

12 **EUROPEAN PATENT APPLICATION**

21 Application number: 82301751.2

51 Int. Cl.³: **E 05 G 1/04**

22 Date of filing: 02.04.82

43 Date of publication of application:
12.10.83 Bulletin 83/41

84 Designated Contracting States:
BE DE FR IT NL

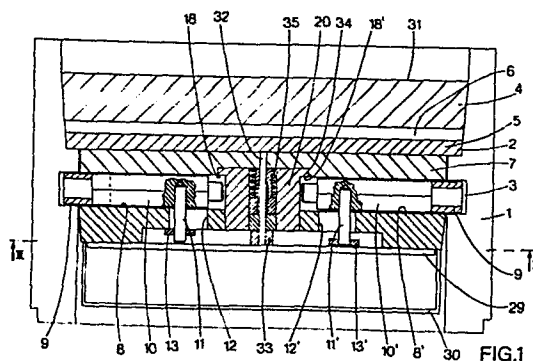
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54 **A safe and door for a safe.**

57 A circular safe door 4 having a pair of semi-circular bolt members 9, 9' extending end-to-end around substantially the whole circumference of the door and slidable laterally by radial slidable bars 10, 10' of a perpendicular axis of the door between unlocked positions in which the bolt members 9, 9' are retracted into a peripheral recess in the door 4 and locked positions in which the bolt members 9, 9' extend from the recess into a recess 3 extending around a tubular housing 1 in which the door 4 is fitted and thereby to secure the door from being removed. The door also includes means for sliding the bars 10, 10' and hence the bolt members 9, 9' between the locked and unlocked positions and a rotatable stop 20 which is rotatable between a position in which it prevents the slidable bars 10, 10' and thus the bolt members 9, 9' from being retracted and a position in which it permits the slidable bars 10, 10' and thus the bolt members 9, 9' to be retracted to their unlocked positions. The door is provided with a lock which is operable from the outside of the door to turn the stop 20 into one or other of its positions.



A SAFE AND DOOR FOR A SAFE

The invention relates to a safe and is particularly, but not exclusively, concerned with a safe comprising a housing to be built into the floor or wall of a building and having a rebated opening therein into which a door, or other closure member and
5 hereinafter called a door, is fitted, the door having bolt members movable into and out of positions in which they extend from the periphery of the door into a recess or recesses formed in the housing to prevent removal or opening of the door. The invention is also concerned with a door for a safe of the foregoing kind.

10 In a type of safe known hitherto the bolt members have been in the form of radially-extending bars which are slidable in radial slots in the door between their extended and retracted positions. Such a safe has the disadvantage that the total shear area between the bolt members when extended and the co-operating recess or recesses
15 in the housing is determined by the number of bolt members and the shear area of each individual bolt member, which in turn depends upon the width of each bolt member and the depth of engagement with the recess into which it is fitted. One object of the invention is to provide a safe door in which the total shear area
20 of the bolt members is very much greater than in safes known hitherto.

According to the invention, a safe door has at least a pair of bolt members slidable laterally of a perpendicular axis of the door between unlocked positions in which the bolt members are retracted
25 into a recess or recesses in the peripheral edge of the door and locked positions in which the bolt members extend from said recess or recesses to be engaged in a recess or recesses defined in an opening in a housing in which the safe door is to be fitted and thereby to secure the door from being opened, the door also
30 including means for moving the bolt members between their locked and unlocked positions and vice versa and a stop movable between

a position in which it prevents the bolt members from being retracted from their locked positions and a position in which the stop permits the bolt members to be retracted to their unlocked positions, a lock mounted on the door behind the outer face thereof and accessible by means of a key insertable in a keyhole extending through the door from the outer face thereof to the lock and operable by the key to turn the stop into one or other of its said positions or by equivalent locking means accessible from the outer face of the door, and is characterised in that the bolt members extend end-to-end along a major part of the periphery of the door.

Preferably, the bolt members together occupy substantially the whole of the periphery of the door and thereby together provide a total shear area extending along substantially the whole of the circumference of the door. This makes it impossible or extremely difficult for the door to be withdrawn by force from the housing and also for the door to be removed by cutting through the bolt members, because of their considerable circumferential dimensions.

The safe door is conveniently of circular shape, as viewed in plan, and the bolt members are of arcuate shape and are movable in radial directions between their locked and unlocked positions. For example there may be two diametrically-arranged bolt members each extending along substantially half the circumference of the door.

With a view to preventing retraction of the bolt members following damage to the lock, the stop is formed on a portion of a rotatable block having an end portion adjacent the stop portion of such a shape that when said end portion is positioned in the same diametral plane as the bolt members, it will prevent the bolt members from being retracted from their locked positions whatever angular position the block is in, the block being movable axially of the door by a spring into a position in which said end portion is located in the same diametral plane as the bolt members but is normally held against the force of the spring by thrust means

carried by the door in a position in which the stop portion is located in the same diametral plane as the bolt members, whereby on dislodgement of the thrust means by damage to the door, the spring will urge the block axially of the door into the position in which the end portion of the block is located in the same diametral plane as the bolt members, thus preventing the retraction of the bolt members to their unlocked position whatever the angular position of the block.

Additionally, a pin may be located between each pair of adjacent end faces of the bolt members and be urged by a spring into a position in which it will hold the bolt members against retraction from their locked positions, the pin being normally held against the force of the spring in the position in which retraction of the bolt members to their unlocked positions is permitted by thrust means carried by the door, whereby on dislodgement of the thrust means by damage to the door, the spring will urge the pin into the position in which it will prevent retraction of the bolt members to their unlocked positions. Where there are two diametrically-arranged bolt members, each extending through substantially half the circumference of the door, there would be one of said pins between each pair of adjacent end faces of the bolt members, the bolt members thereby being prevented from retraction to their unlocked positions at three spaced locations along the diameter of the door, namely at the centre by the stop and at each end of the diameter by the respective pin.

The thrust means which is positioned to hold said block, and the pins where provided, conveniently comprises a mounting plate for the lock, whereby if an attempt should be made to dislodge the lock by, for example, an explosive charge applied through the keyhole, the mounting plate will effect movement of the block and the pins, where provided, by the respective springs into the positions in which the block and pins, where provided, will prevent retraction of the bolt members from their locked positions.

The invention also includes a safe comprising a safe door as set out in any of the preceding six paragraphs and a housing having a

peripheral wall in which there is a rebate in which the door is arranged to be placed, the peripheral wall of the housing also having a peripheral recess therein for receiving the bolt members.

5 By way of example, a safe in accordance with the invention is now described with reference to the accompanying drawings, in which:-

Figure 1 is an axial section through the safe showing the bolt members in their locked positions;

Figure 2 is a section on the line II-II in Figure 1, and

10 Figure 3 is a view of the bolt members and the associated operating mechanism in the position in which the bolt members are unlocked.

Referring to Figures 1 and 2 it will be seen that the safe comprises a housing having an annular wall 1 in which there is a rebate 2 at one end thereof for receiving the door. The wall 1 also has below the rebate 2 a circumferentially-extending annular recess 3 for
15 receiving the bolt members of the door.

The door is circular in shape and conveniently comprises an outer portion formed from a lamination of hardened steel plates 4 and 5 and a stainless steel plate 6. This construction makes it difficult for the door to be cut open by means of drilling or by
20 using a flame gun. Beneath the outer portion of the door there is a body 7 also of circular shape in plan which is secured from the inside of the door to the outer part thereof. Alternatively, the body of the door may be machined from steel instead of being of laminated construction, thus allowing the whole door to be
25 hardened; although this would reduce the ability of the door to withstand attack by a flame gun. The body 7 has a pair of diametrically aligned slots or holes 8, 8' for guiding and locating slidable bars 10, 10' which extend radially inwardly from each of the bolt members, which comprise semi-annular arcuate blocks 9, 9'.

The slidable bars 10, 10' carry pins 11, 11' which are guided for sliding in elongated slots 12, 12' of length sufficient to provide the required radial movement of the bolt members 9, 9'. The slots 12, 12' are formed in the block 7 beneath the slots 8, 8'. The pins 11, 11' are engaged respectively by a pair of oppositely pivotable bell crank levers 13, 13' pivotally mounted in the block 7 by means of pivot pins 15, 15' respectively. The ends of the bell crank levers 13, 13' remote from the pins 11, 11' are formed with slots 17, 17' engaged by a common eccentric block 19 or pin which is turned from the outside of the door by means of a knob carried on a spindle extending through the door and not shown. The knob and spindle may conveniently be retractible into the door so that the outer end of the knob is substantially flush with the outer face of the door, to prevent the knob from being turned. The knob may be hardened to prevent attack by drilling. By turning the knob, when in its extended position, and hence, the eccentric block 19, the bell crank levers 13, 13' move the slidable bars 10, 10' and thus the bolt members 9, 9' radially of the door between locked positions, as shown in Figures 1 and 2, and unlocked positions, as shown in Figure 3. In the locked positions, each arcuate bolt member 9, 9' is engaged in the recess 3 and hence prevents removal of the door from the housing 1. Rotation of the eccentric block 19 is limited by, for example, a cam 22 concentric with the shaft of the eccentric block and having a stop face 23 engageable with a fixed pin 24.

Between the radially-inner ends of the slidable bars 10, 10' there is a rotatable stop block 20 having a cylindrical portion having an outer surface 21 in which there is a pair of diametrically-opposed slots 18, 18'. Conveniently these slots may be replaced by holes of slightly larger diameter than the radially-inner ends of the slidable bars 10, 10'. In the illustrated position, the surface 21 of the stop block 20 prevents the retraction of the slidable bars 10, 10' and thus the bolt members 9, 9'; but when the stop block 20 is turned through an appropriate angle, the radially inner ends of the slidable bars 10, 10' will enter the respective slots

18, 18' thereby providing sufficient clearance between the cam block 20 and the ends of the slidable bars 10, 10' to permit the latter and thus the arcuate bolt members 9, 9' to be moved radially inwardly of the door by means of the eccentric block 19.

5 The stop block 20 is turned by means of a lock member 25 engaging a pin 26 carried by the stop block 20. The lock member 25 is slidable in a lock housing 27 by turning a key inserted in a keyhole 28. The lock housing 27 is mounted on a plate 29 secured to the inner face of the block 7 and enclosed within a casing 30.
10 The keyhole 28 is accessible through a hole extending through the door from the outer face 31 thereof.

The stop block 20 is mounted on a central shaft 32 supported at its ends in aligned holes in the block 7 and in a bearing 33 carried on the plate 29. The clearance between the ends of the shaft 32 and
15 its bearings is such that if an attempt should be made to remove the door by introducing explosive through the keyhole 28 to blow-off the lock, the consequent displacement of the plate 29 will cause the stop block 20 to jam and make it impossible or difficult for it to be turned to permit the slidable bars 10, 10' and thus
20 the bolt members 9, 9' to be retracted to their unlocked positions. As a further precaution, as illustrated, the stop block 20 has at one end thereof a circular flange 34 which on axial movement of the block 20 from the position shown in Figure 1 will fit between the radially inner ends of the slidable bars 10, 10' when the
25 bolt members 9, 9' are fully extended. When the flange 34 is positioned between the slidable bars 10, 10' it will be impossible for them and thus the bolt members 9, 9' to be retracted, whatever the angular position of stop block 20. The stop block 20 is normally held in the illustrated position against the force of a
30 compressed spring 35 by the bearing 33, carried by the base plate 29, pressing against the bottom of the stop block 20. If an attempt should be made to open the door by introducing explosive through the keyhole 28 and blowing off the lock 27 and thereby dislodging the plate 29, the spring 35 will immediately cause

the stop block 20 to move downwardly from the position illustrated so that the flange 34 will drop between the radially inner ends of the slidable bars 10, 10' and thereby make it impossible for them and thus the bolt members 9, 9' to be retracted.

5 Yet a further precaution to foil an attempt to remove the door by blowing off the lock 27 is to provide a pair of pins 36 having enlarged heads and of which the shanks are located between the adjacent circumferential end faces of the arcuate bolt members 9, 9'. The pins 36 are supported against the face of springs arranged
10 similarly to spring 35, with only the shanks between the arcuate bolt members 9, 9' by the plate 29. The diameter of the shanks of the pins 36 is such that the slidable bars 10, 10' can be retracted only when the shanks of the pins 36 are located between the arcuate bolt members 9, 9'. The enlarged heads of the pins 36
15 each have a diameter substantially equal to the spaces between the adjacent circumferential end faces of the arcuate bolt members 9, 9' when the latter are in their locked positions. If the lock should be blown off when the slidable bars 10, 10' and the bolt members 9, 9' are in their locked positions, the consequent
20 dislodging of the plate 29 by the explosion will cause the pins 36 to be moved downwardly by their springs so that the enlarged heads will drop between the adjacent circumferential end faces of the arcuate bolt members 9, 9'. Thus in that event, the slidable bars 10, 10' will be held apart by the flange 34 on the stop block
25 20 and also at the diametrically outer ends of the bolt members 9, 9' will be held apart by the heads of the pins 36. Therefore it will be impossible to push the bolt members 9, 9' out of the recesses 3 in the housing 1 of the safe by trying to deform or break the bolt members 9, 9', because the latter will be firmly
30 held against retraction at these three positions spaced apart along a diameter of the door. It will be appreciated therefore that when the bolt members 9, 9' are in their locked positions, the only way in which they can be retracted to permit the door to be removed from the safe housing 1 is to turn the stop block 20 to the
35 position, in which the slidable bars 10, 10' can be retracted, by means of the key of the lock 27 and then to effect withdrawal of the

slidable bars 10, 10' and thus the bolt members 9, 9' by turning the knob which turns the eccentric block 19, after the knob has been withdrawn outwardly from the outer face of the door, where it is of the retractable kind. If the stop block 20 has not been turned by using the key, then the eccentric block 19 cannot be turned and the slidable bars 10, 10' and the bolt members 9, 9' cannot be retracted. If any attempt is made to open the lock by force, thereby causing the plate 29 to be damaged, either the bearing 33 will be dislodged making it impossible for the stop block 20 to be turned or, in the case of an explosion, the stop block 20 will be moved axially by the spring 35, thereby causing the flange 34 to prevent retraction of the slidable bars 10, 10' and thus the bolt members 9, 9' from their locked positions. Furthermore if the aforesaid pins 36 are provided between the adjacent circumferential end faces of the arcuate bolt members 9, 9', these too will make it impossible to retract the bolt members. If the stop block 20, and the pins 36 where provided, are moved into their stop positions by the respective springs on damage to the plate 29, the only way in which the door could be removed would be to remove the whole safe from the wall or the floor in which it is built and to cut open the annular housing 1. It would not be possible to withdraw the door from the housing by force because the arcuate bolt members 9, 9' provide a substantial shear area extending around substantially the hole of the circumference of the door.

Instead of providing a lock operable from the outside of the door by a key, equivalent locking means, for example a rotatable barrel, or dial, accessible from the outer face of the door may be provided.

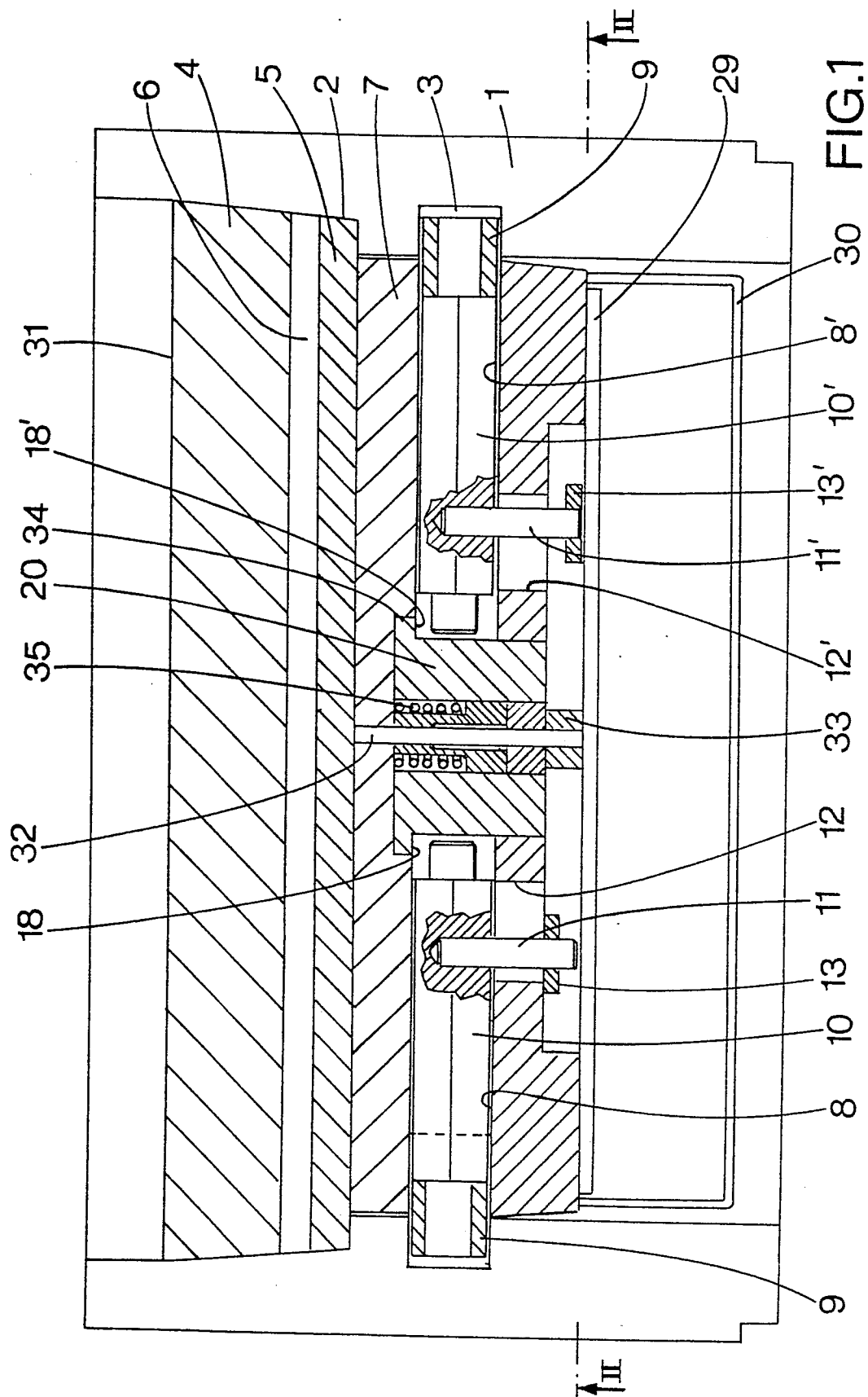
CLAIMS

1. A safe door having at least a pair of bolt members (9,9') slidable laterally of a perpendicular axis of the door (4-6) between unlocked positions in which the bolt members (9, 9') are retracted into a recess or recesses in the peripheral edge of the door and locked positions in which the bolt members (9, 9') extend from said recess or recesses to be engaged in a recess or recesses (3) defined in an opening in a housing (1) in which the safe door (4-6) is to be fitted and thereby to secure the door from being opened, the door (4-6) also including means (10, 10'; 13, 13') for moving the bolt members (9, 9') between their locked and unlocked positions and vice versa and a stop (20) movable between a position in which it prevents the bolt members (9, 9') from being retracted from their locked positions and a position in which the stop (20) permits the bolt members (9, 9') to be retracted to their unlocked positions, a lock (25, 27) mounted on the door (4-6) behind the outer face thereof and accessible by means of a key insertable in a keyhole (28) extending through the door from the outer face thereof to the lock and operable by the key to turn the stop (20) into one or other of its said positions or by equivalent locking means accessible from the outer face of the door, characterised in that the bolt members (9, 9') extend end-to-end along a major part of the periphery of the door (4-6).
2. A safe door as claimed in Claim 1 in which the bolt members (9, 9') together occupy substantially the whole of the periphery of the door (4-6) and thereby together provide a total shear area extending along substantially the whole of the circumference of the door.

3. A safe door as claimed in Claim 1 or 2 of circular shape, as viewed in plan, the bolt members (9, 9') being of arcuate shape and movable in radial directions between their locked and unlocked positions.
- 5 4. A safe door as claimed in Claim 3 in which there are two diametrically-arranged bolt members (9, 9') each extending along substantially half the circumference of the door.
- 10 5. A safe door as claimed in any preceding claim in which the stop (20) is formed on a portion of a rotatable block having an end portion (34) adjacent the stop portion of such a shape that when said end portion (34) is positioned in the same diametral plane as the bolt members (9, 9'), it will prevent the bolt members (9, 9') from being
15 retracted from their locked positions whatever angular position the block is in, the block being movable axially of the door by a spring (35) into a position in which said end portion (34) is located in the same
20 diametral plane as the bolt members (9, 9') but is normally held against the force of the spring (35) by thrust means (33) carried by the door in a position in which the stop portion is located in the same diametral plane as the bolt members, whereby on dislodgement of the thrust means (33) by damage to the door, the spring
25 (35) will urge the block axially of the door into the position in which the end portion (34) of the block is located in the same diametral plane as the bolt members (9, 9'), thus preventing the retraction of the bolt members (9, 9') to their unlocked position whatever the
30 angular position of the block.

6. A safe door as claimed in Claim 5 in which a pin (36) is located between each pair of adjacent end faces of the bolt members (9, 9') and is urged by a spring into a position in which it will hold the bolt members against retraction from their locked positions, each pin (36) being normally held against the force of the spring in the position in which retraction of the bolt members (9, 9') to their unlocked positions is permitted by thrust means carried by the door, whereby on dislodgement of the thrust means by damage to the door, the spring will urge the pin (36) into the position in which it will prevent retraction of the bolt members (9, 9') to their unlocked positions.
7. A safe door as claimed in Claim 6 in which there are two diametrically-arranged bolt members (9, 9'), each extending through substantially half the circumference of the door and in which there is one of said pins (36) between each pair of adjacent end faces of the bolt members, the bolt members (9, 9') thereby being prevented from retraction to their unlocked positions at three spaced locations along the diameter of the door, namely at the centre by the stop (20) and at each end of the diameter by the respective pin (36).
8. A safe door as claimed in any one of Claims 5-7 in which said thrust means (33) positioned to hold said stop (20), and said pins (36) where provided, comprise a mounting plate (29) for the lock, which when dislodged will effect movement of said stop (20) and said pins (36), where provided, by the respective springs into the positions in which said stop (20) and said pins (36), where provided, will prevent retraction of the bolt members (9, 9') from their locked positions.

9. A safe comprising a safe door (4-6), as claimed in any of the preceding claims, and a housing (1) having a peripheral wall in which there is a rebate in which the door is arranged to be placed, the peripheral wall of the housing (1) also having a peripheral recess (3) therein for receiving the bolt members (9, 9').



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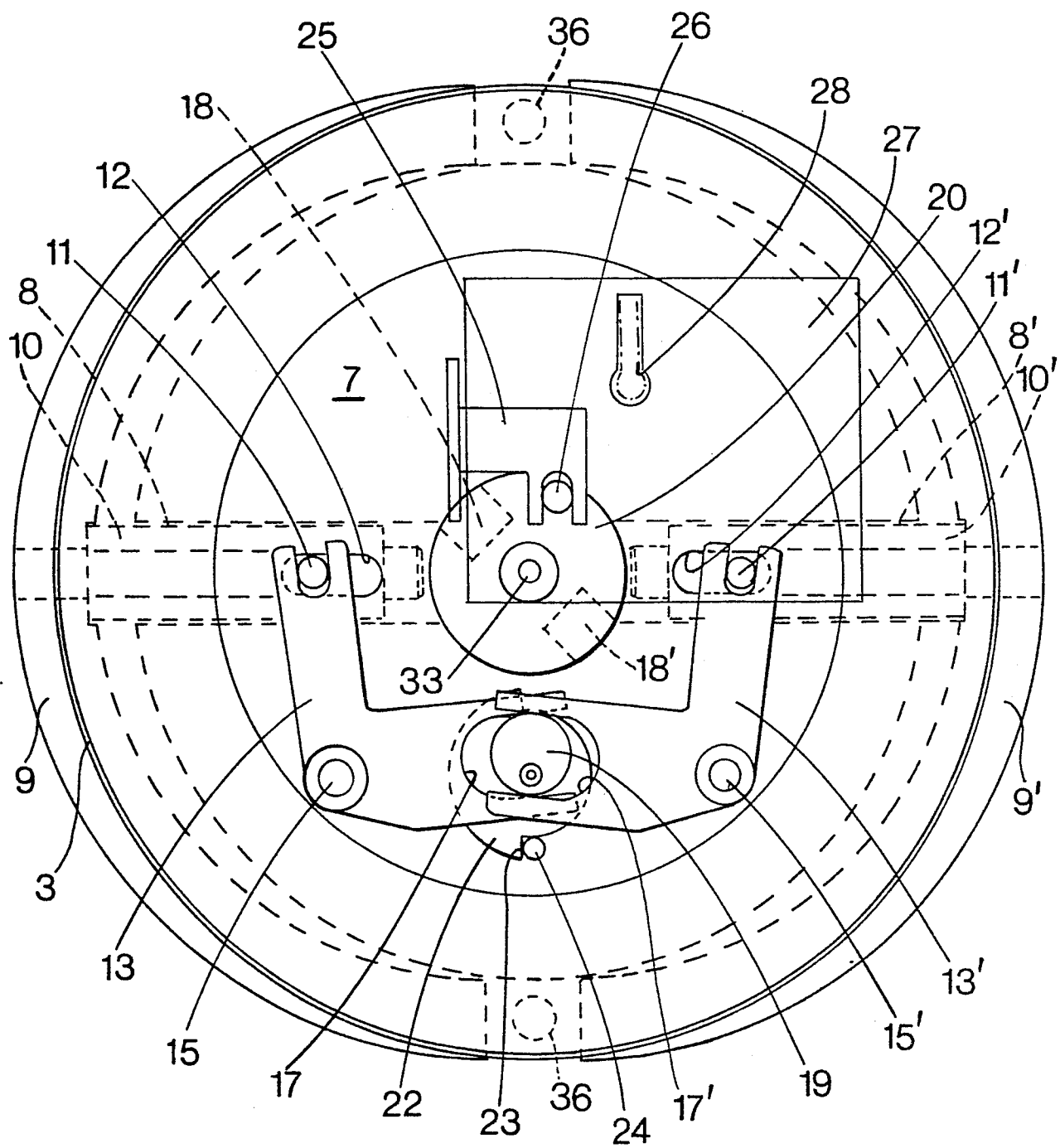


FIG. 2

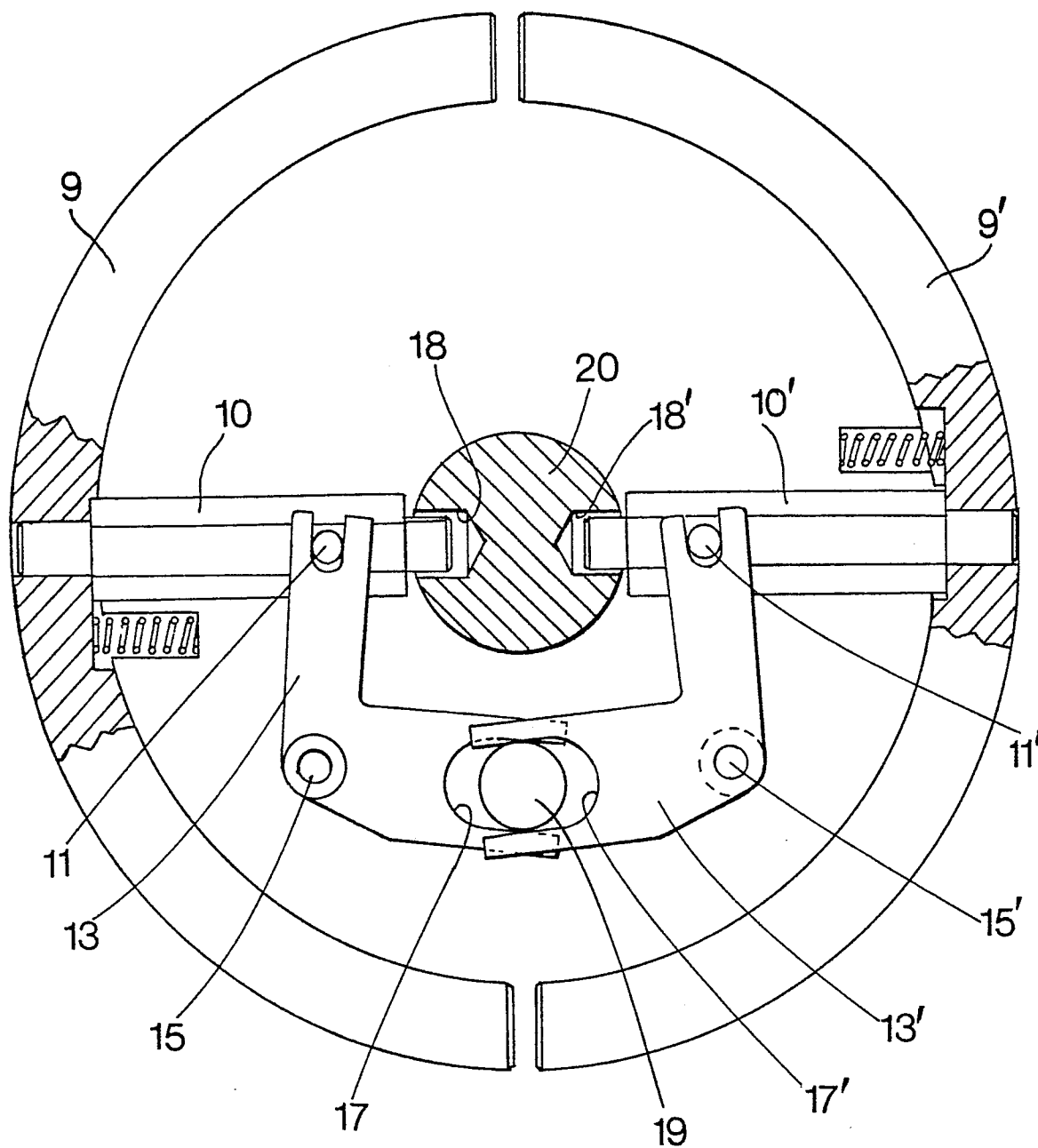


FIG.3



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. ³)
X	--- GB-A-2 057 043 (HAMBER) *The whole document*	1-4, 9	E 05 G 1/04
E	--- GB-A-2 084 238 (BATES) *The whole document*	1-9	

			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			E 05 B E 05 G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 24-11-1982	Examiner VAN BOGAERT J.A.M.M.
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	