Sept. 4, 1951 J. G. HOFLER 2,566,836

ALARM SWITCH FOR LOCKS

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Fig. 1.

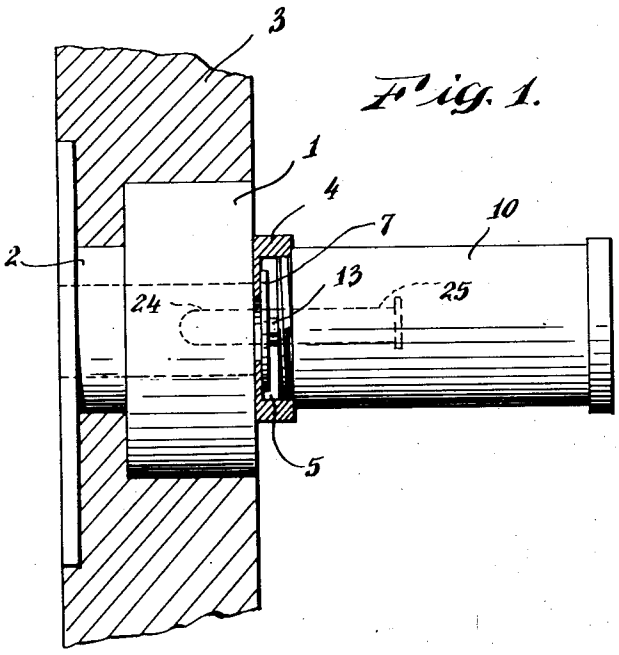


Fig. 2.

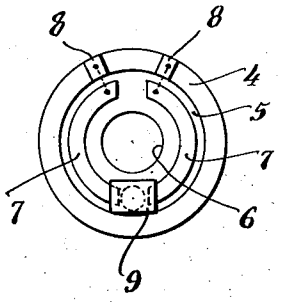
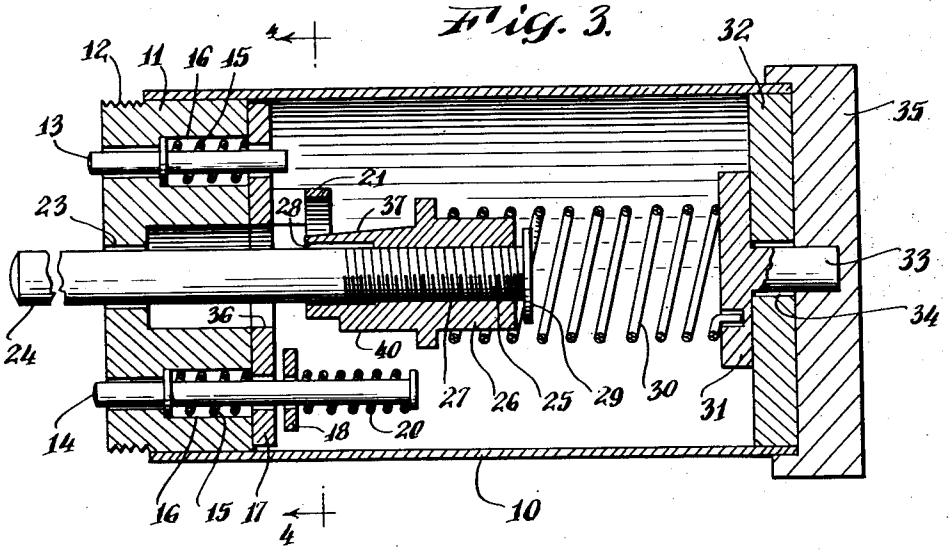


Fig. 3.



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Fig. 4.

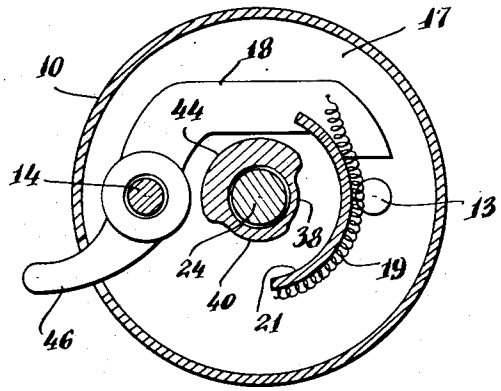


Fig. 5.

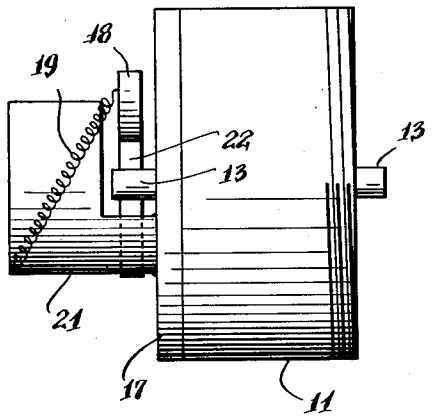


Fig. 6.

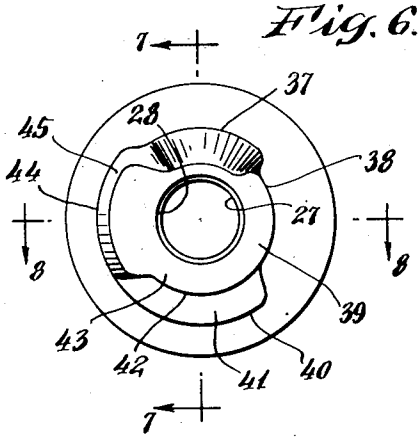


Fig. 7.

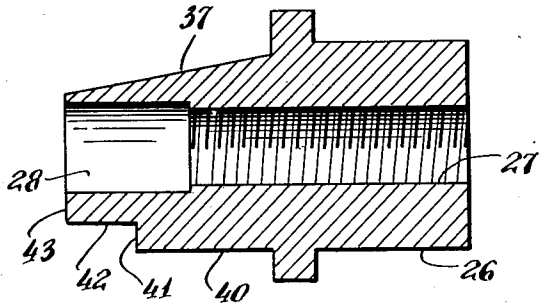


Fig. 8.

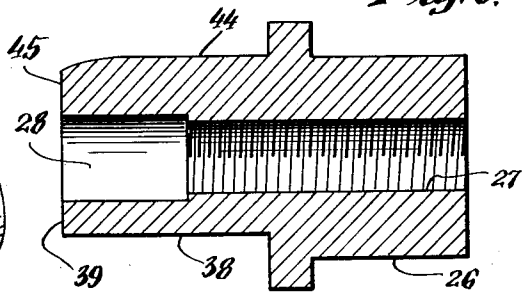
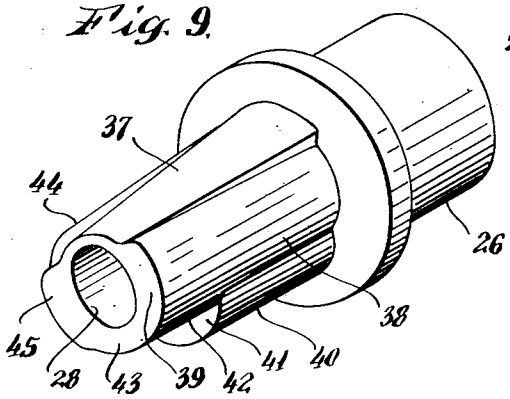


Fig. 9.



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ALARM SWITCH FOR LOCKS

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Section 1, Public Law 690, August 8, 1946
Patent expires June 8, 1966

12 Claims. (Cl. 200—55)

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The present invention relates to alarm devices, and particularly to an alarm device for mounting in association with a lock on a door or other closure to be actuated by a key or other similar member inserted into the lock.

An object of the present invention is to provide an alarm device for association with a lock which is adjustable to signal each insertion of a key or other object into the lock, when in one condition, and to only signal or indicate the second insertion of a key into the lock, when in another condition, so that with the device in the last mentioned condition the door or other closure having the lock thereon may be locked from the outside without energizing the alarm and the alarm will operate in response to a subsequent insertion of a key into the lock.

Another object is to provide an adjustable alarm device of the described character which is operated by the insertion of a key into the associated lock and is further adjustable to operate the alarm in one condition only during the residence of a key in the lock, and in another condition, to continue to operate the alarm even after the key has been removed from the lock.

A further object is to provide an adjustable alarm device of the described character capable of adjustment to still another condition in which it is not responsive to the insertion of a key or other foreign object into the associated lock.

According to the present invention, the above objects are accomplished by providing an alarm device to be mounted on the inner side of a lock and comprising a longitudinally slidable pin spring urged to project outwardly into the key hole of the lock, a fixed contact and a movable contact engageable with the fixed contact to close an alarm circuit, and transmission mechanism actuated longitudinally by displacement of the slidable pin to control the engagement of the contacts, the transmission mechanism including longitudinally extending guide surfaces and being adjustable to selectively utilize the desired one of the guide surfaces in controlling engagement of the contacts. The transmission mechanism preferably is provided with a first guide surface shaped to close the contacts each time a key is inserted into the lock and to separate the contacts when the key is withdrawn; a second guide surface shaped to close the contacts each time a key is inserted and to retain the contacts in engagement when the key is withdrawn from the lock; a third guide surface shaped to hold the contacts apart the first time a key is inserted in the associated lock and to provide for the engagement of the

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contacts only when a key is inserted a second time; and a fourth guide surface shaped to retain the contacts in spaced apart condition irresponsive to the repeated insertion of a key or other foreign article into the lock.

The above and other objects, features and advantages of the invention will appear in the following detailed description of a preferred embodiment of an alarm device according to the invention which is to be read with reference to the accompanying drawings, in which:

Fig. 1 is a side elevational view of a lock mounted on a door shown in section and provided with an alarm device according to the invention,

Fig. 2 a front view of a lock plate for mounting the alarm device,

Fig. 3 a longitudinal, horizontal section through the alarm device,

Fig. 4 a transverse, vertical section of the alarm device as it appears along the line IV—IV in Fig. 3,

Fig. 5 a side elevational view of an assembly included in the alarm device,

Fig. 6 an end elevational view of a guide member included in the alarm device,

Fig. 7 a longitudinal sectional view taken along the line VII—VII in Fig. 6, and

Fig. 8 a longitudinal sectional view taken along the line VIII—VIII in Fig. 6.

Fig. 9 is an isometric view of the guide member shown in Fig. 6.

Referring to the drawings in detail, and initially to Fig. 1 thereof, a lock 1 is shown mounted in a door 3 and with the exception of the key hole 2 only the outlines of the lock are indicated. On the inner side of the door 3 a special lock plate 4 is placed in front of the key hole 2 for mounting the alarm device and is formed with a circular recess 5 having a threaded wall. The lock plate 4 has a central aperture 6, Fig. 2, aligned with the key hole 2. In the bottom of the recess 5 two mutually isolated semicircular contact strips 7 are mounted and separately connected with one of two terminals 8 which are so connected with an alarm system that an electrical connection between the two terminals will effect an alarm, for example by causing an electric bell to ring.

At one of the two places where the two contact strips 7 end opposite one another a resilient contact member 9 is secured in the lock plate 4 which tends to short-circuit the two contact strips but is prevented from doing so by means of a plug of insulating material, such as for example wood, extending through a hole in the lock

plate 4 and abutting against the lock 1. This contact member 9 serves to establish an alarm if a person should try to break off the lock plate 4 from outside, the contact member 9 short-circuiting the contact strips 7 when the lock plate 4 gets loose because the wooden plug can then be pushed forwardly by the resilient contact member 9.

An alarm device enclosed in a casing 10 is screwed into the lock plate 4, Fig. 1.

In one end of the cylindrical casing 10 an end plug 11 is secured having at an end projecting from the casing and threaded as at 12 for engagement with the threaded wall of recess 5 in the plate 4, the adjacent end surface of the casing 10 limiting the screwing together of the two parts. Two contact plugs 13 and 14 are longitudinally slidable in the end plug 11 and are spring pressed outwardly through the face of plug 11 by suitable springs 15. The springs 15 are mounted in borings 16 in the end plug 11 and held in place by means of a washer 17 secured to the end plug.

When the device is screwed into the lock plate 4 the two contact plugs 13 and 14 will each engage one of the contact strips 7, the springs 15 securing the establishment of the necessary electric contact.

It should be noted that the lock plate having the contact strips 7 and the contact plugs 13 and 14 are only shown by way of example, and that the separable electric connections to the alarm device can be designed in many other suitable ways.

The contact plug 13 has such a length that its inner end extends only a rather short distance into the casing 10, the said end forming a fixed contact of the device. the other contact plug 14 extends a rather long distance into the casing and a contact arm 18 is pivoted and slidable on the inwardly extending portion of plug 14, Figs. 3 and 4. The free end of contact arm 18 forms the movable contact of the device and can be swung laterally into engagement with the contact plug 13 by the action of a spring 19, Figs. 4 and 5. Between the contact arm 18 and the inner headed end of the contact plug 14 a spring 20 is inserted, Fig. 3, securing the necessary electric connection between the contact plug 14 and the contact arm 18.

A fixed stop 21 of substantially semi-cylindrical form, Fig. 4, extends fixedly from the washer 17 adjacent the fixed contact forming plug 13. Stop 21 is provided with a cutout 22 in its upper edge adjacent the washer 17 which is of sufficient depth so that the contact arm 18 may engage plug 13 when the arm is positioned on plug 14 for movement within the cutout, Fig. 5. As seen in Fig. 5, the spring 19 extends at an angle relative to the plane of the swinging movement of contact arm 18 so that spring 19 not only urges the arm 18 to swing toward the fixed contact but also to move axially along plug 14 away from washer 17 and cutout 22. The component of force exerted by spring 19 to effect this axial movement of contact arm 18 is greater than the force exerted by spring 20 on plug 14. Thus, when contact arm 18 is lifted out of cutout 22 by mechanism hereinafter described, spring 19 moves the contact arm axially to ride on the upper edge of the stop 21, which upper edge holds the contact arm away from the fixed contact 13.

The end plug 11, Fig. 3, has a central aperture 23 serving as a guide for a pin 24 slidable longitudinally of the device and extending into the key hole when the device is mounted on a lock as will appear from Fig. 1. In the embodiment shown in the drawings the inner end 25 of pin 24 is threaded to be received within a threaded portion 27 of a bore 28 formed in a guide member 26. Provided on the inner end of the pin 24 is an end plate 29 securing the pin against being screwed out of the guide member 26. The threaded end of the pin 24 has such a length that no portion of the thread will appear outside the guide member 26 when the pin has been screwed out of the said guide member so far as the end plate 29 allows, and it is thus possible to adjust the length of the portion of the pin 24 projecting outwardly of the device by screwing the pin more or less into the guide member 26.

Guide member 26 is formed with an annular rim intermediate its ends, and a spring 30 is disposed within casing 10 with one end thereof abutting against, and secured to, the rim on guide member 26 and its other end secured to a disc 31 abutting against an end plate or closure 32 at the rear end of the casing. A shaft 33 is secured to disc 31 and extends rotatably through a central opening 34 in end plate 32 for attachment to an adjusting hand wheel 35. The spring 30 acts to urge guide member 26 forwardly to project pin 24 into the key hole 2 and also provides a connection between hand wheel 35 and the guide member 26 so that the latter may be conveniently rotated within the casing. In the event that spring 30 is not strong enough to transmit the rotation of wheel 35 to the guide member, suitable driving mechanism (not shown) permitting axial displacement of the guide member may be interposed between the latter and the disc 31, such as, for example, a cylinder extending from disc 31 and having longitudinal slots in its free end portion to receive radial pins carried by the guide member 26.

In the most advanced position of the guide member 26 and the pin 24 the front end portion of the said guide member 26 projects into a boring 36 formed in the washer 17 and end plug 11. The front end portion of the guide member 26 is further provided with longitudinally extending guide surfaces to be engaged by the contact arm 18 and by means of which the pivoting of the contact arm 18 can be controlled. These guide surfaces are formed on the different portions of the circumference of the guide member so as to be selectively brought into position for engagement with the contact arm 18 by rotation of the guide member 26, the said rotation being effected by means of the hand wheel 35.

In the preferred embodiment of the invention illustrated by the drawings, guide member 26 is formed with four guide surfaces so that four different characteristics of operation are achievable depending on which of the four surfaces is positioned for engagement with contact arm 18 to actuate the latter when the guide member is moved axially by displacement of pin 24, as when a key or other object is inserted in key hole 2.

One of these four guide surfaces is a guide surface 37, Figs. 6 and 7, which is conical and so inclined relative to the axis of the guide member that the contact arm 18, engaging the rear portion of this conical or inclined guide surface 37 when the guide member 26 is in its foremost position, is swung away from the contact plug 13 but still remains inside the recess 22 of the stop 21. When an object, such as for instance a key or a skeleton key, is introduced in the key hole 2, with the effect that the pin 24 and the guide

member 26 are pushed inwards, the conical or inclined form of the guide member permits the spring 19 to swing the contact arm 18 towards the contact plug 13 until contact is establihsed; the contact arm 18 being so designed and arranged as to establish contact with the contact plug 13 before engaging the pin 24. When the said contact is established the alarm circuit will be closed and continue thus until the object introduced into the key hole is again withdrawn so that the spring 30 may push the guide member 26 together with the pin 24 outwards with the effect that the inclined guide surface 37 lifts the contact arm 18 thereby disengaging the contacts. When the guide member is rotated to place guide surface 37 in operative position alarm is only effected during the period in which the foreign object is introduced into the key hole.

By rotating the guide member through 90° a second guide surface 38, 39 may be positioned for engagement with the contact arm 18. This guide surface has a cylindrical or plane surface 38 approximately parallel to the direction of axial motion of the guide member, and an end surface 39 approximately perpendicular to the surface 38. The surface 38 is so arranged on the guide member 26 that the contact arm 18 when abutting against the surface 38 is disengaged from the contact plug 13 but still remains inside the recess 22 of the stop 21.

When the pin 24 is pushed in to displace guide member 26, the spring 19 will swing the contact arm 18 into contact with the contact plug 13 as soon as the forward edge of guide surface 38 has been moved beyond the path of swinging of the contact arm 18 as defined by cutout 22; so that the alarm circuit will be closed. When the object introduced into the key hole is withdrawn, however, in this case the end surface 39 will abut against the contact arm 18 which thereby stops the outward movement of the pin without being lifted so that the engagement of the contact arm 18 with the contact plug 13 is maintained even after the withdrawal of the object, and the alarm will be continued until it is manually interrupted.

By further rotating the guide member 26 a third guide surface 40—43 is brought into engagement with the contact arm 18. This guide surface is stepped and has a first step 40 toward the rear in the form of a surface approximately parallel to the direction of motion of the guide member 26 the said surface being either plane or cylindrical. This step has such a distance from the axis of the guide member 26 that the contact arm 18 when resting on step 40 will have been swung up above the stop 21 and by means of the spring 19 been carried in over the top edge of said stop 21. The forward edge of step 40 is defined by a radial shoulder 41 which extends into a forward step defined by a surface 42 extending parallel to the direction of movement of member 26 and a radial or normal end surface 43. The surface 42 is substantially the same distance from the axis of rotation of member 26 as the surface 38, heretofore described, to produce the operating characteristics given below.

When guide member 26 is rotated to position guide surface 40—43 for engagement with the contact arm 18 the latter will, as mentioned above, be initially lifted by surface 40 above the stop 21 some distance apart therefrom and moved by spring 19 over the top edge of the stop. When now the pin 24 is pushed in the surface 40 will move away from the contact arm 18 which in consequence thereof will swing down to rest against the top edge of stop 21 preventing the contact arm 18 from being swung into contact with the contact plug 13. When the key introduced into the key hole 2 is withdrawn and the guide member 26 is again moved outwardly by means of the spring 30, the shoulder 41 will abut against the contact arm 18 and carry the same along in this movement until it is swung down into the recess 22 thereof to rest against the surface 42 of the guide member 26. Next time the pin 24 is pushed in the end surface 43 will be displaced beyond the contact arm 18 which can then be swung by spring 19 into engagement with the contact plug 13 so that the alarm circuit is closed and maintained thus even when the object introduced into the key hole 2 is again withdrawn, the end surface 43 abutting against the contact arm and being incapable of lifting the latter.

It should be noted that the surface 42 may be inclined or conical in the manner of the aforementioned surface 37 so that after the pin 24 has been pushed in a first time, the alarm circuit will be closed only during the periods in which the pin 24 is subsequently held in the pushed-in position.

In the embodiment shown in the drawings the guide member also has a fourth guide surface 44, 45 (Fig. 8) consisting of a surface 44 approximately parallel to the direction of motion of the guide member and spaced from the axis of rotation of the latter a distance corresponding to the distance of surface 40 mentioned above from that axis, the said surface 44 ending in an inclined or conical surface 45. When the contact arm 18 engages the surface 44 it will assume a position above the top edge of stop 21 and be swung towards the same when the guide member 26 is pushed inwardly away from the contact arm. When, however, the guide member 26 is again moved outwardly later on the inclined or conical end surface 45 will engage the contact arm 18 and again lift the same into the position above the stop 21, so that no alarm is established when this guide surface is in operative position.

When it is desired to interrupt the continuously closed alarm circuit established when guide surface 38, 39 or guide surface 40—43 is in operative position, the guide member 26 can be rotated to the position in which the guide surface 37 is effective, so that the spring 30 may urge the guide member forward to its normal position, and at the same time the guide surface 37 will swing the contact arm 18 away from the contact plug 13. Thereafter the guide member can again be rotated to place the desired guide surface in operative position.

As shown in Fig. 4 the contact arm 18 can also be provided with a lever 46 extending outwardly through a suitable slot in the casing 10, so that the contact arm 18 can be manually swung away from the contact plug 13 by means of this arm 46.

While I have illustrated a specific embodiment of my invention, it is to be understood that various changes and modifications may be effected therein, such as, for example, by providing more than four guide surfaces on the guide member, without departing from the scope or spirit of the invention and while utilizing the features thereof, which are intended to be defined by the appended claims.

I claim:

1. An alarm device adapted to be mounted on the inner side of a lock comprising a longitudinally slidable pin adapted to project outwardly into

the key hole of said lock, said pin being displaceable inwardly upon insertion of a key into said key hole; a pair of contacts adapted to engage one another to close the alarm circuit; a spring constantly urging said pin outwardly; and adjustable transmission means actuated by displacement of said pin and adapted to control the engagement of said contacts, said transmission means being adjustable into at least two positions, said transmission means in one of said positions effecting engagement of said contacts upon the first displacement of said pin, and in another of said positions maintaining said contacts out of engagement during the first displacement of said pin and effecting engagement of said contacts upon the second displacement of said pin.

2. An alarm device according to claim 1, wherein one of said contacts is fixed, and the other of said contacts includes a movable contact arm spring urged into engagement with said fixed contact; and said transmission means includes a rotatable guide member movable longitudinally with said pin, said guide member being formed with a plurality of longitudinally extending guide surfaces adapted to selectively engage said movable contact arm, each of said guide surfaces being so formed as to space said movable contact arm from said fixed contact when said pin is in the outermost position thereof.

3. An alarm device adapted to be mounted on the inner side of a lock comprising a longitudinally slidable pin adapted to project outwardly into the key hole of said lock, said pin being displaced inwardly upon insertion of a key into said key hole; a pair of contacts adapted to engage one another to close an alarm circuit; a spring constantly urging said pin outwardly; and adjustable transmission means actuated by displacement of said pin and adapted to control the engagement of said contacts; said transmission means being adjustable into a plurality of positions, said transmission means in one position thereof effecting engagement of said contacts when said pin is displaced and disengaging said contacts when said pin is subsequently restored to the outermost position of said pin, said transmission means in a second position thereof effecting engagement of said contacts when said pin is displaced and continuing such engagement when the key effecting displacement of said pin is subsequently removed.

4. An alarm device according to claim 3, wherein one of said contacts is fixed, and the other of said contacts includes a movable contact arm spring urged into engagement with said fixed contact; and said transmission means includes a rotatable guide member movable axially with said pin, said guide member being formed with a plurality of axially extending guide surfaces adapted to selectively engage said movable contact arm, one of said guide surfaces being disposed substantially parallel to the direction of movement of said guide member and terminating abruptly at the outer end thereof and being engageable with said contact arm in said second position of said transmission means, each of said guide surfaces when engaged with said contact arm being adapted to space the latter from said fixed contact when said pin is in the outermost position thereof, and said one of said guide surfaces having a length such that said outer end thereof is clear of said contact arm when said pin is displaced to the innermost position thereof to thereby permit engagement of said contacts, and whereby said abruptly terminated outer end of said one guide surface will bear longitudinally against said contact arm and prevent return of said pin to the outermost position.

5. An alarm device according to claim 4, wherein said guide member is formed with another guide surface thereon inclined relative to the direction of axial motion of said guide member and forming an angle therewith of such degree that the contact arm will engage said fixed contact when said transmission means is disposed in said first position thereof and said pin is displaced inwardly to the innermost position thereof.

6. An alarm device according to claim 4, including a lever projecting radially from said transmission means and operatively connected to said contact arm, rocking of said lever effecting separation of said contact arm from said fixed contact.

7. An alarm device adapted to be mounted on the inner side of a lock comprising a longitudinally slidable pin adapted to project outwardly into the key hole of the lock, said pin being displaceable inwardly upon insertion of a key into the key hole; a fixed contact and a movable contact arm mounted for movement parallel to the direction of travel of said pin and for pivoting in a plane at right angles to said direction of travel; a fixed stop having a notch formed therein; said contact arm in one longitudinal position being received in said notch and being free to engage said fixed contact to close an alarm circuit, and in another longitudinal position thereof being arrested by an abutting surface of said stop and spaced from said fixed contact; means resiliently urging said contact arm to pivot towards said fixed contact and to move longitudinally to a position overlying said abutting surface of said stop; spring means constantly urging said pin outwardly; and adjustable transmission means for controlling the engagement of said contact arm and said fixed contact including a rotatable guide member movable longitudinally with said pin, said guide member being formed with a plurality of longitudinally extending guide surfaces adapted to selectively engage said movable contact arm, one of said guide surfaces being stepped and having a raised portion engageable with said contact arm and raising the latter above said notch to permit the movement of said contact arm to said spring urged longitudinal position, said raised portion of said stepped guide surface being engaged with said contact arm when said pin is in the outermost position thereof; said stepped guide surface having a relatively depressed portion adapted when engaged with said contact arm to raise the latter out of engagement with said fixed contact but to a position below said abutting surface of said stop, and steps formed between said raised and depressed portions and at the outen end of said depressed portion; whereby when said pin is initially displaced and restored to the outermost position thereof, said step between the raised and depressed portions of said guide surface will engage said contact arm and move the latter longitudinally into said notch; and whereby a subsequent displacement of said pin will move said step at the outer end of said depressed portion under said contact arm to permit pivoting of the latter into engagement with said fixed contact.

8. An alarm device according to claim 7, wherein said contact arm is spring urged by a coiled tension spring member extending obliquely in a

direction towards said fixed contact and away from said notch in said stop.

9. An alarm device according to claim 7, wherein said notch formed in said stop engages the sides of said contact arm during pivoting of the latter towards said fixed contact to thereby serve as a side guide during such pivotal movement.

10. An alarm device according to claim 7, wherein said depressed portion of said guide surface is disposed substantially parallel to the direction of travel of said pin and terminates abruptly in said step on the outer end thereof, and the combined length of said raised and depressed portions is such that said depressed portion is moved past the contact arm when said pin is displaced to the innermost position thereof.

11. An alarm device according to claim 7, wherein said depressed portion is inclined relative to the direction of movement of said pin so that the contact arm will engage the fixed contact

when the outer end of said depressed portion is disposed under said contact arm.

12. An alarm device according to claim 7, wherein another of said guide surfaces is disposed substantially parallel to the direction of the axial movement of said guide member, said last mentioned guide surface being spaced radial from the axis of said guide member a distance such that said contact arm when engaged therewith will be raised above said abutting surface of said stop, the outer end of said last mentioned guide surface terminating in an inclined end surface having an outer edge disposed closer to said axis of said guide member than the distance said abutting surface of said stop is spaced from said axis whereby said last mentioned guide surface will retain said contact arm in spaced relation to said fixed contact for all positions of said pin.

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No references cited.