United States Patent

Boving

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[54] LOCK, IN PARTICULAR PADLOCK, WITH TUMBLERS CONTROLLED BY A MAGNETIC KEY

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[52] **U.S. Cl.** .....**70/38 C,** 70/276, 70/413

[51] **Int. Cl.** **E05b 67/22,** E05b 47/00, E05b 19/26

[58] **Field of Search**.....70/38 R, 38 B, 38 A, 38 C, 70/39, 276, 413

[56] **References Cited**

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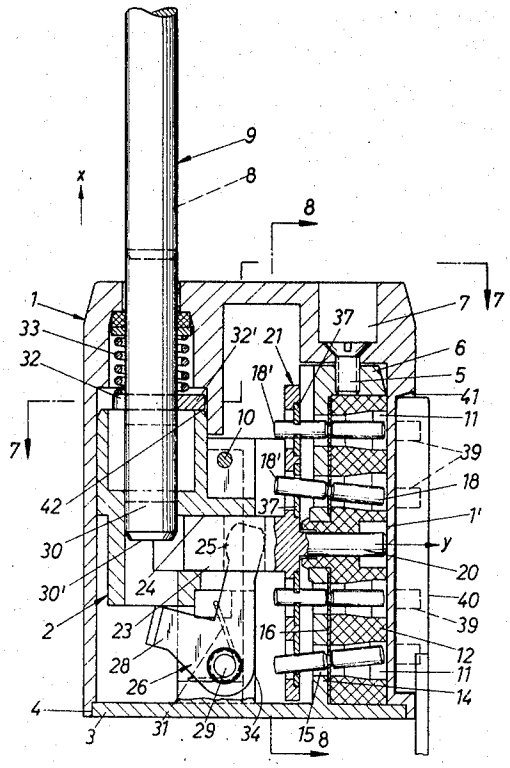
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[57] **ABSTRACT**

A lock, particularly a padlock, with tumbler pins controlled by magnets disposed on the key side and suspended on their middle section for a pendulum movement, which comprises a plurality of tumbler pins and a locking plate, whereby the tumbler pins are directed with one end towards the locking plate. The latter has an opening for entrance of the ends of the correspondingly aligned tumbler pins, and is mounted for parallel displacement perpendicularly to its plane and retained by a spring load in an abutment position in front of the ends of the tumbler pins.

4 Claims, 8 Drawing Figures



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SHEET 1 OF 3

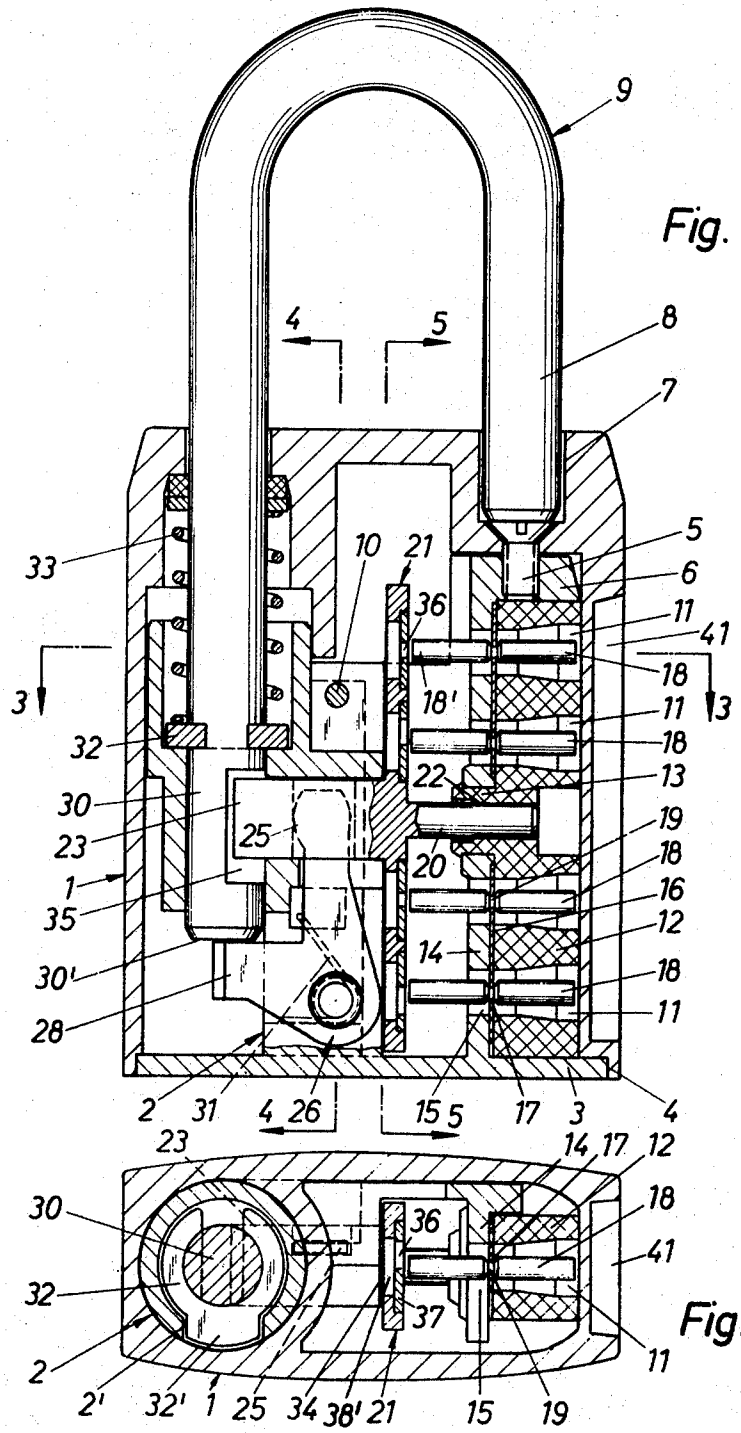


Fig. 1

Fig. 2

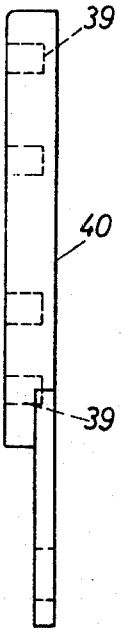


Fig. 3

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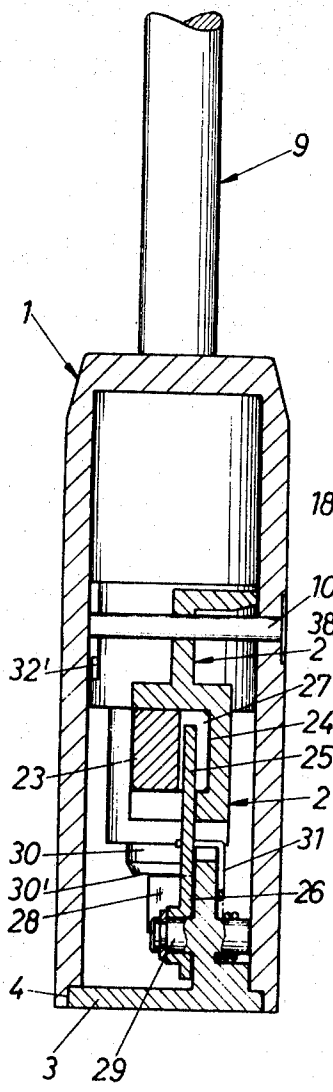


Fig. 4

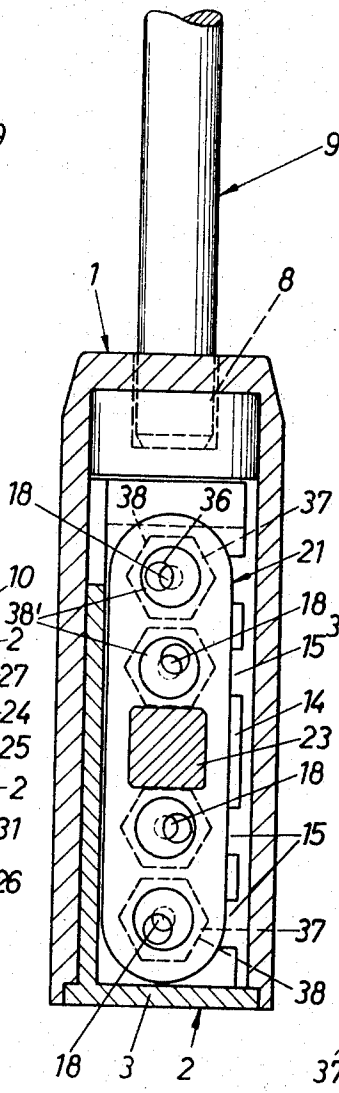


Fig. 5

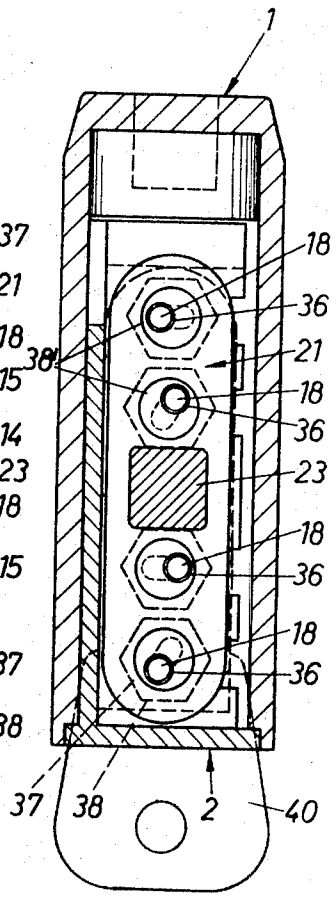


Fig. 8

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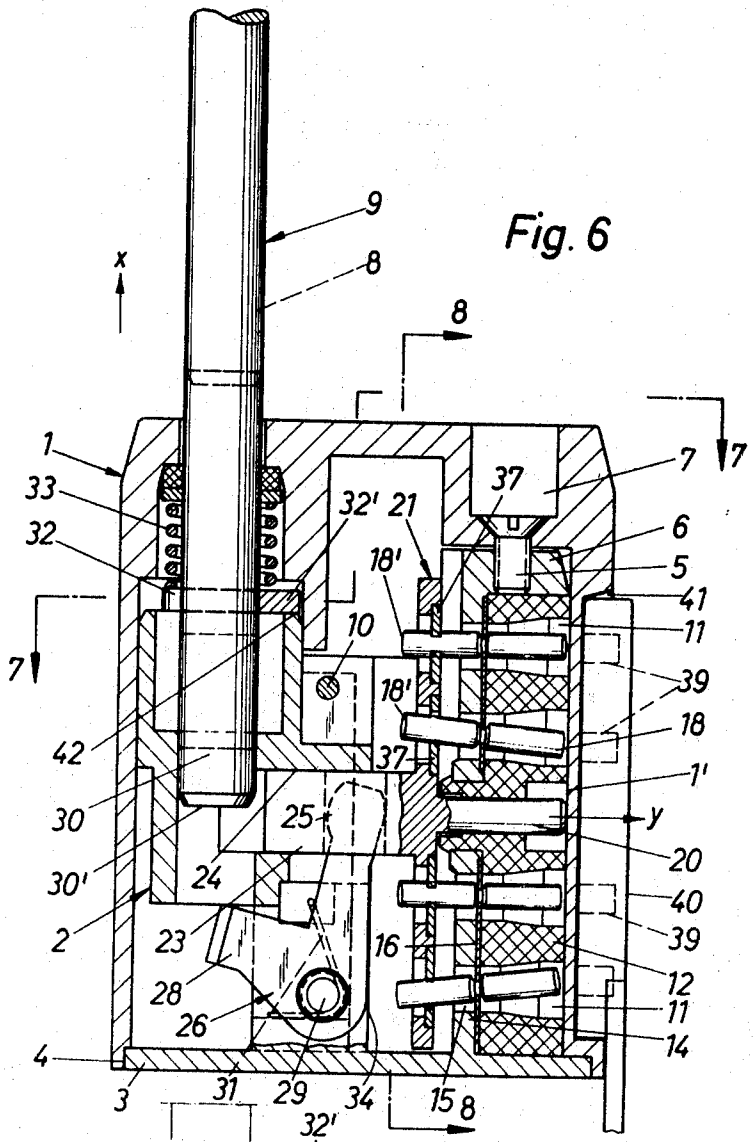


Fig. 6

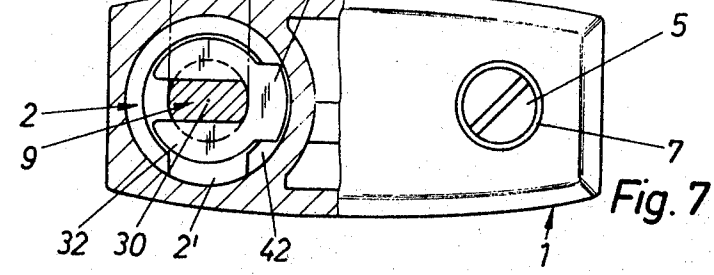


Fig. 7

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LOCK, IN PARTICULAR PADLOCK, WITH TUMBLERS CONTROLLED BY A MAGNETIC KEY

The present invention relates to a lock, in particular to a padlock, with tumbler pins controlled by magnets disposed on the key side, which tumbler pins are preferably suspended on their center section for a pendulum movement, are directed with their one end towards a locking plate, which locking plate has openings for the entrance of the ends of the correspondingly aligned tumbler pins.

Such locks are known already, in which for the purpose of the desired opening the closing member must be moved at first inwardly in closing direction. This inward movement of the closing member is necessary, in order to obtain a distance between the locking plate and the ends of the tumbler pins pointing towards the locking plate, so that the tumbler pins can perform without interference a pendulum movement corresponding to the magnet arrangement in the key. Only after aligning of the tumbler pins can the closing member be moved out of the lock housing into the open position, such opening is cumbersome. Furthermore, it is of disadvantage that the locking plate in the closing position finds an abutment in the ends of the sensitively suspended tumbler pins.

It is one object of the present invention to provide a lock, in particular a padlock, with tumblers controlled by a magnetic key, which can be extremely simply operated and which operation can be performed without difficulty also by a one-hand operation.

It is another object of the present invention to provide a lock, in particular a padlock, with tumblers controlled by a magnetic key, wherein a locking plate mounted perpendicularly to its plane for parallel displacement due to a spring load is retained in an abutment position prior to the ends of the tumbler pins.

It is in accordance with the present invention of advantage, if a baffle lever engages the locking plate, which baffle lever is abutted by one end of the shackle of the padlock spring-biased in closing direction.

In addition, it is preferable in accordance with the present invention, that the locking plate has a guiding pin on its wide side pointing towards the tumbler pins and has opposite of the guide pin, a lock wing, the latter being coupled with one arm of the baffle lever by engagement of the forces, while the other arm is disposed below the end-face of the shackle which has an angular shoulder, on which the spring supports itself and which has a radially directed projection, opposite which is disposed an entrance opening upon aligning of the shackle on the proper closing angular position.

A further advantage resides in accordance with the present invention with the fact, that the locking plate has multi-edged insert pieces having equal edge-lengths, in which the openings for the entrance of the tumbler pins are disposed.

Finally, it is also preferable in accordance with the present invention, if a spring loading of the locking plate in the direction of the tumbler pins is coordinated to the baffle lever, the force of the spring being less than the force of the spring loading the shackle in opposite direction. Due to this arrangement a lock, in particular a padlock, of a stabile structure is created, which permits an extremely simple operation. For the opening of the lock, it is merely necessary to insert the magnet key into a corresponding recess of the lock housing. Since the locking plate is retained in an abutment position in front of the ends of the tumbler pins, the latter can align themselves without interference in accordance with the magnet arrangement of the key. By a following pull on the lock housing the closure can easily be opened. No additional inward movement of the locking member is required, in order to remove the locking plate from the ends of the tumbler pins, so that an undisturbed pendulum movement of the pins is made possible. The opening can be performed in a favorable manner also without difficulty by a one-hand operation. In this connection, it is of advantage that the sensitively mounted tumbler pins do not form an abutment for the locking plate, whereby the life of the lock is increased. The safe abutment position of the locking plate in front of the ends of the tumbler pins during the closing position is assured by a baffle lever. The latter is abutted advantageously by one end of the shackle spring-biased in locking direction. In order to realize a non-objectionable parallel guidance of the locking plate perpendicularly to its place, the locking plate is equipped on the wide side pointing towards the tumbler pins with a guide pin and oppositely to the latter with a lock wing. The latter stands with one arm of the baffle lever in engagement of the prevailing forces and in closing position this lock wing locks the shackle, the front end of which abuts the other arm of the baffle lever. The closing position of the shackle secures a spring, which supports itself on a ring shoulder having a radially directed projection. The projection radially directed and coordinated to an entrance opening serves, on the one hand, that in the open position of the closure, the shackle cannot snap back automatically, since the projection supports itself on the collar or an inner part. On the other hand, the automatic snapping of the shackle can take place only, if the U-box is brought into the exact closing angle position thereof. Since the entrance openings for the tumbler pins of the locking plate are provided in multi-edged insert pieces of equal edge-lengths, these insert pieces can be reached in the mounting corresponding with the arrangement of the magnets in the key in the locking plate. The use of these insert pieces is made possible, because due to the free alignment of the tumbler pins the possibility exists, to vary the closing combination in smallest steps. Even a slightest displacement of the entrance openings for a few angular grades suffice, in order to obtain another closing combination. It is no more necessary to punch out individually each opening in the locking plate. For each lock thus the same locking plate can be used, whereby the production costs are reduced. The automatic snapping in of the shackle is not impaired, since the spring loading the baffle lever and thereby the locking plate in the direction towards the tumbler pins has a lower force than the spring loading the U-bow in opposite direction.

With these and other objects in view which will become apparent in the following detailed description, the present invention, which is disclosed by example only, will be clearly understood in connection with the accompanying drawings, in which:

FIG. 1 is a longitudinal section through the padlock in closing position, designed in accordance with the present invention;

FIG. 2 is a side elevation of a key coordinated to the padlock disclosed in FIG. 1;

FIG. 3 is a section along the lines 3—3 of FIG. 1;

FIG. 4 is a section along the lines 4—4 of FIG. 1;

FIG. 5 is a section along the lines 5—5 of FIG. 1;

FIG. 6 is a longitudinal section of the padlock in open position;

FIG. 7 is a section along the lines 7—7 of FIG. 6; and

FIG. 8 is a section along the lines 8—8 of FIG. 6.

Referring now to the drawings, the padlock designed in accordance with the present invention comprises a housing 1 which receives the inner structure 2. This inner structure 2 closes with its ground plate 3 the opening 4 of the housing 1. The inner structure 2 is secured by means of a screw bolt 5, which enters a threaded bore of a loop 6 formed on the inner structure 2. A bore 7 is provided co-axially to the screw bolt 5 in the housing 1 for the end 8 of a shackle 9. In closing position (FIG. 1) the end 8 of the shackle 9 enters the bore 7 of the housing 1 and covers up thereby the screw bolt 5. As a further fastening element for the inner structure 2 serves a cross-pin 10.

Between the loop 6 and the base plate 3 of the inner structure 2 extends a guide piece 12 which projects with its collar-shaped projection 12 through the web 14 of the inner structure. This web 14 has openings 15 disposed on the same axis in which the bores 11 are arranged. Between the web 14 and the guide piece 12 is disposed the bearing bridge 16, in the openings 17 of which flush with the bore 11 of the guide piece 12 are mounted the tumbler pins 18 for a pendulum move-

ment. For this purpose, these tumbler pins **18** are equipped at about their center with a constriction **19**.

A guide pin **20** provided on the wide side of the locking plate **21** pointing towards the tumbler pins **18** enters the bore **22** of the collar-shaped projection **13** of the guide piece **12**, which bore **22** is coordinated to the locking plate **21**. Opposite to this guide pin **20**, the locking plate **21** has a locking wing **23**, which is four-edged in cross-section, such locking wing **23** guides itself in a recess **24** of the inner structure **2** and which is in coupling engagement with one arm **25** of the baffle lever **26**.

For this purpose the locking wing **23** forms a recess **27**. The other arm **28** of the baffle lever **26**, mounted at the inner structure **2** about the axial pin **29**, is disposed below the front end **30'** of the arm **30** of the shackle **9**. A torsion spring **31** coordinated to the baffle lever **26** biases the locking plate **21** in the direction towards the tumbler pins **18**.

The arm **30** of the shackle **9** has a ring shoulder **32** in form of a sliding disc, on which one end of a pressure spring **33** supports itself, while the other end of the pressure spring **33** finds its support on the housing **1**. The force of this spring **33** biasing the shackle **9** in closing direction is greater than the force of the spring **31** biasing the baffle lever **26**, so that in closing position (FIG. **1**) the locking plate **21** is retained continuously by means of the baffle lever **26** in an abutment position in front of the ends **18'** of the tumbler pins **18**. For this purpose the inner structure **2** forms an abutment shoulder **34** for the locking plate **21**.

In closing position, the shackle **9** is blocked by the locking wing **23**, which enters a locking recess **35** of the arm **30** of the U-bow **9**.

The ring shoulder **32** has a radially directed projection **32'**, to which an entrance opening **2'** is disposed opposite on the inner structure **2** upon setting the shackle **9** to the correct angular position for closing thereof.

Furthermore, the locking plate **21** is equipped with openings **36** for entrance of the ends **18'** of the correspondingly aligned tumbler pins **18**. These openings **36** are preferably provided in multi-edged insert pieces **37** having equal edge-lengths. The locking plate **21** has recesses **38'** adjusted to the insert pieces **37**, which assume the shape of a hexagon. It is thus possible, to insert during the mounting of the lock the insert pieces **37** in accordance with the arrangement of the magnets **39** in the key **40**. The structural parts provided within the range of the magnetic force of the magnets as well as the block of the key **40** comprise insulating or non-magnetic material in addition to the tumbler pins **18**. Since the total closing parts are disposed in a one-part housing, a good protection against weather influences and soilings is assured.

The operation of the lock is performed in the following manner:

Starting with FIG. **1**, which discloses the closing position of the lock, the key **40** is brought into the lateral recess **41** of the lock housing **1**. The force of the magnets **39** is effective upon the tumbler pins **18**, which align themselves accordingly. The ends **18'** of the tumbler pins **18** are disposed, therefore, in a flush position with the openings **36** of the locking plate **21**. By a pull on the shackle **9** in the direction of the arrow or by a pull on the housing **1**, the baffle lever **26** is released and the torsion spring **31** swings over the baffle lever **26**, the arm **25** of which moves the locking plate **21** in direction *y*. By this movement in the direction *y*, the locking wing **23** steps out from the locking recess **35**, while the tumbler pins **18** enter the openings **36** of the locking plate **21**. In open position the radially directed projection **32'** of the ring shoulder **32** engages the collar **42** of the inner structure **2**, so that the open position is secured. The locking plate **21** finds its abutment by means of the guide pin **20** on the wall **1'** of the housing **1**. The closing of the closure takes place such, that the shackle **9** swings into the proper angular position for closing, so that the entrance opening **2'** is disposed opposite to the projection **32**. The pre-tensioned pressure spring **33** is relaxed and moves the shackle **9** in closing direction. The end-face **30'** of the shackle **9** abuts the arm **28** of the baffle lever **26**, which brings the locking plate **21** into its original position and in which position the locking wing **23** enters the locking recess **35** of the arm **30** of the U-bow **9**.

The bore **38'** follows co-axially to the recess **38** of the locking plate. The bore **38'** is chosen with such diameter that the locking plate **21**, in case of aligned tumbler pins **18** by the key **40**, can be displaced parallel in the direction towards the tumbler pins **18** without interference. The openings **11** and **15** disposed over the same axis are likewise sufficiently large, so that the swinging movement and the pendulum movement of the pins are not impaired.

While I have disclosed one embodiment of the present invention, it is to be understood that this embodiment is given by example only and not in a limiting sense.

I claim:

1. A lock, particularly a padlock, with magnetically operative tumbler pins disposed on a key side and suspended on their middle section for a pendulum movement, comprising

a plurality of tumbler pins,

a locking plate, said tumbler pins being directed with first ends, respectively, towards said locking plate,

said locking plate having openings for entrance of said first ends, respectively, of the correspondingly aligned tumbler pins, and

said locking plate defining a plane and being mounted transversely shiftable relative to said plan,

said locking plate being retained in an abutment position in front of said one end of said tumbler pins,

a U-shackle,

spring means biasing said U-shackle in a closing direction,

a baffle lever having two arms,

one of said arms abutting said U-shackle,

said locking plate having a locking wing, the latter having a rearward end,

the other arm of said baffle lever being coupled with said locking wing of said locking plate,

said rearward end of said locking wing adapted to engage boltingly in said U-shackle,

a spring operatively biasing said locking plate in the direction of said tumbler pins being coordinated to said baffle lever, and

said spring having a lesser operative force than that of said spring means which biases said U-shackle in an opposite direction.

2. The lock, as set forth in claim **1**, wherein

said baffle lever is abutted by one end of said U-shackle of said lock.

3. The lock, as set forth in claim **1**, wherein

said locking plate has on its wide side pointing towards said tumbler pins a guiding pin and opposite to the latter said locking wing,

the latter is operatively coupled with said other arm of said baffle lever,

said one arm of said baffle lever is disposed below an end-face of said U-shackle, which has a ring shoulder,

said spring means supporting itself on said ring shoulder and the latter has a radially directed projection, and an entrance opening disposed opposite said projection, upon aligning said U-shackle to a correct angular position for closing.

4. The lock, as set forth in claim **1**, wherein

said locking plate has multi-edged insert pieces with equal edge lengths and

said insert pieces define openings for entrance of said tumbler pins.

* * * * *