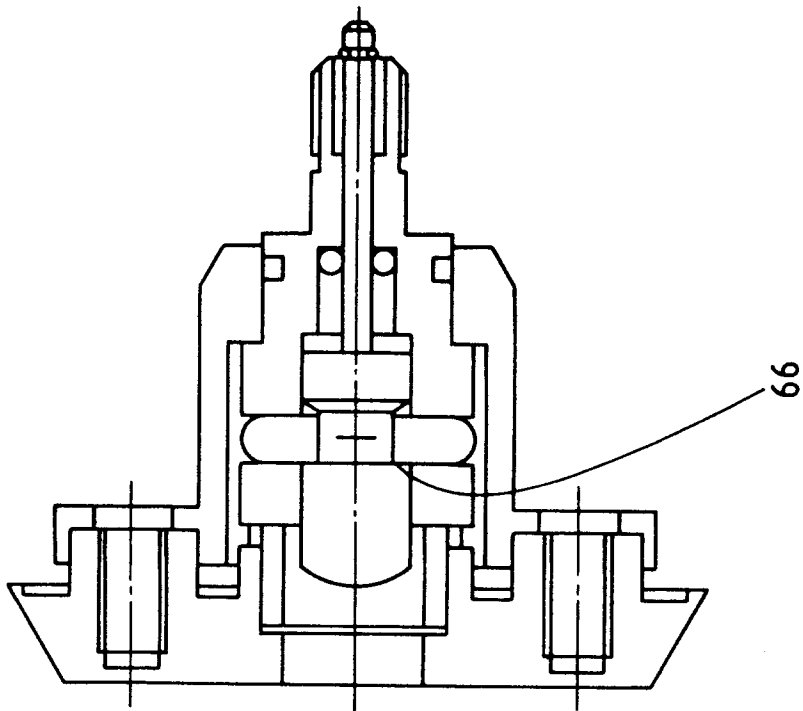
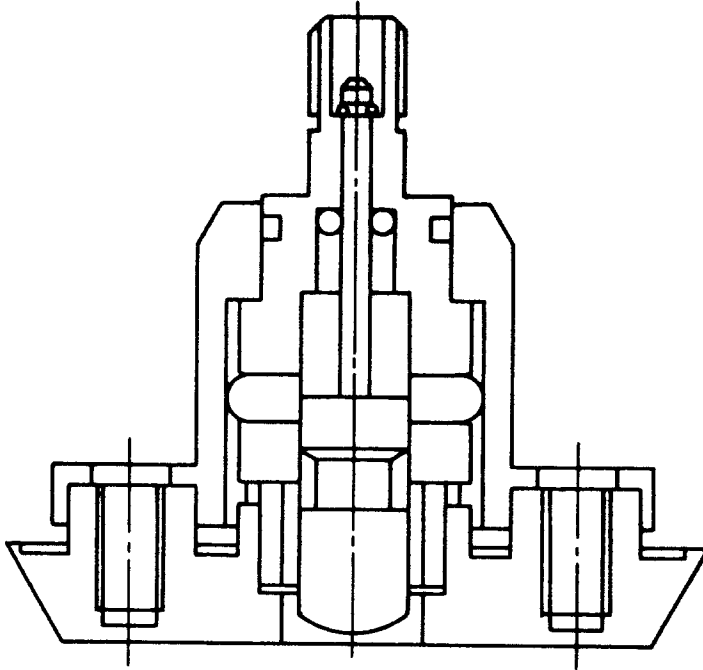


Fig.5

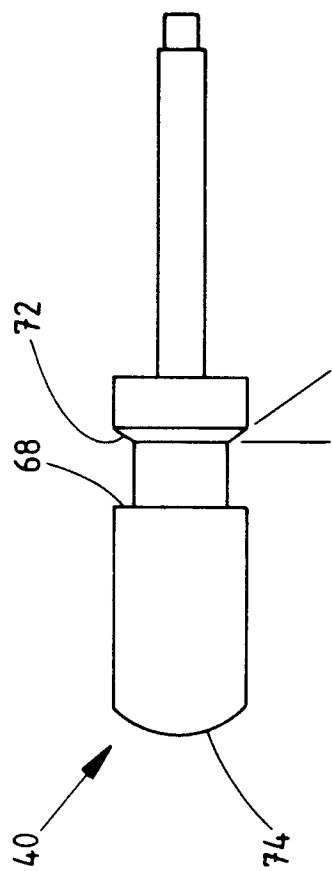


Fig. 6

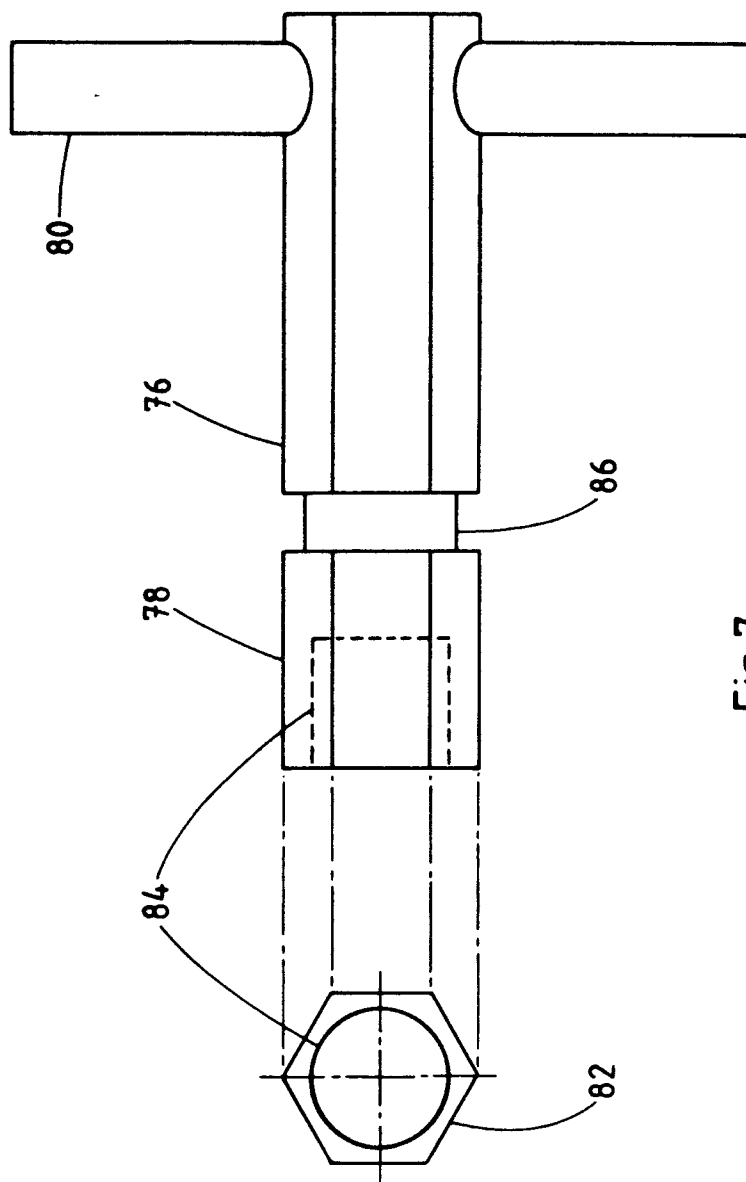


Fig. 7

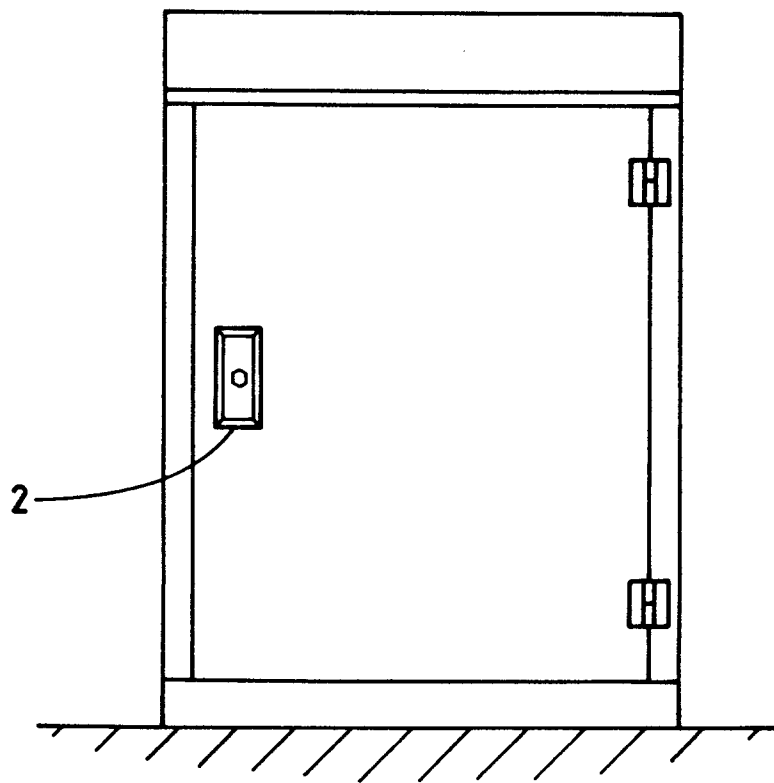


Fig.8

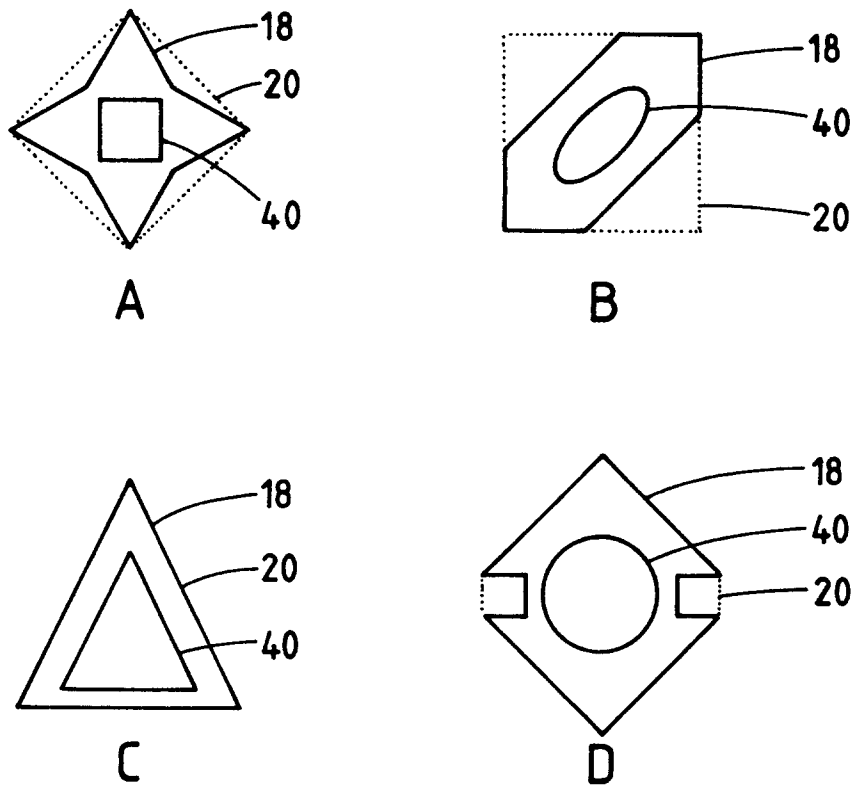


Fig.9



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 30 6744

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	EP-A-0 175 049 (RAMSAUER) * the whole document * ---	1-3,5,7, 22, 26-29,31	E05C3/04 E05B35/00
X	CH-A-218 316 (VOEGELI) * the whole document * ---	1,3,5,6, 8,9,12, 29-31	
A	EP-A-0 036 141 (RAMSAUER) * the whole document * ---	1-5,22, 24, 26-29,31 14,16	
X	EP-A-0 175 012 (RAMSAUER) * the whole document * ---	1-5,7, 22, 26-29,31	
X	US-A-5 082 392 (MARCHESE ET AL.) * the whole document * ---	1,2, 28-30	TECHNICAL FIELDS SEARCHED (Int.Cl.5)
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 16 February 1994	Examiner Vestin, K
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			



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Application Number
EP 93 30 6744

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