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(12) # EUROPEAN PATENT APPLICATION

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(54) **Card operated lock.**

(57) A lock of the type using a card as an unlocking element, where the card is not physically actuating over the movable elements of the lock, but the card just establishes a code which will free the lock elements, while their operation is carried out by a knob alien to the unlocking elements. This knob can be extremely rugged and it allows the use of very weak cards. A card reader belonging to the above mentioned technique is used, and the lock is made of four rectangular sheets which define three flat parallel spaces where the different parts which rock or slide over holes or slots are located, within the sheets, with the aid of spindles, pins and rivets.

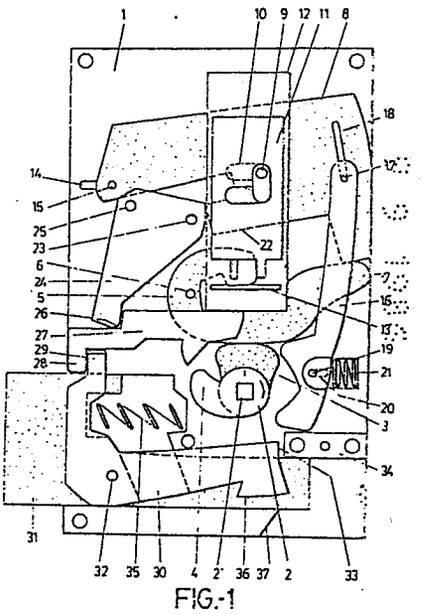

FIG.-1

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Description

"CARD OPERATED LOCK"

OBJECT OF THE INVENTION

As mentioned in the title of these patent specifications, the present invention refers to a lock of the type using a card as an unlocking element and it is applicable to doors, safes, hotel rooms, etc.

This lock is fully mechanical and its structural features aim to a maximum reduction in width. It also includes easily manufactured components which do not require special adjustments and are not subject to important effort and wear. It specially aims to a practically unlimited number of combinations, with the special feature that the combination of one specific card can be changed at any time, in a very simple way.

It also offers the possibility of using combined unlocking cards, so that the simultaneous use of two different cards is required to open a lock.

PRECEDINGS TO THIS INVENTION

Some card operated locks have appeared in the market lately as an alternative to the conventional key operated lock. A card is much easier to carry, due to its geometry and weight, than the conventional metallic key.

There are many solutions to a card operated lock, most of them electromechanical and some also mechanical only, but all of them present a double-sided problem: on one side, not only the releasing but also the unlocking operation are carried out with a card in a function of a "key". Therefore, the card must necessarily be strong and, as a consequence, it is necessary that the lock mechanisms be light, perfectly adjusted and not subject to wear which would make them lose such perfect adjustment, so that interlocking can be carried out with a minimum effort, exactly the one the card can take up.

This means that the card operated locks known until now cannot fit latches strong enough when safety is required. Besides, very rugged and precisely machined materials must be used in the manufacture of these locks, what means a quite high final price.

DESCRIPTION OF THE INVENTION

The lock proposed by the invention has been designed to fully solve the above mentioned problem by allowing the use of parts which do not require too precise and adjustment and permitting important wear tolerances. For this reason, materials of not a very high quality can be used and, in spite of that, a very long life of the lock is assured as well as a perfect operation.

This is obtained due to the fact that it is not the card itself what physically operates the moving elements of the lock, but the card is only used to establish a pre-determined code to free the locking elements while the opeation of such elements will be carried out with and independent element, namely with a control knob which is alien to the unlocking mechanisms. Consequently, this control can be as rugged as desired, such as to move very heavy parts such as big lockbolts, etc. This control will not operate until the unlocking of the combinations elements is carried out.

This, in turn, allows the use of cards as weak as desired, made of plastic material or even paper, which are inexpensive and simple can can be easily carried in quantities in any wallet.

To obtain this, a card reader is used as the one claimed in Utility Model 276.246 or any other which is similar to that one, based on a number of sheets inside a casing and fitted with grooves which are irregularly arranged, as well as relative extensions which are located on the way of the opening card. After introducing the card and according to the established code for the lock which is materialized in a number of holes in the card, the extensions take a given relative position in which the grooves mentioned above are all confronted, thus allowing the diagonal displacement of one spindle which is housed in the grooves and duly related to the mechanisms operating the latch.

Therefore, starting from the use of this card reader, the lock being claimed is made of four rectangular sheets which define three parallel spaces among them. These spaces are considerably flat and house the different parts which are the operative mechanism of the lock. These parts tilt or slide over the holes and grooves in the aforementioned rectangular sheets, with the co-operation of adequate pins and rivets.

In a more specific way, the spindle which operates in the grooves of the card reader is connected to a part positioned in the frontal space of the three spaces in the lock, defined by the four sheets mentioned above. This part rests on a rocking safety part which, in turn, restes on a dual cam connected to the lock operating spindle through a relevant handle. This spindle can only rotate in one direction due to a stop for this operative purpose.

One of the two sections of this cam, which is obviously located in the same lock space as the safety part and the part supporting the spindle moving in the sheets, when driving the operating control knob in a rotating sense, will allow the lowering of the safety part shaped as a rocking trigger. Over the free end of this rocking trigger the end of the part supporting the spindle rests, in opposition to the lock latch.

After lowering of the part supporting the spindle and as a contribution to the previously mentioned rotation, the second cam section which is angularly out of phase in respect of the first cam section, and is placed in the intermediate lock space, operates over a rocker which is, in turn, connected with a part with a spindle and that rocker moves the part with the spindle over its own plane in a way which is quite parallel to the emergency movement of the latch. Obviously, this displacement operates only when the slots of the various reader sheets are duly confronted, after introduction of the unlocking card, so

that the spindle associated to this part may move along the slots.

Immediately afterwards, as a continuation to the cam revolution the first section of the cam actuates again over the safety part, or trigger, which makes the spindle supporting part move upwards. During this upward movement this part, due to its diagonal displacement, interlocks with a pin connected to a lower rocker, makes this rocker rock and the rocker in turn entrains a slide which is parallel to the latch. This slide is, in turn, connected to a rocking latch entrainment and first makes the entrainment rock so as to be free from a fixed stop located on the opposite latch end. Then it moves the latch entrainment in a longitudinal way and, as a consequence, the above mentioned latch is entrained to the opening position.

In this connection it should be specially mentioned that during the displacement of the aforementioned slide, there are two sequences. During the first sequence, the slide is shifted by the rocker and during the second sequence it is shifted by the internal section of the dual cam as a continuation of the rotation of the relevant control knob.

As an addition to the above described structure, this lock also incorporates a second slide placed in the inner space of the three ones defined by the four sheets. This slide directly moves the latch rocking, entrainment when manually operated and it also directly moves a toothed part interlocking with a section of the above mentioned slide, in the form of a toothed rack.

It has also been foreseen the addition in this lock of additional parts allowing a quick replacement of the sheets in the card reader, to change the lock combination.

DESCRIPTION OF DRAWINGS

An additional description of this card operated lock will be carried out in the following paragraphs, in respect of the enclosed drawings. The drawings depict, just as an example and by no means in a limited way, one preferable manufacturing possibility which is subject to any detail modifications not altering its commercial features substantially.

The drawings show:

Figure 1.- It is a schematic side view of a card operated lock, in accordance with the invention, where two of the spaces established are shown. It particularly refers to the central space and to the space corresponding to the door external side, with the parts included in the spaces. The dotted areas refer to the parts in the external space and the assembly is in a rest and locked position.

Figures 2 to 6.- These figures show the same assembly as in figure 1, in a sequence of operative phases for the various components, from the locked position shown in figure 1 to the open position shown in figure 6.

Figure 7.- It shows another view of the lock which is similar to the one in figure 1, but in this case the space between sheets corresponds to the inside face of the door and the parts included in that space.

Figures 8 and 9.- These figures show detail views of the mechanisms foreseen for the change of the sheets in the card reader in rest position and in operating position.

Figure 10.- It shows a view similar to figure 1, with the same parts, but when an attempt is made to open the lock with one card which does not correspond to that lock. The blocking of the lock is clearly depicted.

Figure 11.- It shows a casing prepared for two cards, in three different executions: one casing prepared for combinations to be changed from inside, one sheet used as a safety and protective component and one new casing to change the combination from outside.

Figure 12.- It finally shows a view in perspective of a detail in the alingnment of the sheets.

DESCRIPTION OF ONE PREFERRED WAY TO CARRY OUT THE INVENTION

In connection with the figures, for instance figure 1, it can be seen that the claimed lock includes a set of parallel sheets (1), which will be fixed one another, within a distance, by means of any conventional system. This defines three spaces: the one corresponding to the external face of the door defined by the dotted parts in figures 1 to 6 and 10- The intermediate space is defined by the parts appearing undotted in the same figures and the space correspondingly to the internal face of the door is defined by the parts in figure 7.

More precisely, these parts consist of one cam (2) fitted with a hole (2') with a polygonal cutaway, for connection of the corresponding manual knob (not shown in the figures). The cam has two operative sections (3 4). The first section is placed in the external space of the lock and the second section is placed in the intermediate space.

Over the cam space (3) a safety part (5) is resting. This part is mounted in a rocking way on a pin (6) and extends considerably in its function of a trigger by its end opposite to the hinge pin (6) and beyond the cam (3). On its free end (7) it receives a part (8) carrying the spindle (9) which has to move in the slots (11) mounted inside the casing (12) and forming the card reader with its corresponding slot (13) for introduction of the card whenever the slots (10) allow it to enter.

This part (8) is able to rock in a vertical direction along the vertical section of the slots (10) and can also move diagonally within the limits established by a slot (14) in the sheets (1) in which a pin (15) moves integral with that part.

The diagonal displacement of part (8) is obtained by means of a rocker (16) placed in the intermediate space of the lock. It allows free rocking in a vertical position in relation with the mentioned part (8) as it is related to such part by means of a pin (17) moving in a slot (18) which is sufficiently long and clearly visible in figure 1. This rocker is mounted on sheets (1) through the rocking pin (19) and with the aid of slotted holes (20) which allow its displacement against a spring tension (21), so that when part (8) is blocked due to the fact that no card or a wrong card is introduced, the knob fitted to hole (3) and, as a

consequence, the dual cam may freely rotate by moving the lower rocker end(16) against the spring (21) but, obviously, without unblocking the lock mechanism.

Part (8) is provided with a down-side branch (22) which gives it a clevis like shape. In its diagonal movement this part is meant to interlock in a pin (23) in a second rocker (24) which is forced to rock when the said part is also rocking upwards.

On ther other hand, this rocker (24), through its end opposite to the trunnion axle (25) operates on the graduation (26) of a slide (27) which also has an elbow (28) actuating on a projection (29) of a rocking entrainment (30) for the latch (31). The entrainment rocks on an axle (32) when receiving the movement on the elbow (28) to set free its internal end (33) in relation to a fixed stop (34) which prevents the latch (31) from retracting in a rest position of the lock, due to its direct actuation over the latch. The rocking axle (32) of the entrainment (30) is the driving element of the latch movement (3). The displacement of the entrainment (30) is carried out against the tension of a spring (35) up to a limit position where a lower gradation (36) of the entrainment interlocks in an additional gradation (37) in the body of the lock, as shown in figure 6.

According to this configuration, and starting from the closed position shown in figure 1, the operating know makes cam (2) turn to a position where its section (3) remains turned downwards and the trigger or safety part (5) lowers and also allows the lowering movement of part (8) so that branch (22) of its clevis is located under the pin (23) of the rocker (24) as shown in figure 2. As a continuation of the cam (2) turn in the same direction as the arrow in the figures, section (4) of the above mentioned cam actuates on the lower end of the rocker (16) and, if an adequate card has been introduced through the slot of the card reader, the above mentioned rocker (16) originates a diagonal displacement of part (8) up to a point when pin (23) is introduced within the clevis shaped part (8) as shown in figure 3. As a continuation of the turning movement of the cam (3-4) in accordance with figure 4, cam (3) again actuates on the trigger or safety part (5) and this part pushes part (8) in an upwards direction. This part, through its branch (22) and pin (23) makes rocker (24) move and this rocker pulls the slide (27). The slide, in turn through its projection (28) and the additional projection (29) of the rocking entrainment (30), forces the entrainment to turn over its axle (32) and frees its end (33) off the stop (34). It then moves inwards pulling the latch (31) in the first portion of its trip, exactly in one width equivalent to the rocking degree of the arrow (8), up to the limit position shown in figure 4.

From this position it is cam (4) which continues the displacement in the same direction as the slide (27) and, consequently, the displacement of the rocking entrainment (30) and the latch (31) up to the limit position shown in figure 5, where spring (35) is fully retracted. as well as latch (31) to a fully open position.

After opening, as shown in figure 5, when the card is withdrawn and it does not actuate any more on the operating knob, a slight take-up of the latch towards the closed position takes place. This take-up is shown in figure 6. up to the limit position in which the additonal gradations (36 and 37) interlock. Thus, when closing the door, this slight protrusion of the latch (31) forces it also to a slight retraction during which unlocking of the gradations (36 and 37) take place and then the spring (35) will force the latch to regain the closed position shown in figure 1.

The above mentioned operating description corresponds to the opening sequence as carried out from outside of the door. However, when it is required to open from inside, the above described parts remain non-operative and only parts shown in figure 7 are operative and situated in the lock space defined by its sheets and directed towards the inside face of the door. More precisely, these parts consist of one rack or slide (38) fitted with an elbow shaped projection (39) similar to elbow (28) of the lock (27) which also operates on the projection (29) of the rocking entrainment (30) connected with the latch (31). This rack is directly operated by a gerar wheel (4) with a polygonal hole (41) connected to a manually operated knob, which is directly operated from the inside face of the door.

When an opening sequence is attempted from outside with a card not corresponding to the established scheme in the card reader (12) the slots (10) are not matching in the sheets of the card reader, as shown in figure 10 and make diagonal displacement of part (8) impossible and, consequently, it is also impossible to operate the other mechanisms of the lock. In spite of this, operation of the opening knob is possible, to avoid forcing the assembly, in which case cam (4) operates rocker (16) and obtains the displacement of the nearest end of the rocker, against the tension of spring (21).

In the casing (12) corresponding to the card reader, a variable number of sheets (11) can be fitted, preferably between 16 and 30. However, some of these sheets can be put out of service, as previously programmed, with the aid of parts (42, 43 and 44) appearing in figures 8 and 9. More precisely, part (42) can be operated from inside of the room where the door with the lock is situated. In its displacement, this part operated rocking part (43) which turns on axle (45). During its rocking movementl this part pushes part (44). fitted with a gradation (46) through which it pulls sheets (11) into the casing, with the aid of one side projection (47) fitted in these sheets.

Figure 11 shows a casing (12) of a card reader fitted with two slots (13) - 13′) for introduction of two cards in such a way that one of the cards is introduced from the inside face of the door and the other one is the normal card, and this allows an easy change of the lock combination, as changing the card operating from inside is enough to invalidate the original card operating from outside, which must then be changed. This application is particularly suitable for hotels and likely places. where the potential risk exists that an old customer has copied a card and tries to come into the room when it is already occupied by another customer.

A casing (12) is also shown in this figure to change

the combinations from inside with only one card. In this case, the card has two hole spaces, one of them for programming whilst the other one is valid for opening the lock.

This figure also shows on sheet (11') which can be used as a safety and protective device in several applications.

Finally, figure 12 shows one way of sheet alignment (11) as mentioned previously.

From the depicted configuration it is clear that the lock claimed by the invention is fully mechanical, that the card selector (12) can be disassembled from the inside face of the door and the combination can be very easily changed and also the cards can be metallic, plastic or even made of paper as they are not subject to effort during their handling, thus permitting to establish an infinite number of combinations, and the cards are very inexpensive to make.

This lock also offers, at the same time, the possibility of combining two or more cards in such a way that a door can only be opening with the presence of two persons with the relevant cards.

There is a possibility too, to establish a set of locks, each of them to be opened with a different card, whilst all of them can also be opened with a single common card which would be considered as a master card. This is specially applicable to a number of rooms in a hotel, where each customer has a card corresponding only to his room, while the hotel service personnel can have a card to open all the rooms.

The shape, dimensions and material of the cards can be variable as well as any other secondary features, while no alteration or change is made in the essential characteristics of the object being described.

The terms used to write these patent specifications are certain and they truly describe the claimed object. They should be taken as a broad and not limited description.

Claims

1.- A card operated lock of the type incorporating a mechanical card reader distinguished for being made from an assembly of four parallel sheets which hold its operative elements and determine three independent spaces where the parts or moving elements of the lock are located, and incorporating, in the space corresponding to the external face of the lock, one laminar part fitted with a spindle perpendicular to that laminar part, which moves inside the sheet slots that belong to a card reader, a component resting on a safety part, shaped as a trigger, which is mounted as a rocker in one of its ends. On the opposite end, which is free, the above mentioned part rests, and the safety part, or trigger, in turn, is resting on a dual cam, more precisely, it is resting on one of the two sections of the cam. This cam is fitted with one polygonal hole for insertion of the spindle of the lock operating knob, whilst in the intermediate space of the lock a rocker is fitted capable of moving diagonally the part bearing the spindle related to the card reader. This rocker is operated by the second section of the dual cam included in the intermediate space. An additional feature is the fact that the part bearing the above mentioned spindle takes a clevis shape and is able to operate a second rocker which, in turn, operates a diagonal slide, the movement of which rocks and displaces longitudinally a rocking entrainment, situated under the dual cam, against the tension of a spring. The axle of the rocking entrainment is directly mounted on the lock latch and pulls the latch in its movement.

2.- A card operated lock, as per claim 1, distinguished by the fact that, in a locked position of the latch, a safety part shaped as a trigger takes and upward limit position by the action of a relevant cam section and the part with the spindle interlocking with the card reader also takes the same position, whilst a first clockwise rotation is supplied to the operating knob and it originates a reverse in the position of this cam and the consequent lowering of the spindle bearing part. In this moment, the second cam section touches the first trigger and forces it to rock and pull the spindle bearing part in the same direction as the latch is moved, when the sheets in the card reader allow, due to the introduction of an adequate card, up to a limit position in which the above mentioned spindle bearing part, due to its clevis shape interlocks with one pin located in the second rocker. With this, the cam goes on turning and the first cam section touches the trigger or safety part, and this trigger moves upwards pulling the spindle bearing part, which makes the rocker rock, and the rocker, in turn, pulls the slide. This slide pulls the rocking entrainment and the rocking entrainment pulls the latch.

3.- A card operated lock as per above claims, distinguished by the fact that the second rocker pulls the slide in one of its displacement stages, at the beginning of which the rocking entrainment makes a slight rocking that forces its left end to be misaligned in respect of a blocking stop, for the latch in a rest position and a closed lock, whilst at the end of the rocking stage, it is the cam itself, through its second section, which continues the slide displacement, interlocking in one projection of the slide up to the opening limit position.

4.- A card operated lock as per above claims, distinguished by the fact that the first trigger on which the dual cam actuates, features a rocking axle, mounted on slotted holes in the lock sheet and is assisted by a spring, in such a way that in case of an eventual operation of the lock knob in a blocked position of the card reader, the above mentioned rocker gives way, allowing the knob to rotate in spite of the fact that the mechanisms keep the previous blocking position.

5.- A card operated lock as per above claims. distinguished by the fact that a rack is fitted in the internal compartment of the lock. This rack directly operates the rocking entrainment of the latch when operated from the inside face of the door through a knob with an integral gear wheel which meshes with the above mentioned rack.

6.- A CARD OPERATED LOCK.

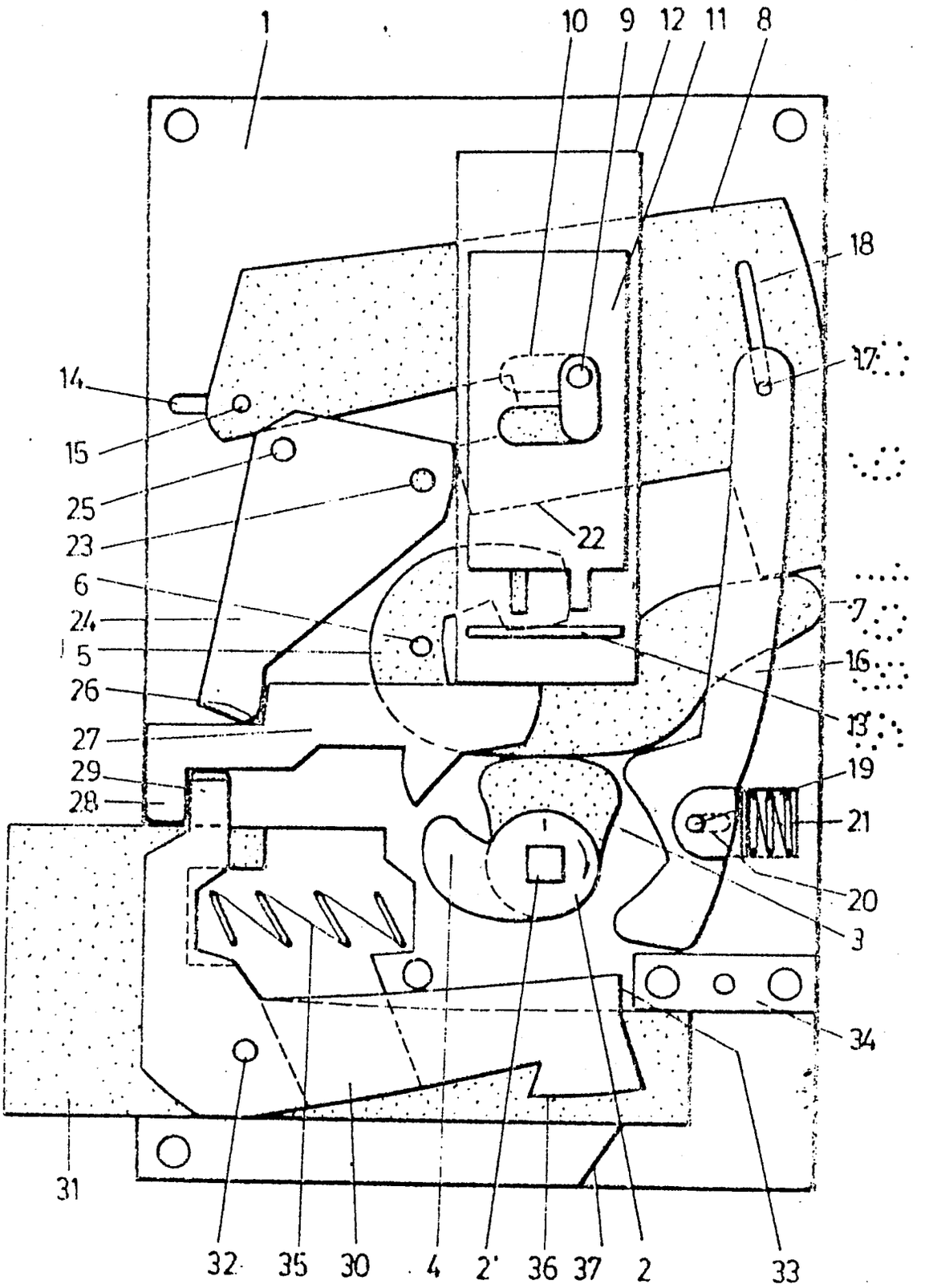
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FIG.-1

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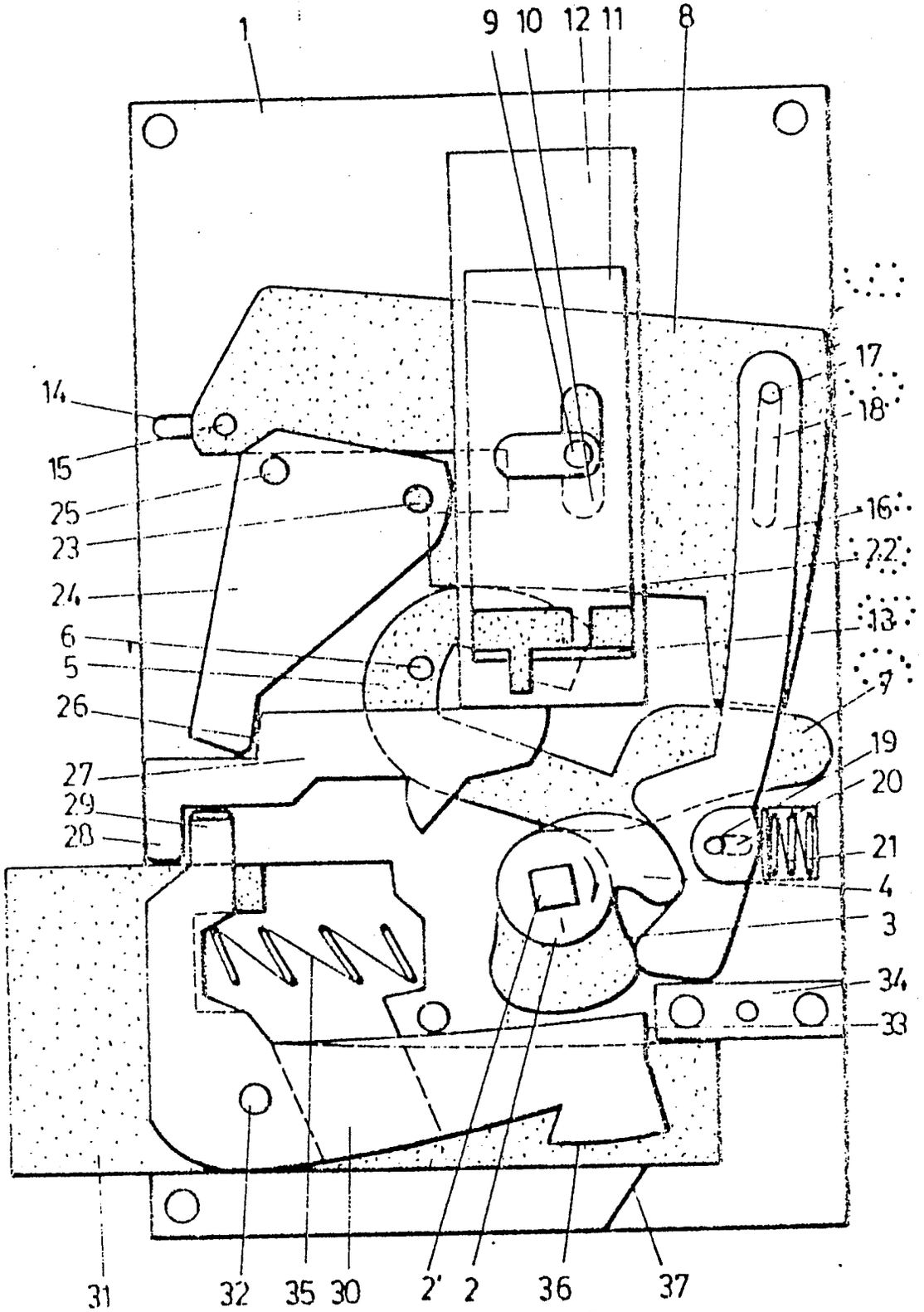
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FIG.-2

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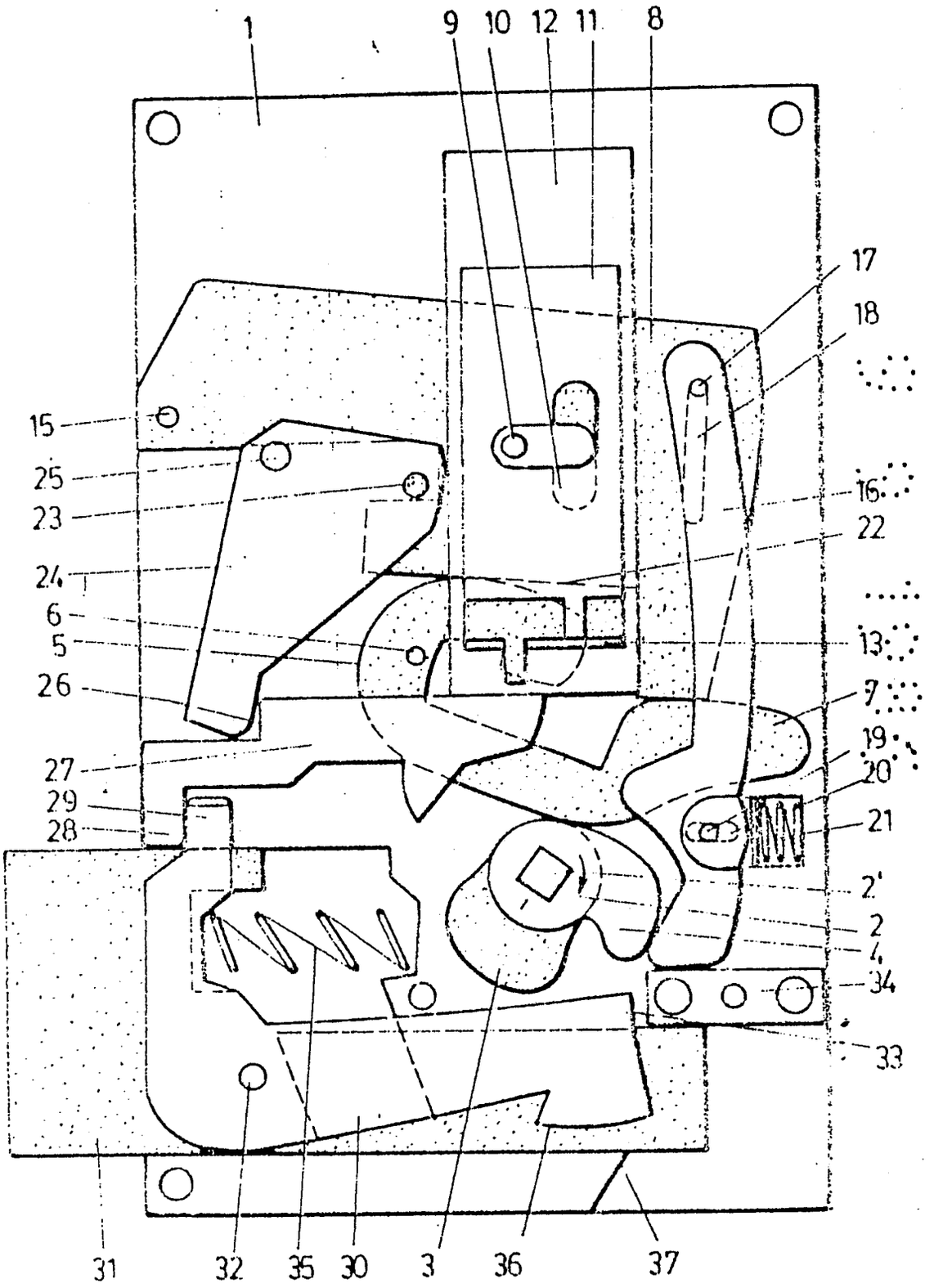
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FIG.-3

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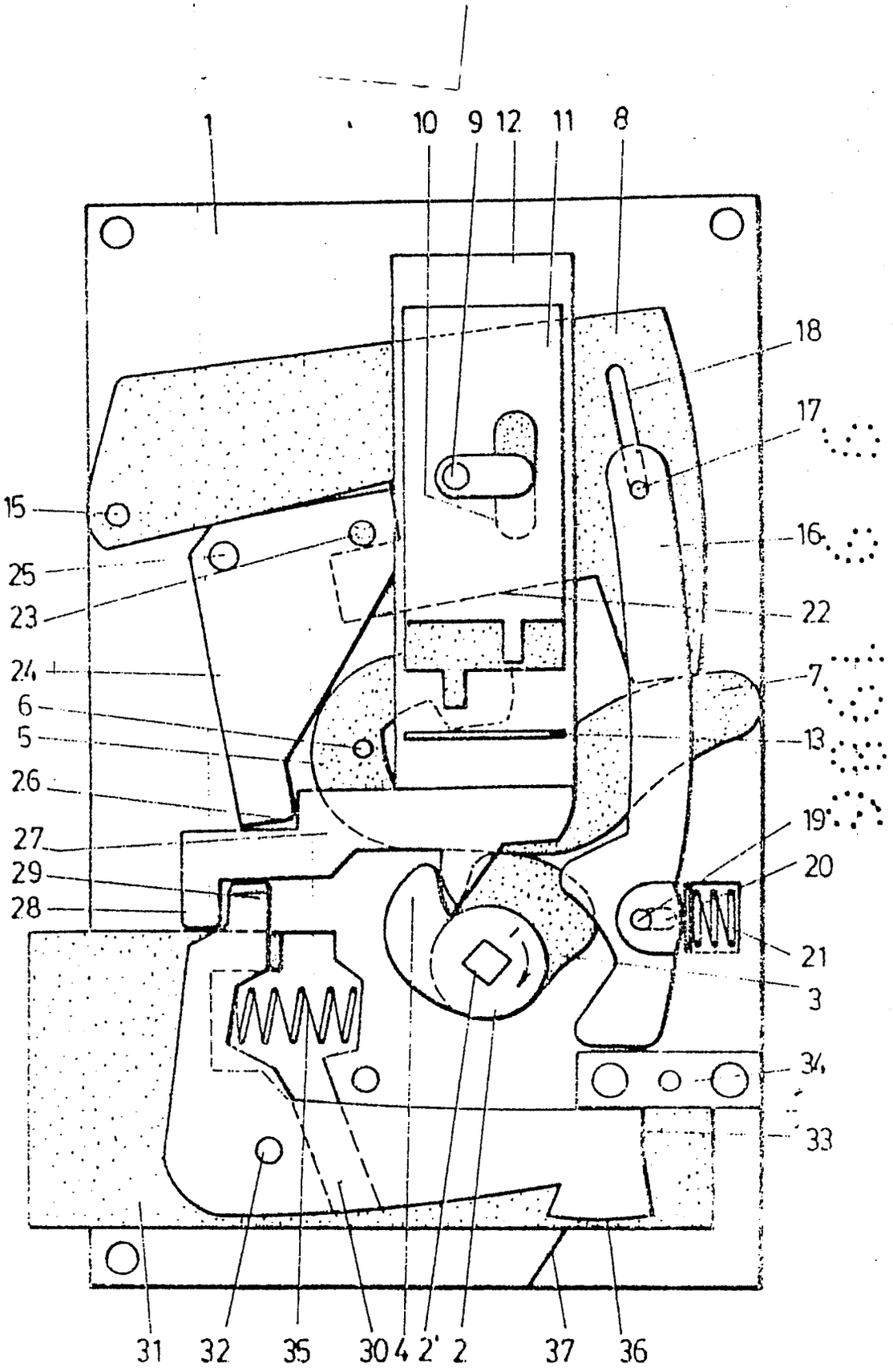
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FIG.-4

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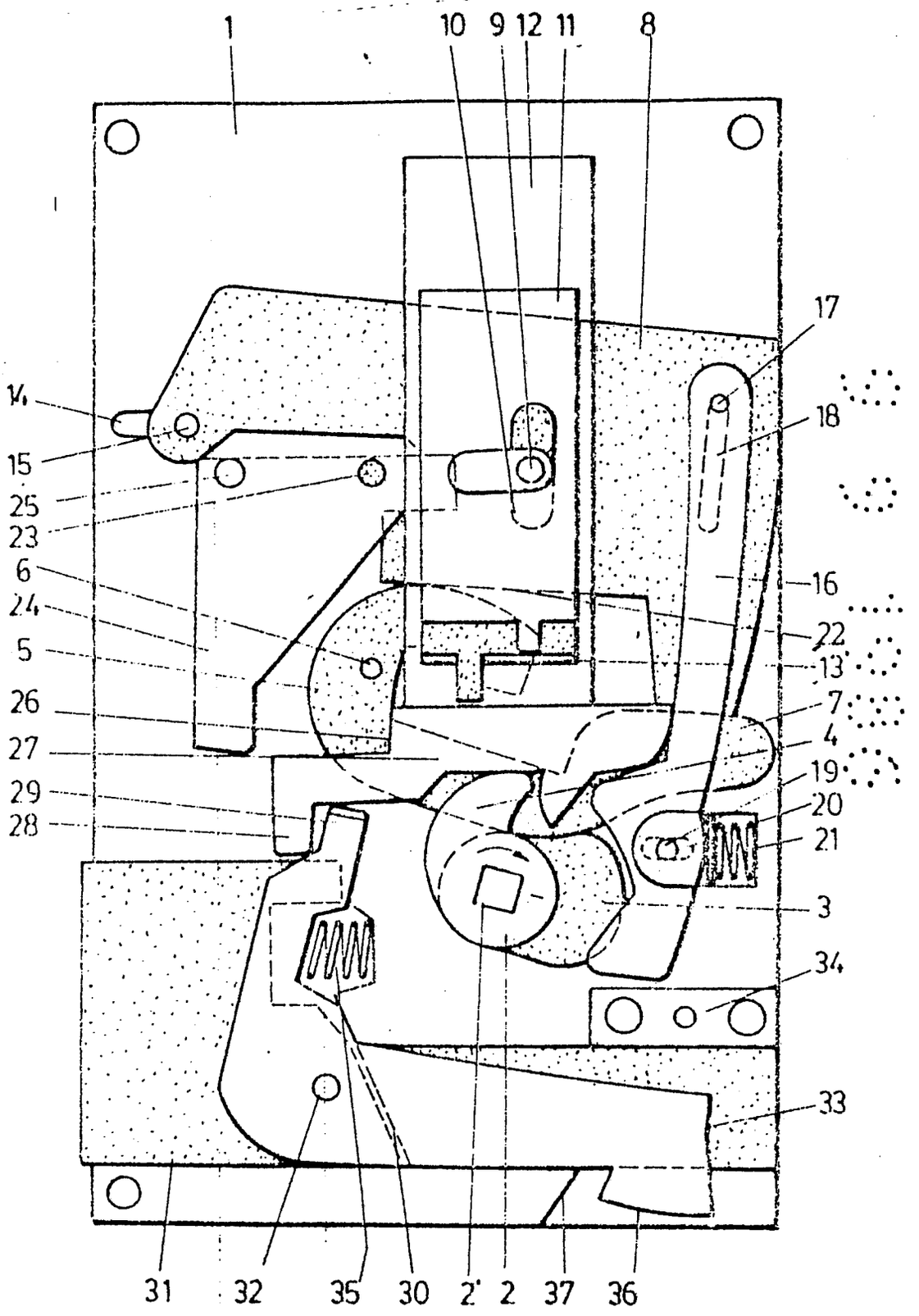
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FIG.-5

MADRID

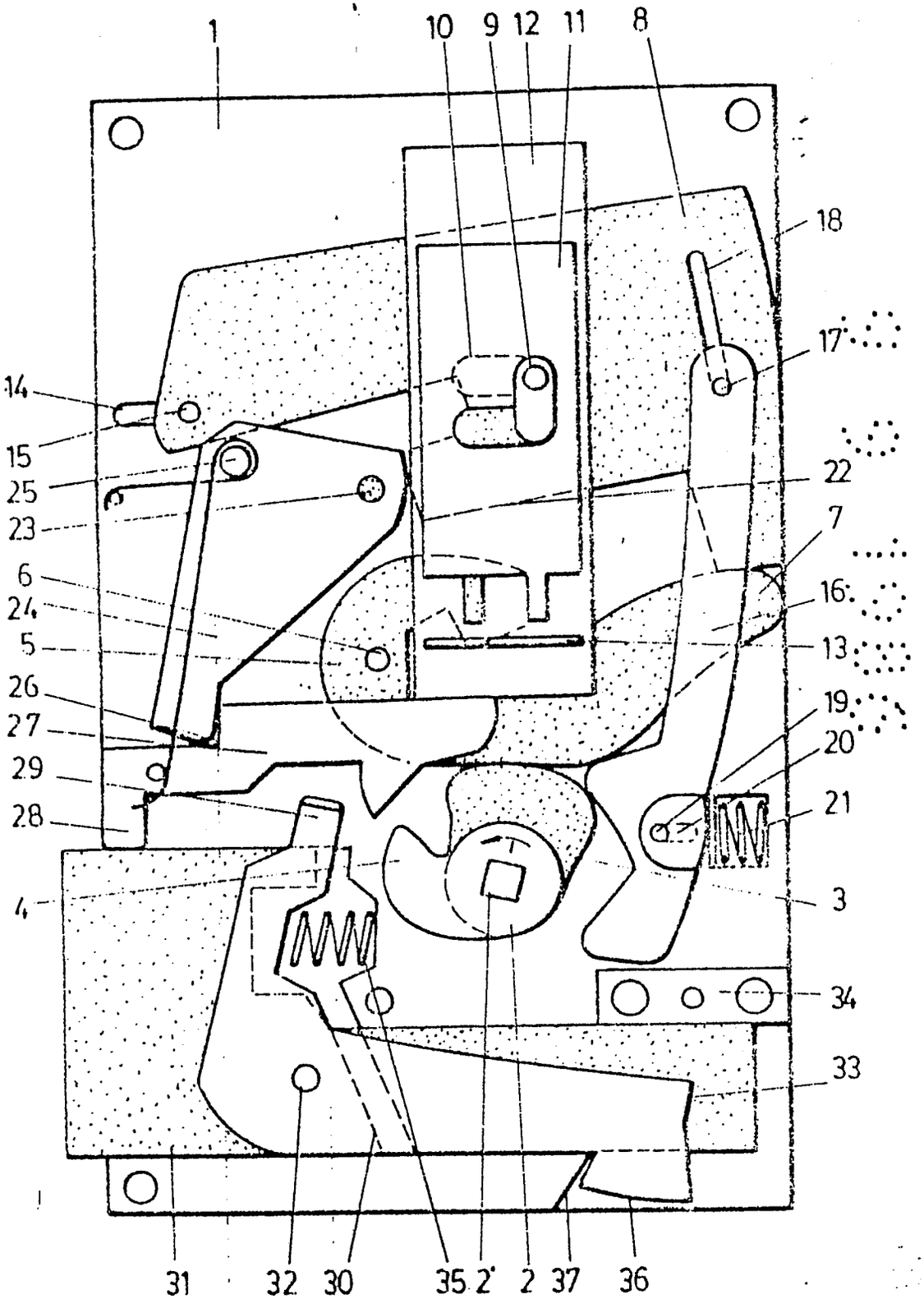
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FIG.-6

MADRID

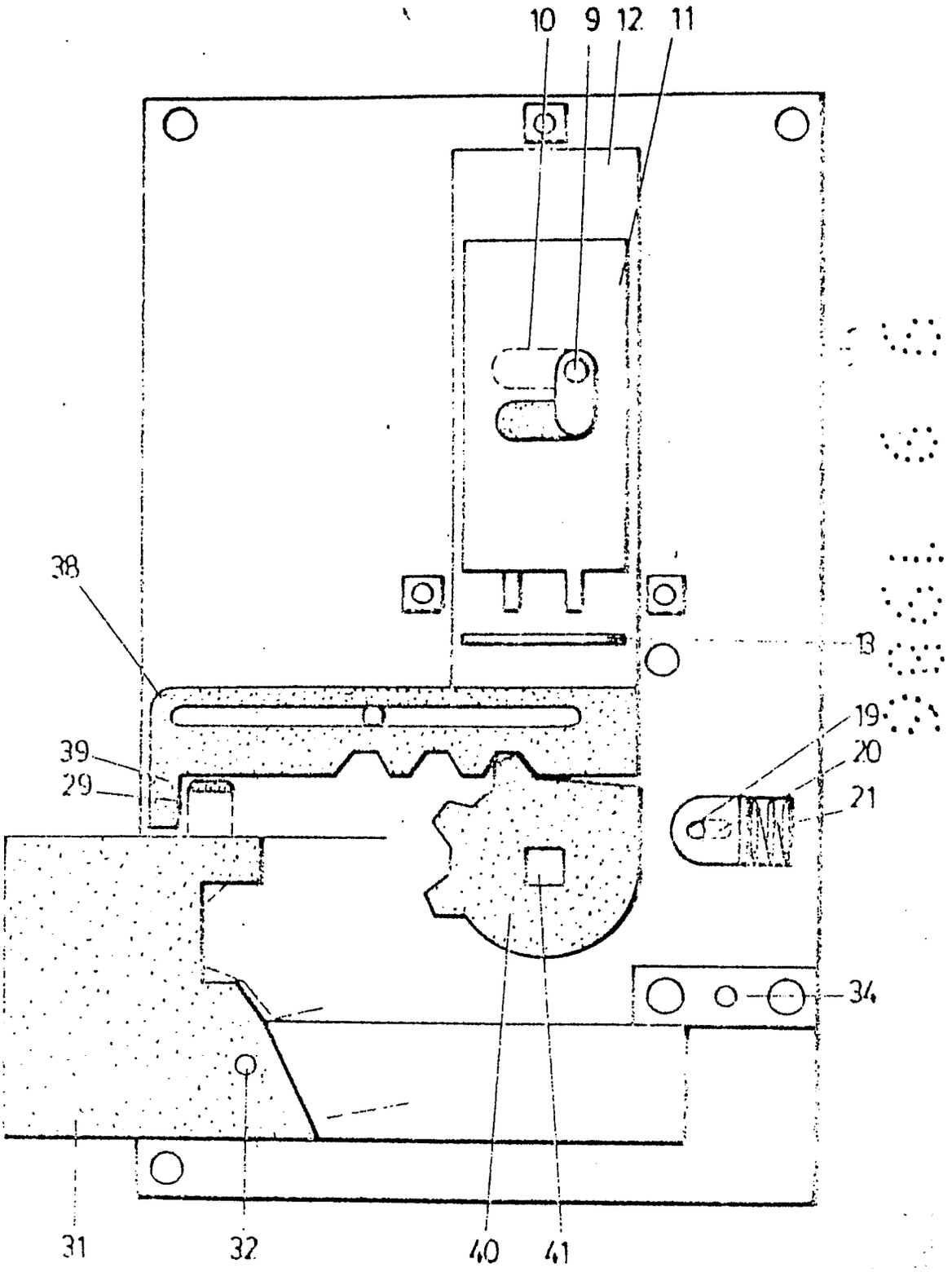

FIG.-7

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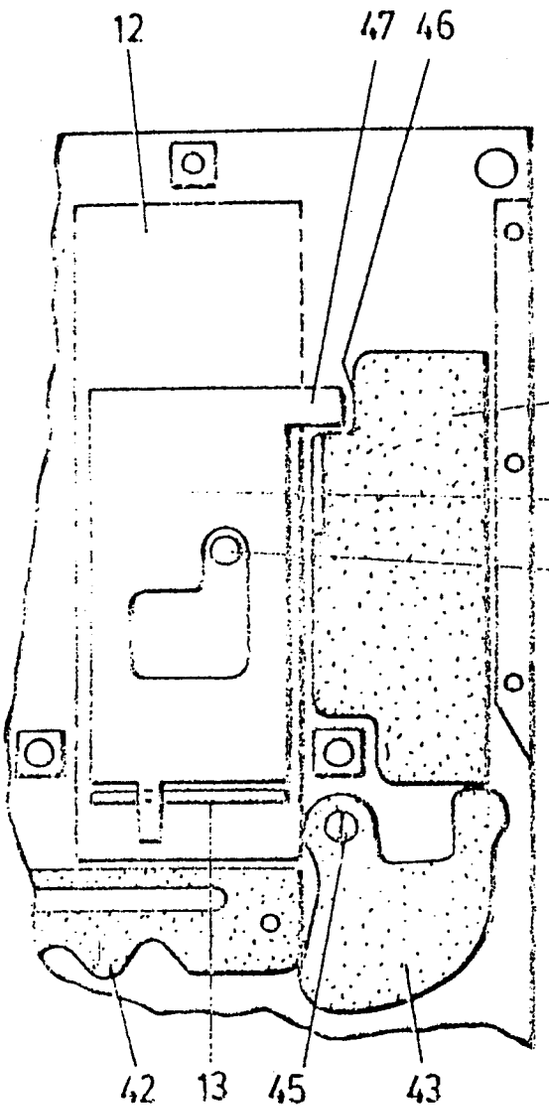

FIG.-8

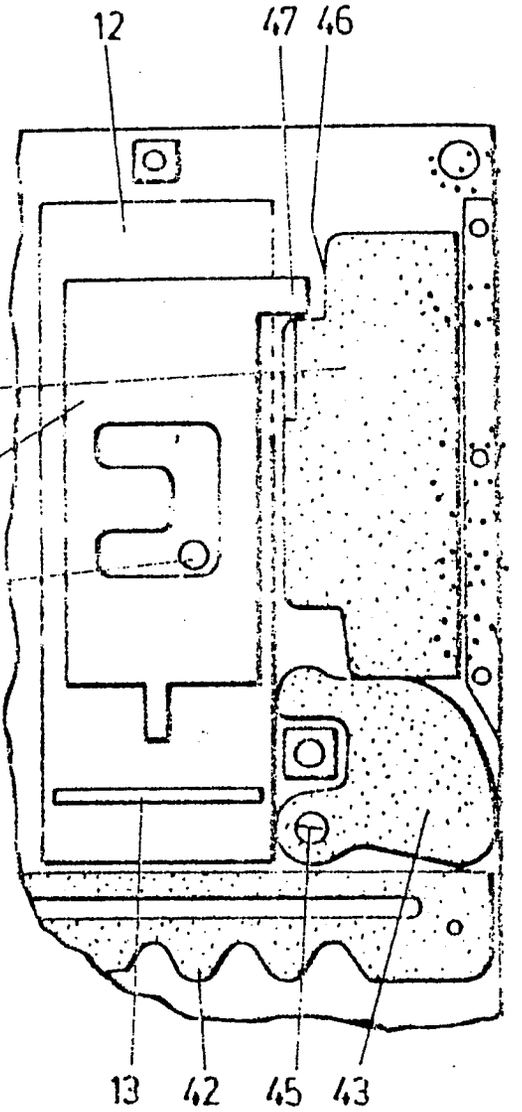

FIG.-9

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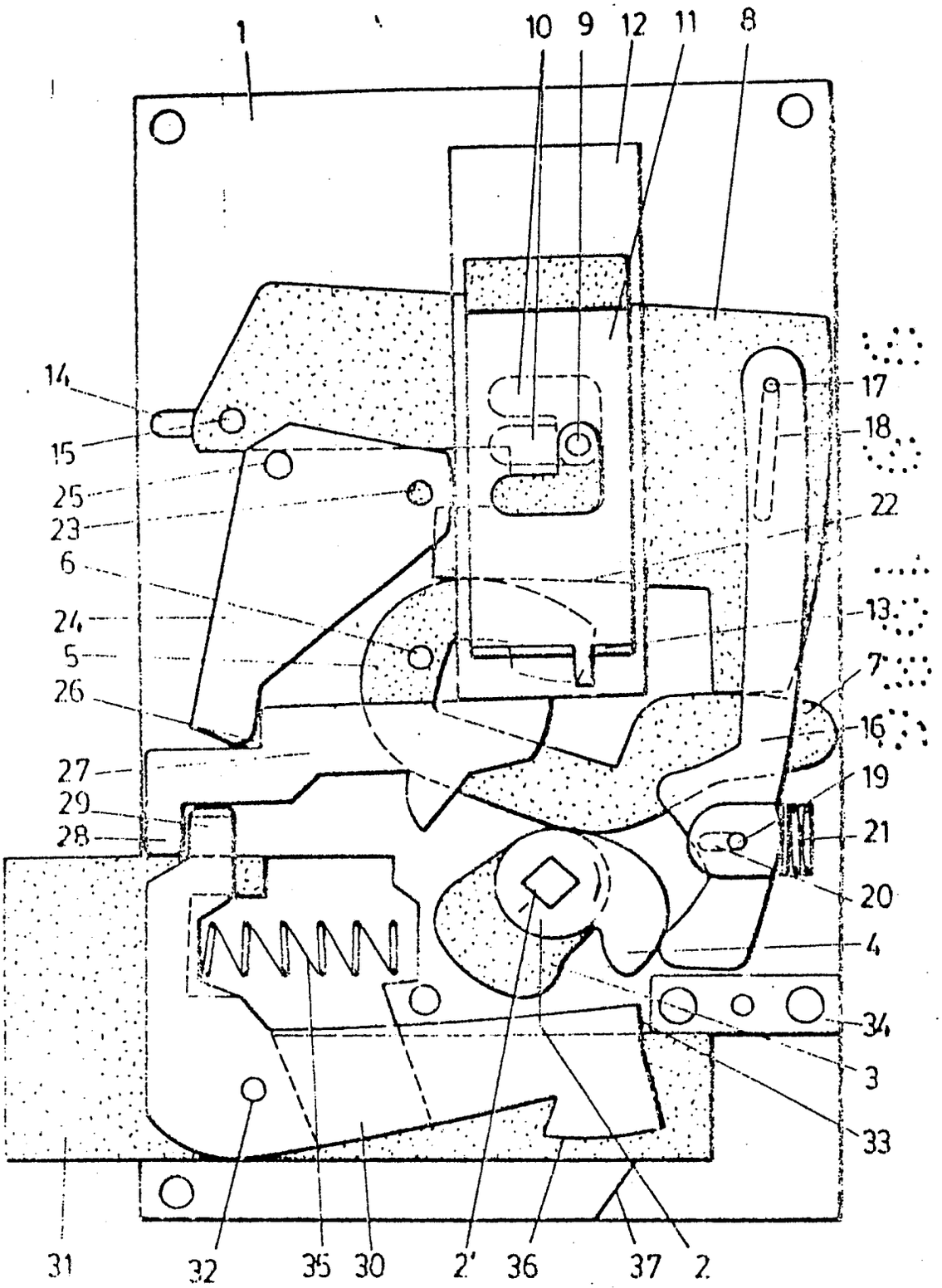

FIG.-10

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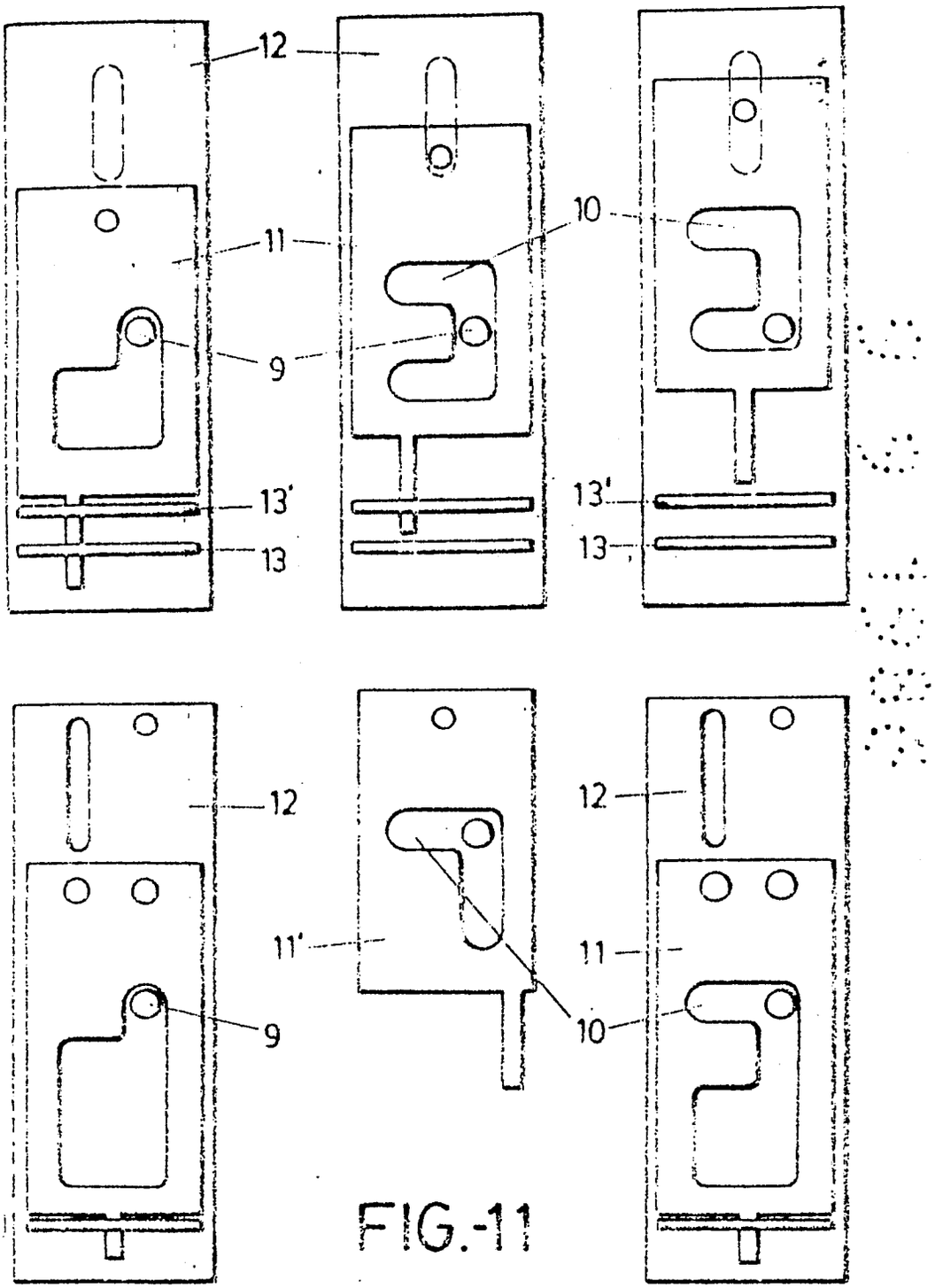

FIG.-11

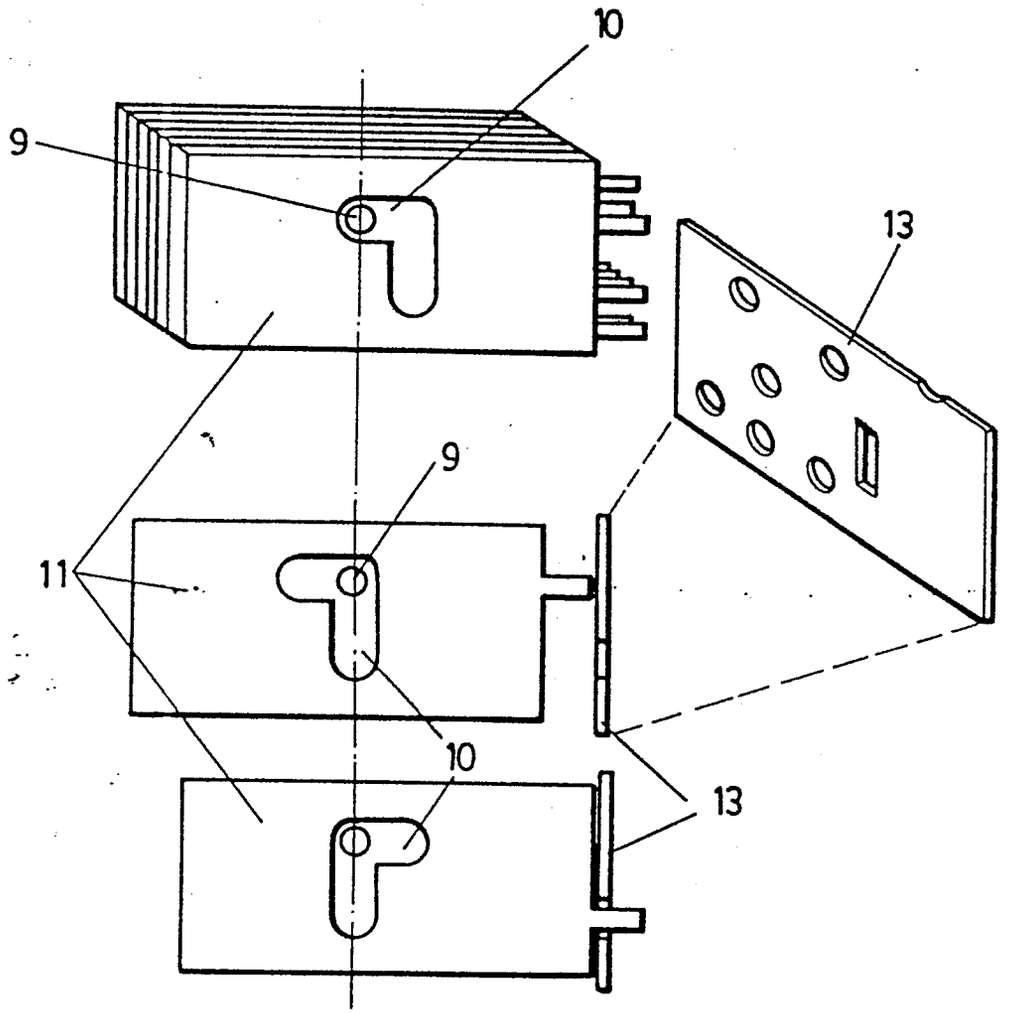

FIG.-12

European Patent Office

EUROPEAN SEARCH REPORT

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 87500055.6

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	GB - A - 2 127 478 (SCOVILL) * Fig. 1-5; pages 1-2 * --	1,6	E 05 B 47/00
A	GB - A - 1 456 547 (AUSTIN ARISS HILLS) * Fig. 1-29; claims 1-28 * --	1-6	
A	GB - A - 1 475 395 (ZEISS IKON AG) * Fig. 1-5; claims 1-12 * ----	1-5	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

E 05 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	12-11-1987	CZASTKA

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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