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Locking mechanism for door of security enclosure.

(57)

The rotary thrower (19) for the bolts (25) of a safe door is driven from a wheel (16) through a bobbin-shaped member (18) keyed rotationally within the thrower but borne for limited axial movement therein. When the main bolts (25) are thrown, locks (31, 32) act to lock the thrower (19) by shooting their own bolts (33, 34) into apertures (35, 36) in the thrower; the lock bolts also shoot into a groove (37) in the bobbin (18) to withdraw that member from the wheel (16) and thus disengage the drive connection between the external handle (not shown) and the main bolts (25). A "relocker" bolt (41) is also provided and can be triggered by frangible plates (13, 14) to lock into an aperture (44) in the thrower (19) and engage in the groove (37) to maintain the bobbin (18) disengaged from the wheel (16), independently of the state of the primary locks (31, 32).

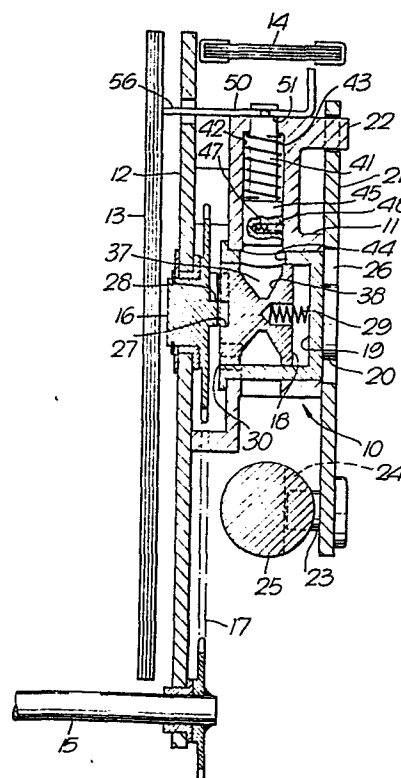
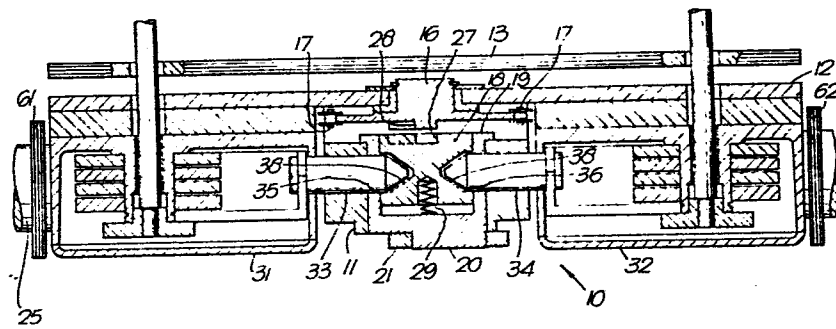


Fig. 1.

Fig. 4.



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Locking Mechanism for Door of Security Enclosure

The present invention relates to safes, vaults, strongrooms and the like security enclosures, and more particularly to
5 locking mechanisms for the doors of such enclosures.

It is customary for the door of a safe or the like to be locked by means of bolts thrown from the door into engagement with the surrounding frame, for which purpose
10 there is provided an externally-accessible handle, wheel or the like operating member which drives the boltwork through a mechanical transmission mounted within the door, the same mechanism, of course, being used to withdraw the bolts when the door is to be opened. This boltwork is in turn locked in
15 its thrown condition by the operation of one or more key or combination locks, which throw their own bolts into engagement with portions of the main boltwork or its transmission mechanism to resist subsequent retraction of the main bolts.

20

One known measure for providing additional security to such enclosures against attacks aimed at disabling the locking mechanism, is the so-called relocker. In this specification

the term "relocker" means a device, provided in addition to the primary lock(s) of a security enclosure, which includes a secondary locking member adapted to operate automatically to block withdrawal of the boltwork, independently of the state of the primary lock(s), in response to the detection of an attack upon the enclosure. Relockers can take many forms. For example, the secondary locking member may be spring-biased towards its locking position but normally held away from that position by a cord or other mechanism connected to a glass plate placed at a strategic position within the door; if the glass plate is shattered eg by contact with a drilling tool or exposure to other force the mechanism is released to allow the secondary locking member to move into its locking position. Other forms of mechanical force detector can be employed in place of the glass plate; heat-actuated detectors can also be used to trigger a relocker in the event of an attack with thermal tools. Relockers in which the secondary locking member is normally held away from its locking position and released into that position only when an attack is detected are called "dead" relockers. In a "live" relocker the secondary locking member is normally connected to the bolt of a primary lock to be moved into and out of its locking position whenever the primary lock bolt is thrown and withdrawn. However, a device is arranged to disable that connection in response to detection of an attack so that thereafter the secondary locking member will remain in its locking position and will not be withdrawn even if the attack succeeds in withdrawal of the primary lock bolt.

In one aspect the present invention seeks to provide a relocker-equipped locking mechanism for the door of a security enclosure which can be made in an advantageously compact and cost-effective form, and accordingly resides in a mechanism comprising: boltwork for securing the door closed

when thrown; a rotary operating member accessible from outside the door; a mechanical transmission for coupling said operating member to the boltwork for throwing and withdrawing the same; said transmission comprising a rotary transmission train adapted to be driven by said operating member and mechanism for converting rotary movement of said train to translatory movement of one or more bolts of said boltwork; one or more primary locks for selectively locking the boltwork in its thrown condition; and a relocker (as herein defined) the secondary locking member of which is adapted to engage with a member of said rotary transmission train to block withdrawal of the boltwork.

In a preferred embodiment the aforesaid member of the rotary transmission train is borne for rotation in a housing and the secondary locking member of the relocker is borne in said housing for sliding movement transversely to the axis of that rotary member; the rotary member has a complementary formation which aligns with the secondary locking member when the boltwork is thrown and the secondary locking member moves into engagement with said formation to lock the rotary member against rotation relative to the housing.

In some known mechanisms for locking the door of a safe or the like, means are provided for selectively disengaging the coupling of the handle or other external operating member to the boltwork when in its thrown condition, so that in the event of burglarious attack on the enclosure it is impossible to use the handle to put force on the boltwork or to withdraw the boltwork even if the normal blocking action of the locks can be overcome. In a second aspect the invention seeks to provide additional security to a locking arrangement of this kind and accordingly the invention also resides in a locking mechanism for the door of a security

enclosure which comprises: boltwork for securing the door closed when thrown; an operating member accessible from outside the door; a mechanical transmission for coupling said operating member to the boltwork for throwing and withdrawing the same; one or more locks for selectively locking the boltwork in its thrown condition; primary means for selectively disengaging the coupling of said operating member to the boltwork when in its thrown condition; and secondary means adapted to operate automatically to maintain said disengagement of the coupling of said operating member to the boltwork, independently of the state of said primary means, in response to the detection of an attack upon the enclosure.

15 In this second aspect of the invention the aforesaid primary disengaging means are preferably operatively associated with a said lock whereby operation of the lock to lock the boltwork in its thrown condition serves also to disengage the coupling of the operating member to the boltwork.

20 Alternatively, however, the primary disengaging means could if desired be embodied as an independent key or combination mechanism selectively operable under the control of an authorised operator, separately from any such lock.

25 Most preferably the aforesaid secondary disengaging means performs also the function of a relocker, in which case the above-defined first and second aspects of the invention may be embodied together in the same locking mechanism.

30 In such a mechanism disengagement of the coupling of the operating member to the boltwork preferably takes place as described in Australian Patent Specification No 79113/81 and United Kingdom Patent Specification No 2094390A. That is

to say the mechanical transmission includes a pair of coaxial rotary members a first of which is caused to rotate in either sense by corresponding movement of the external operating member and the second of which is adapted to engage the first in order to transmit movement of the operating member to the boltwork, and the primary disengaging means are operable to displace the second rotary member axially away from the first to disengage the coupling between them. Preferably the second rotary member is keyed rotationally within the next succeeding member of the rotary transmission train but with freedom therein for the aforesaid axial displacement; the aforesaid secondary locking member is adapted to pass through an aperture in said succeeding member to block withdrawal of the boltwork; and in so doing the secondary locking member also engages the second rotary member borne in that succeeding member so as to maintain it in its displaced condition.

These and other features of the present invention will become apparent from the following description, given by way of exemplification, with reference to the accompanying drawings which illustrate portions of a preferred embodiment of a safe door incorporating a locking mechanism according to the invention.

25

In the drawings:

Figure 1 is a vertical section, taken along the line I - I of Figure 3 through the handle/boltwork isolating mechanism of the safe with the latter in its disengaged condition;

30

Figure 2 is a vertical section similar to Figure 1 showing the isolating mechanism in its engaged condition;

Figure 3 is an elevation, partly in section, of the locking mechanism showing the secondary locking member maintained away from its locking position; and

- 5 Figure 4 is a section, taken on the line IV-IV of Figure 3, through the locks and handle/boltwork isolating mechanism of the safe.

Referring firstly to Figures 1 and 2, the illustrated
10 locking and isolating unit 10 includes a fixed throw housing 11 which is secured to a steel member 12, (which may be drill-resistant) on the inside face of the safe door (not shown). Mounted between the member 12 and the exterior of the door is a member 13 of a frangible material, such as
15 glass or brittle plastics, which will shatter and disintegrate upon being penetrated, eg by a drill or the like, or if exposed to an explosive shock or other gross force. A second frangible member 14 is mounted above the unit 10. Further frangible members are mounted on each side
20 of the unit 10 and will be described hereinafter.

The boltwork of the safe door is operated by turning an external handle (not shown) mounted on the end of a shaft 15, driving connection between the shaft 15 and a first rotary
25 member 16 of the mechanical transmission being effected by means of an endless chain 17 passing over toothed gears on the shaft 15 and member 16. Coaxial with the first rotary member 16 is a second rotary member 18 mounted within a throw cylinder 19, which latter is journalled in a through-bore in
30 the throw housing 11. Throw cylinder 19 has an eccentrically mounted pin 20 which drives a pivot link 21 by engagement in a longitudinally extending slot 26 therein. Link 21 is pivotally mounted at one end thereof on pin 22 formed on the throw housing 11, the other end of the link 21 driving a

- horizontal main bolt 25 of the safe by means of pin 23 engaging in slot 24 in the bolt 25 (see also Figure 3). Rotation of throw cylinder 19 is thereby transmitted through the link 21 into throwing or withdrawal of the bolt 25. The
- 5 bolt 25 is connected through vertical straps (not shown) to additional horizontal bolts and may be further connected through articulated links (not shown) to bolts thrown from the top and bottom edges of the door, in known manner.
- 10 As will be seen from the Figures the second rotary member 18 has a transverse slot 27 within which is received a corresponding drive lug 28 mounted on the first rotary member 16. Second rotary member 18 is capable of axial movement within the cylinder 19 relative to the first rotary member
- 15 16, and is biased towards the first rotary member by means of compression spring 29 captive within the throw cylinder. When member 18 is free to move under the bias of spring 29 it moves towards member 16 to engage the lug 28 within the slot 27. In this condition (shown in Figure 2), rotation of
- 20 member 16 is transmitted into rotation of member 18.

Second rotary member 18 is also provided with a pair of radially outwardly extending lugs 30, only one of which is depicted in Figures 1 and 2, (the other being positioned

25 diametrically opposite). Each of the lugs 30 is received within a corresponding axially directed slot 40 in the end of throw cylinder 19 adjacent to the first rotary member 16. Lugs 30 are received within the slots 40 in the throw cylinder 19 both when the first and secondary rotary members

30 are disengaged (as shown in Figure 1) and when they are engaged (as shown in Figure 2), to keep the member 18 keyed rotationally to the cylinder 19. In the latter condition, rotation of the member 18 is transmitted into rotation of the

throw cylinder 19 by the engagement of the lugs 30 and slots 40, and hence into throwing or withdrawing of the bolt 25 as previously described.

5 It will be apparent from the foregoing, that when the safe door is closed and locked and the second rotary member 18 held out of engagement with the first rotary member 16, shaft 15 can be turned without any force being put on the locking unit 10 or bolt 25.

10

Disengagement of the rotary members 16 and 18 is achieved by operation of the locks 31 and 32 as shown in Figures 3 and 4. Each of these locks has a bolt 33, 34 with a tapered nose which, when the bolt is thrown, extends through the throw
15 housing 11 and through a respective radial aperture 35,36 in the throw cylinder 19, to engage the inclined surface 38 which bounds a circumferential groove 37 in the bobbin-shaped second rotary member 18 (see Figures 1,2 and 4). Member 18 is thus withdrawn from engagement with rotary member 16 by a
20 wedging or camming action, against the bias of spring 29. By entry of the bolts 33,34 through the apertures 35,36 in the throw cylinder 19, these bolts also lock the throw cylinder to the housing 11 to resist any subsequent attempt to forcibly retract the main bolt 25.

25

In accordance with the present invention, the locking mechanism is also provided with a secondary locking member 41 mounted within a bore 42 in the throw housing 11, and urged by a compression spring 43 to extend through a radial
30 aperture 44 in the throw cylinder 19 which aligns with the bore 42 when the bolt 25 is thrown, so that the head 45 thereof is received within the outer portion of the groove 37 formed in the second rotary member 18. Member 41 is normally

restrained to keep in the position shown in Figures 1 to 3. However, if member 41 is released when the bolt 25 is thrown it will act both to hold the second rotary member 18 away from engagement with the first rotary member 16, and to
5 interlock the throw cylinder 19, independently of the lock bolts 33,34, and maintain the boltwork locked and isolated in this manner even if the lock bolts 33 and 34 are subsequently withdrawn.

10 The secondary locking member 41 is held in its normal, restrained position by the engagement of a restraining element 50 in a circumferential groove 51 formed in the end of the member 41 which extends out of the top of the bore 42. Element 50 is connected to frangible members 13 and 14
15 (Figures 1 and 2), and further frangible members 61 and 62 at either side of the unit 10, in such a manner that breakage or disintegration of any one of these frangible members will trigger the release of the element 50 from its position in the groove 51, under the action of a tension spring 52
20 anchored to the plate 12, thereby releasing member 41 as previously described. In the embodiment depicted in Figure 3, the frangible members are connected to the element 50 by means of a wire or similar flexible tension member 53
25 extending from member 14 to a pulley mechanism 54 attached to frangible member 62, then to pulley mechanism 55 attached to frangible member 61, and then to element 50 where it holds this element in position in groove 51 against the action of the spring 52. Element 50 also abuts the frangible member 13 by its free end 57 as shown in Figures 1 and 2. It will be
30 apparent that breakage or disintegration of any one of the frangible members 14, 61 or 62 will release the tension in wire 53, while disintegration of frangible member 13 will release the element 50 from its abutment thereagainst. In

either case, the secondary locking member 41 will be released by element 50 to lock and isolate the bolt 25 in its thrown condition. Still further frangible members linked to the member 41 could be provided below and behind the unit 10, if
5 desired.

Member 41 is also provided in its head 45 with a radially directed bore housing a compression spring 47 and a pin 48 which is urged by the spring into contact with the inside
10 surface of the housing bore 42. However, when member 41 is released and the head 45 thereof moves through the aperture 44 into the groove 37 in second rotary member 18, the pin 48 will extend out of its bore and under the ledge formed between aperture 44 and housing 11 to resist any attempts to
15 retract the head 45 of member 41 back into the bore 42.

It will be appreciated that while the invention has been particularly described above in terms of its application in one particular embodiment where the secondary locking member
20 41 is part of a "dead" relocker actuated by frangible members 13,14,61 and 62, the member 41 could additionally or alternatively be actuated by thermal detector means or other forms of detector known in the art, and by suitable rearrangement of the run and connections to wire 53 could be
25 adapted for operation as a "live" relocker.

CLAIMS

1. A locking mechanism for the door of a security enclosure, comprising: boltwork (25) for securing the door
5 closed when thrown; a rotary operating member (15) accessible from outside the door; a mechanical transmission (16,18,19,21) for coupling said operating member (15) to the boltwork (25) for throwing and withdrawing the same; said transmission comprising a rotary transmission train
10 (20,21,23) adapted to be driven by said operating member (15) and mechanism for converting rotary movement of said train to translatory movement of one or more bolts (25) of said boltwork; one or more primary locks (31,32) for selectively locking the boltwork (25) in its thrown condition; and a
15 relocker (as herein defined) (13,14,61,62,50-53,41); characterised in that the secondary locking member (41) of the relocker is adapted to engage with a member (19) of said rotary transmission train to block withdrawal of the boltwork (25).

20

2. A mechanism according to claim 1 wherein the said member (19) of the rotary transmission train is borne for rotation in a housing (11) and said secondary locking member (41) is borne in said housing (11) for sliding movement transversely
25 to the axis of said rotary member (19); said rotary member (19) having a complementary formation (44) which aligns with the secondary locking member (41) when the boltwork (25) is thrown, and the secondary locking member (41) being adapted to move into engagement with said formation (44) to lock said
30 rotary member (19) against rotation relative to said housing (11).

3. A mechanism according to claim 1 or claim 2 wherein said secondary locking member (41) is arranged to operate in
35 response to the fracture of frangible means (13) so shaped

and positioned as to mask the or each said primary lock (31,32), said secondary locking member (41) and said member (19) of the rotary transmission train, as viewed from the front exterior of the door.

5

4. A mechanism according to any preceding claim wherein said secondary locking member (41) is arranged to operate in response to the fracture of frangible means (14) so shaped and positioned as to mask the or each said primary lock

10 (31,32), said secondary locking member (41) and said member (19) of the rotary transmission train, as viewed from the top exterior of the door.

5. A mechanism according to any preceding claim wherein

15 said secondary locking member (41) is arranged to operate in response to the fracture of frangible means (61,62) so shaped and positioned as to mask the or each said primary lock (31,32), said secondary locking member (41) and said member (19) of the rotary transmission train, as viewed from either
20 side exterior of the door.

6. A mechanism according to any preceding claim comprising primary means (31,32) for selectively disengaging the coupling of said operating member (15) to the boltwork (25)

25 when in its thrown condition; and wherein said secondary locking member (41) is adapted to maintain said disengagement independently of the state of said primary disengaging means (31,32).

30 7. A mechanism according to claim 6 wherein said rotary transmission train includes a pair (16,18) of coaxial rotary members a first (16) of which is caused to rotate in either sense by corresponding movement of said operating member (15) and the second (18) of which is adapted to engage the first

(16) in order to transmit movement of the operating member (15) to the boltwork (25); and said primary disengaging means (31,32) are operable to displace the second rotary member (18) axially away from the first (16) thereby to disengage the coupling between them (16,18).

8. A mechanism according to claim 7 wherein said second rotary member (18) has a face (38) inclined to the rotational axis thereof and that member (18) is displaced away from the first rotary member (16) by virtue of the camming action of a member (33,34) of said primary disengaging means (31,32) which is thrust against that face (38).

9. A mechanism according to claim 7 or claim 8 wherein said second rotary member (18) is keyed rotationally within the next succeeding member (19) of the rotary transmission train but with freedom therein for said axial displacement; the secondary locking member (41) is adapted to pass through an aperture (44) in said succeeding member (19) thereby to block withdrawal of the boltwork (25); and in so doing the secondary locking member (41) also engages said second rotary member (18) thereby to maintain that member (18) in its displaced condition.

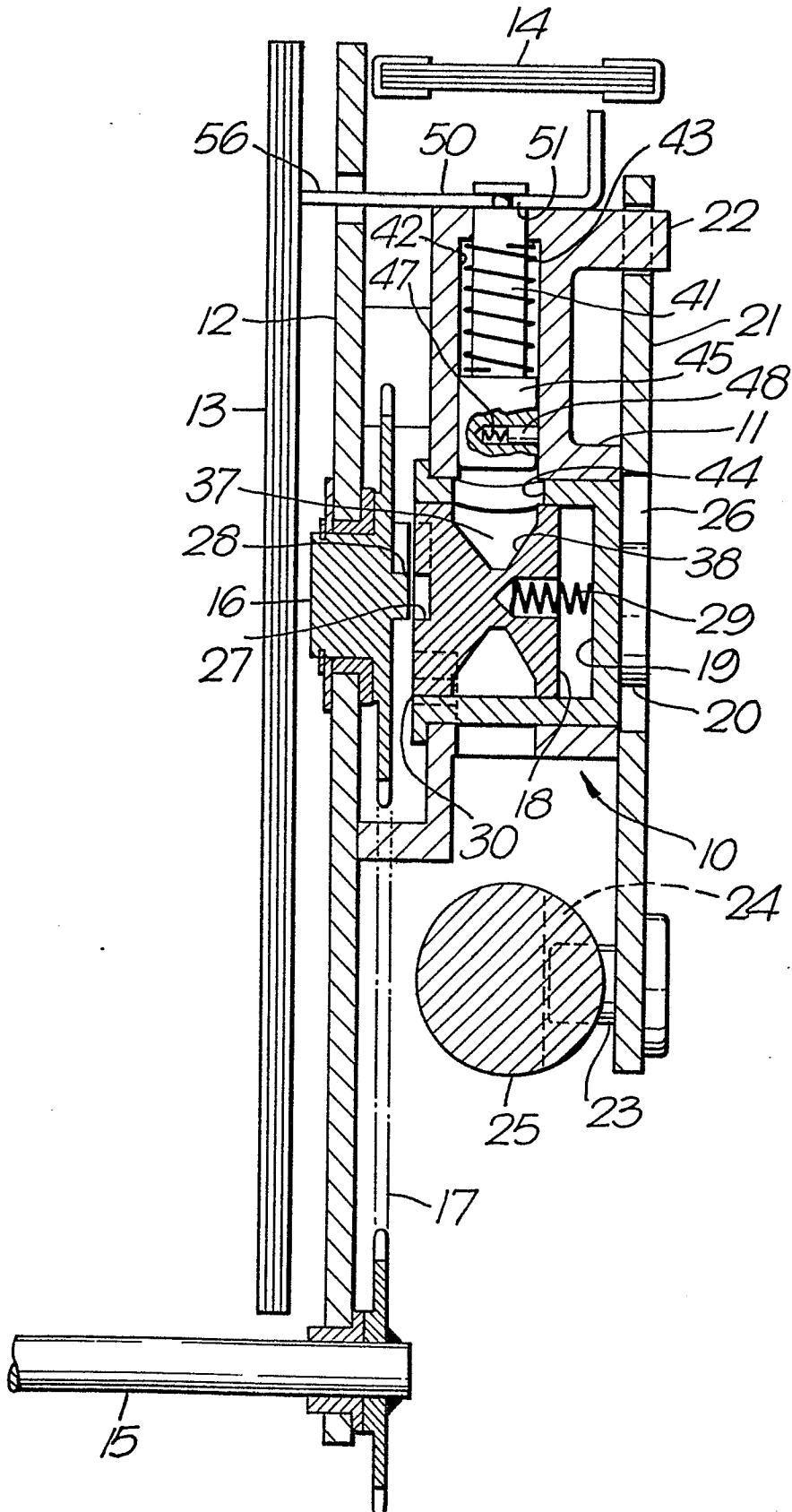
10. A mechanism according to claims 8 and 9 wherein said second rotary member (18) has a circumferential groove (37) one bounding face (38) of which constitutes said inclined face, and into which the secondary locking member (41) engages.

11. A locking mechanism for the door of a security enclosure, comprising: boltwork (25) for securing the door closed when thrown; an operating member (15) accessible from outside the door; a mechanical transmission (16,18,19,21) for

coupling said operating member (15) to the boltwork (25) for
throwing and withdrawing the same; one or more locks (31,32)
for selectively locking the boltwork (25) in its thrown
condition; and primary means (31,32) for selectively
5 disengaging the coupling of said operating member (15) to the
boltwork (25) when in its thrown condition; and characterised
by means (41) adapted to operate automatically to maintain
said disengagement of the coupling of said operating member
(15) to the boltwork (25), independently of the state of said
10 primary means (31,32), in response to the detection
(13,14,61,62) of an attack upon the enclosure.

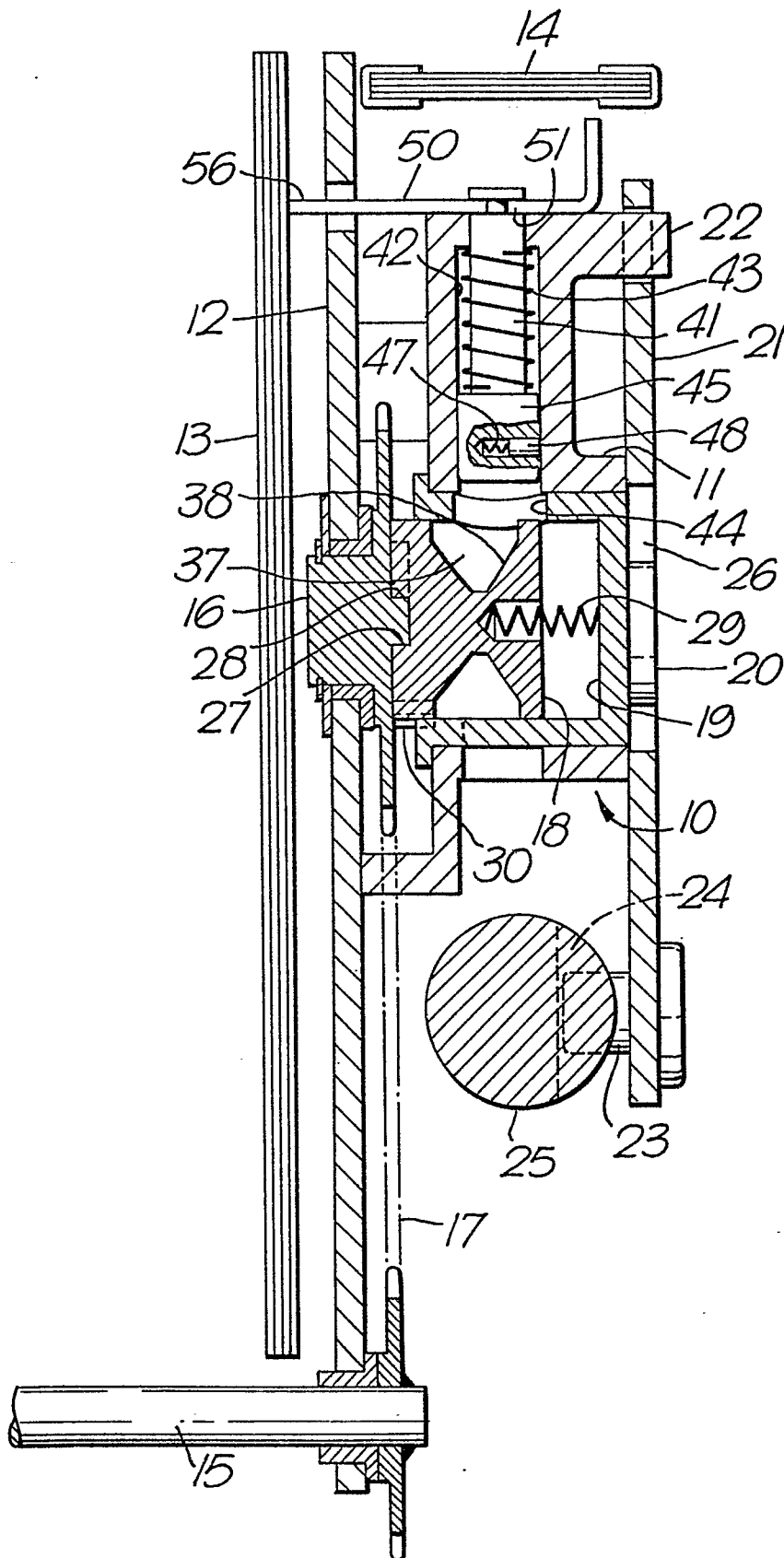
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Fig. 1.



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Fig. 2.



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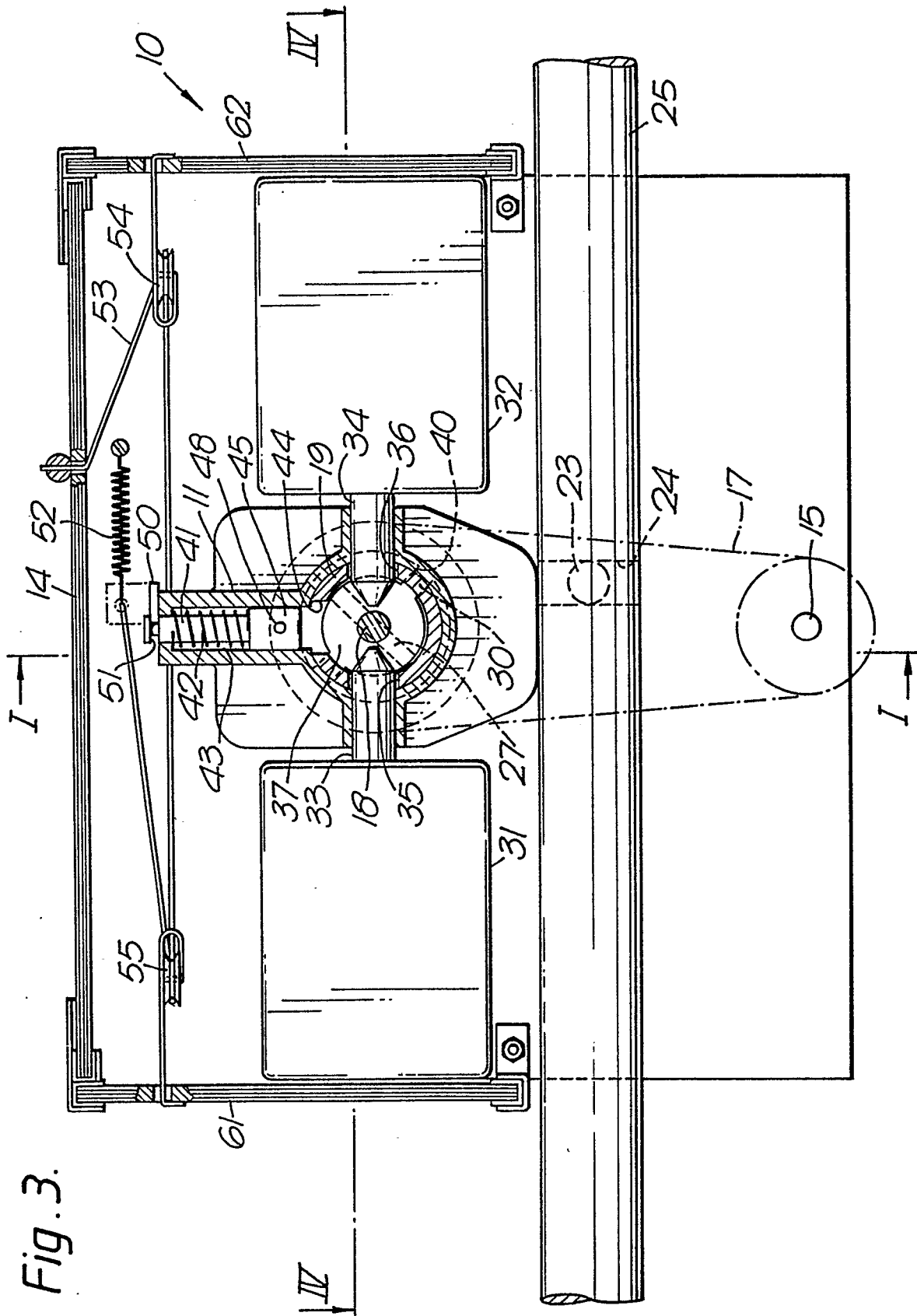
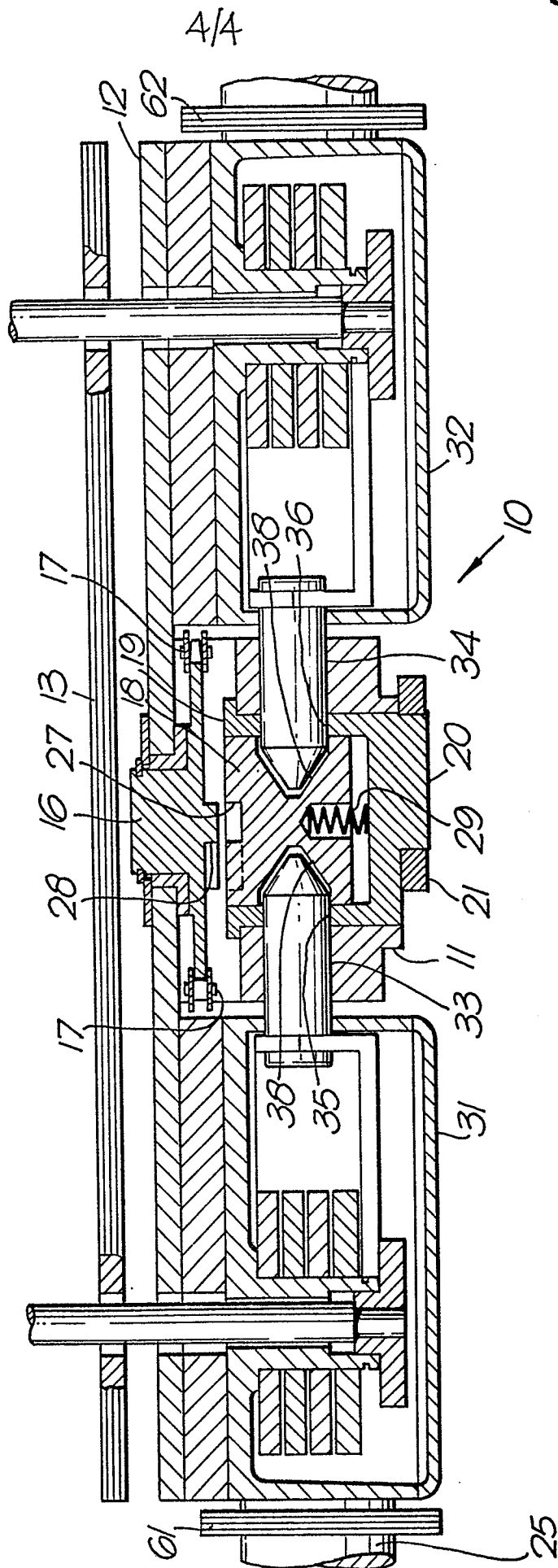


Fig. 4.





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EUROPEAN SEARCH REPORT

0087225
Application number

EP 83 30 0444

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. 7)												
X	US-A-3 371 628 (R.E. McCLELLAN) * Column 4, lines 53-57; figure 1 *	1,2	E 05 G 1/04												
Y		3-5													
X	--- US-A-2 823 536 (W.J. WATSON) * Column 4, lines 40-64; figure 1 *	1,2													
Y	--- GB-A-1 450 397 (THORNE & SON) * Page 1, line 93 - page 2, line 2; figure 1 *	3-5													
A	--- US-A-1 918 411 (LOWE C.B.) * Page 1, lines 5-13; page 3, lines 9-51; figure 1 * -----	6-8	TECHNICAL FIELDS SEARCHED (Int. Cl. 7) 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 04-05-1983	Examiner GRENTZIUS W.												
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