Nov. 9, 1965 O. T. MARSH 3,216,558

PUZZLE LOCKING DEVICE

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FIG. 1

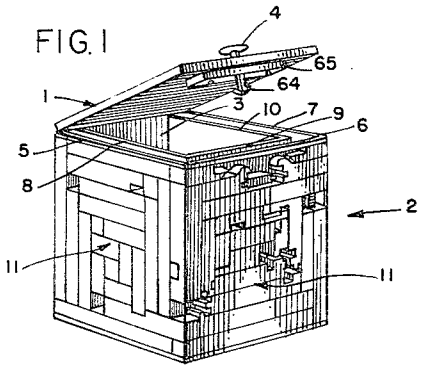


FIG. 2

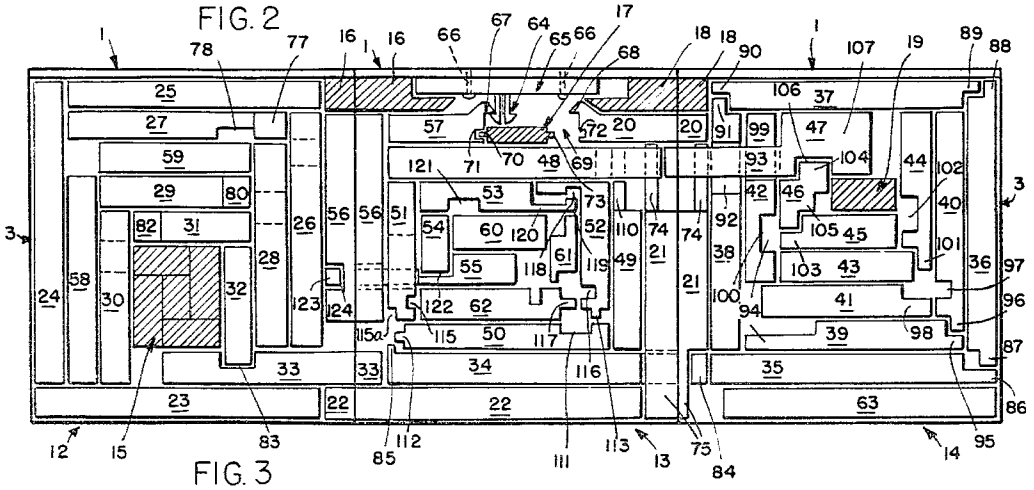
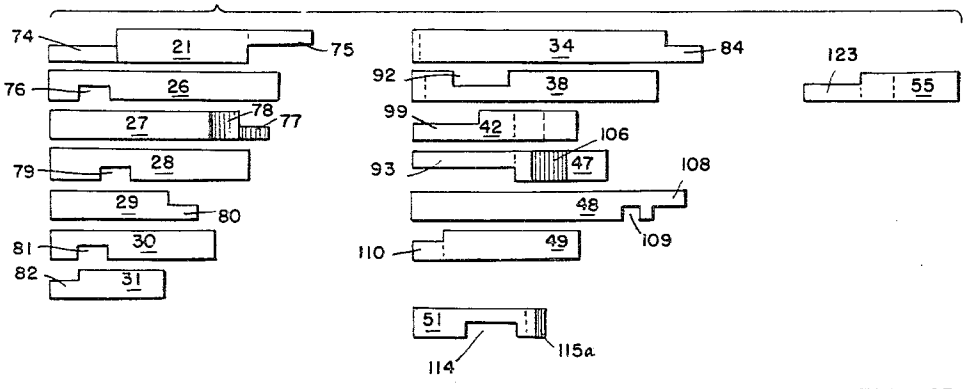


FIG. 3



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FIG. 4

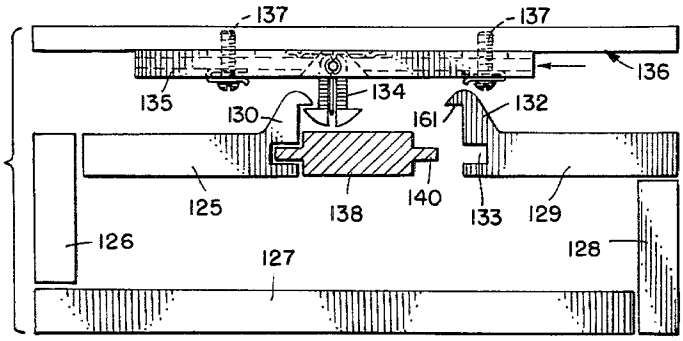


FIG. 5

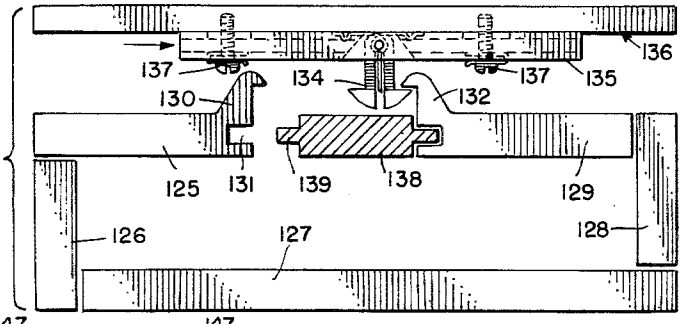


FIG. 7

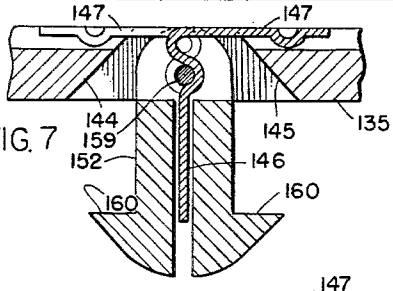


FIG. 8

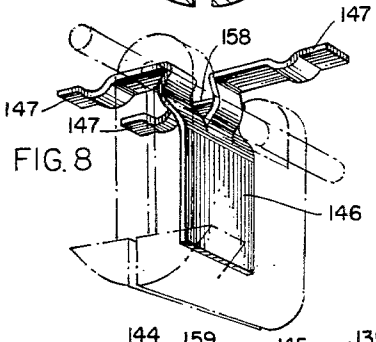


FIG. 9

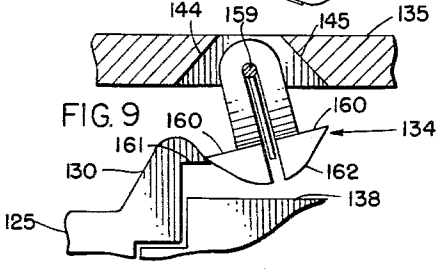
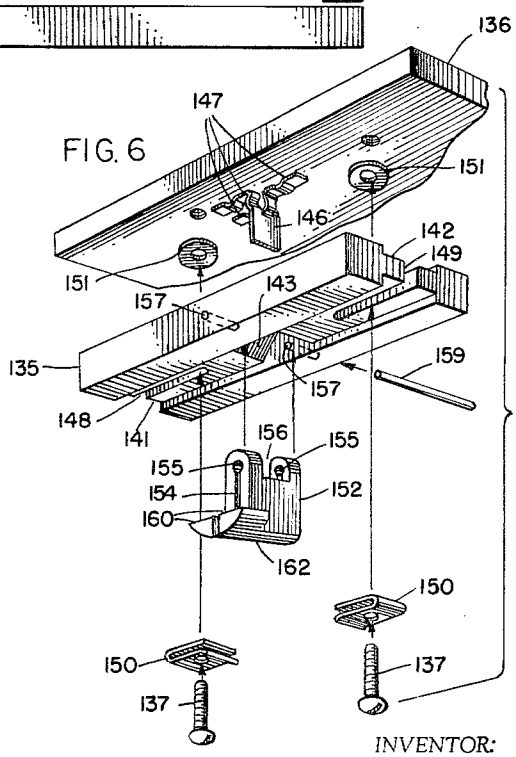


FIG. 6



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PUZZLE LOCKING DEVICE

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FIG. 10

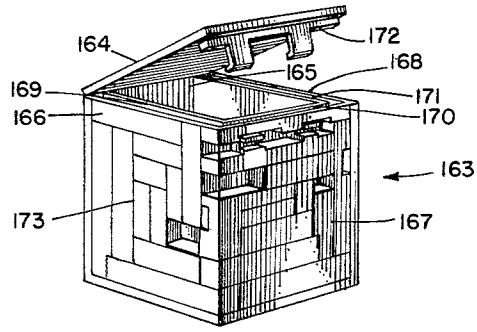


FIG. 11

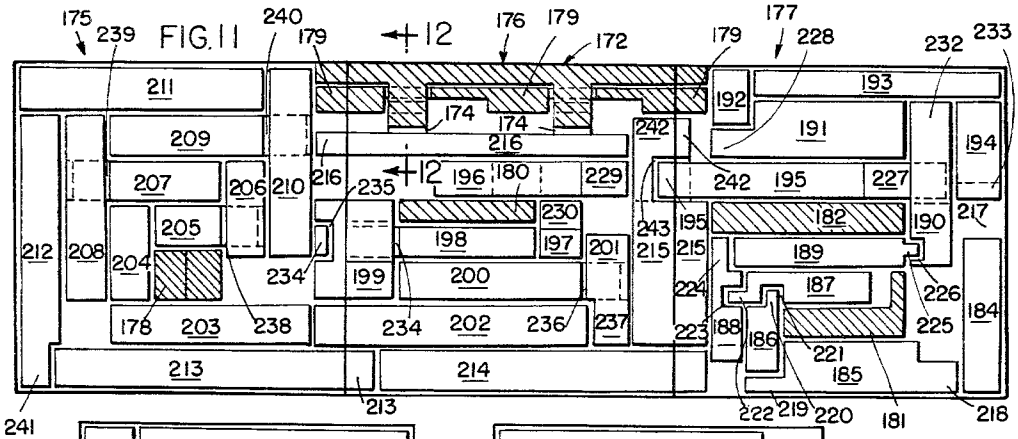


FIG. 13

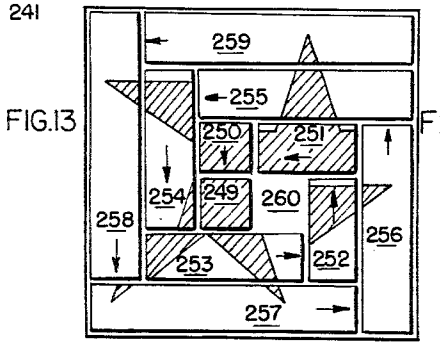


FIG. 14

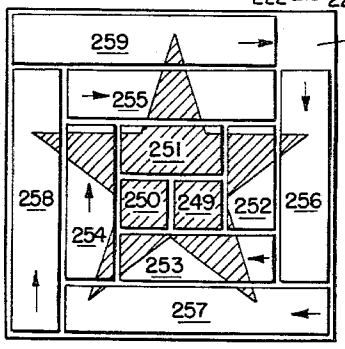
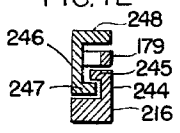


FIG. 12



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United States Patent Office 3,216,558 Patented Nov. 9, 1965

3,216,558

PUZZLE LOCKING DEVICE

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Filed Nov. 6, 1963, Ser. No. 321,913
18 Claims. (Cl. 206—1.5)

This invention relates to puzzle locking devices, and in particular to puzzle locking devices suitable for use on puzzle boxes and the like.

An object of this invention is to provide a locking device for boxes and the like that can be opened only by performing a predetermined sequence of manipulations.

Another object of the present invention is to provide a puzzle locking device of the character described which can be easily and quickly relocked without performing the sequence of manipulations in reverse.

Yet another object is to provide a puzzle box, the unlocking of which gives amusement and challenges the ingenuity.

A further object is to provide puzzle boxes suitable for use as children's toys, novelties, candy boxes and cigarette boxes.

These and other objects and advantages of the present invention will be revealed by the following description. In the drawings:

FIGURE 1 is a perspective view of a puzzle box which embodies the present novel puzzle locking device;

FIGURE 2 is a uniplanar side elevation of three sides of the box shown in FIGURE 1, with two sides projected onto the plane of the third side;

FIGURE 3 is a side view of certain of the movable blocks of the puzzle box shown in FIGURE 2 as seen from the bottom or left side of FIGURE 2;

FIGURE 4 is a side elevation, partially in schematic form, of a puzzle locking device in the left-locked position;

FIGURE 5 is a side elevation, partially in schematic form, of the puzzle locking device of FIGURE 4, in the right-locked position;

FIGURE 6 is an exploded perspective view of the catch mechanism of the puzzle locking device of FIGURE 4;

FIGURE 7 is a detailed cross-sectional view of the slidable spring catch parts of the puzzle locking device in FIGURE 4;

FIGURE 8 is a detailed perspective view of the catch spring of the puzzle locking device of FIGURE 4;

FIGURE 9 is a detailed front view of the spring catch as it is in the process of engaging a latch of the puzzle locking device of FIGURE 4;

FIGURE 10 is a perspective view of another puzzle box which embodies a form of the novel puzzle locking device;

FIGURE 11 is a uniplanar side elevation of the puzzle box shown in FIGURE 10, with two sides projected onto the plane of the third side;

FIGURE 12 is a detailed cross-sectional view, taken along line 12—12 in FIGURE 11;

FIGURE 13 is a side elevation of the movable block arrangement in a puzzle locking device, in which a design is imprinted on the face of the movable blocks; and

FIGURE 14 is a side elevation of the movable blocks of the puzzle locking device in FIGURE 13, showing the design after the blocks have been moved in proper sequence.

The present invention provides a puzzle locking device for use on articles having closure means such as boxes and the like. Broadly described, it consists of a plurality of movable blocks arranged in the confined zone defined by the inner and outer walls of a double walled side of a box. Only one side of the box may be double walled,

but it is preferred that two or more preferably, three sides of the box be double walled, thereby permitting the inclusion of a larger number of movable blocks, in a more intricate and puzzling arrangement. The blocks are arranged in position so that the lid of the box may be locked from within. Each block abuts against or interlocks with an adjacent or nearby block in such a manner as to prevent it from sliding. All of the blocks, except at least one, are thus, prevented from moving. There is a variable free space between at least two of the blocks which permits the movement of a block into said space, said movement at the same time opening another free space into which another block may move. Thus, the blocks may be moved, one at a time, according to a predetermined sequence. A catch member is provided on the lid of said box, and a latch member is provided on at least one of the movable blocks, the latch member engaging the catch member and locking said lid in position. When the blocks are moved according to the predetermined sequence, the latch member is disengaged from the catch member and the lid may be opened.

In a preferred form, latch members are provided on two of the movable blocks, and the catch member is slidably mounted on the lid, so that the catch member can be moved between a first locking position, in which the catch member engages the first of the latch members, and a second locking position, in which the catch member engages the other of the latch members. According to this form of the invention, the blocks are arranged so that movement of the blocks according to the predetermined sequence causes disengagement of the latch member from the catch member in said first locking position, allowing the lid to be opened. The movement of blocks in the sequence results, also, in the block with the second latch member attached thereto being moved so that when the catch member is slidably moved to said second locking position and the lid closed, the catch member will engage the second latch member and the lid will be relocked. Thus, according to this preferred form of the invention, the box lid may be opened by moving the blocks in proper sequence. However, when the lid is again closed, it is immediately re-locked, and it is unnecessary to perform the sequence of block movements, in reverse, to effect the re-locking. It is only necessary to move the catch member on the lid to the other locking position. When this is done, and the lid is closed, it is then necessary to perform the sequence of moves in reverse to unlock and open the lid.

Referring now specifically to the drawings, in FIGURE 1, lid **1** of puzzle box **2** is hinged or otherwise pivotally attached to back **3** thereof. Knob **4** is attached by screw or other means to lid **1**. Box **2** has transparent left outer wall **5**, transparent front outer wall **6** and transparent right outer wall **7**. Box **2** is also provided with left inner wall **8**, front inner wall **9** and right inner wall **10**. Outer walls **5**, **6**, **7** and inner walls **8**, **9**, **10** form a confined zone occupied by a plurality of blocks **11**.

The arrangement of blocks **11** is more clearly shown in FIGURE 2, which is a uniplanar projection of left side **12**, front side **13** and right side **14**. Blocks **15**, **16**, **17**, **18** and **19**, cross-hatched in FIGURE 2, are immovable spacer blocks. The other blocks, indicated by numbers **20** to **63** are not atached to the box **2**, and are so arranged that they abut against or interlock with adjacent or nearby blocks in such a manner as to prevent them from sliding. Blocks **20** to **63** are all substantially rectangular pieces, some being provided with flanges, grooves, channels, tongues, lips, projections and the like. A spring catch **64** is attached to a mounting piece **65**, which is slidably fastened to lid **1** by screws **66**. Block **57** has a latch projection **67** at one end thereof, which latch projection engages spring catch

64 and locks lid 1 in the closed position. Block 57 is prevented from sliding to the left, and thereby disengaging latch 67 from catch 64, by block 56. Spacer block 17 has a tongue 70 which fits inside a groove 71 in block 57. Tongue 70 and groove 71 cooperate to prevent block 57 from being lifted out of the confined zone when lid 1 is raised.

Block 20 is identical in shape to block 57, and has latch projection 68 formed at one end, and is also provided with groove 72 in the same end. Groove 72 is adapted to fit over tongue 73 on spacer block 17, when block 20 is moved to a position adjacent to spacer block 17.

Block 21 has at its upper end a projection 74, which extends under projecting lip 108 of block 48. The lower portion of block 21 is cut away to form flange 75. FIGURE 3 shows block 21 with projection 74 and flange 75, as viewed from the left in FIG. 2. Block 21 is prevented from moving in an upward direction by block 20, and in a downward direction by the bottom of box 2. When block 20 is moved to the left, block 21 may be moved upwardly into the space vacated by block 20.

Block 22 is prevented from sliding to the right by block 21, and is prevented from sliding to the left by left outer wall 5 of box 2. Block 22 may be moved to the right when block 21 is moved in an upward direction. Block 23 is prevented from moving by block 22, against which block 23 abuts, and by back 3 of box 2. Block 23 may be moved to the right into the space vacated by block 22 when clock 22 is moved to the right. Block 24 is prevented from sliding by block 23 and lid 1. Block 24 may be moved in a downward direction into the space vacated by block 23 when the latter is slid to the right. Block 25 is prevented from sliding by block 24, against which it abuts on the left, and by spacer block 16 against which it abuts on the right. Block 25 may be slid to the left into the space vacated by block 24 when the latter is moved in a downward direction.

Block 26 has a channel 76 passing therethrough from left to right, channel 76 being large enough to receive flange 77 on block 27. FIGURE 3 shows block 26 as it is seen from the left side of FIGURE 3. Block 26 is prevented from sliding by block 33, against which it abuts at its lower end, and by block 25 against which it abuts at its upper end. Block 26 may be moved in an upward direction into the space vacated by block 25, when the latter is moved to the left.

Block 27 is cut away at one end, forming flange 77. A channel 78 is cut in block 27 perpendicular to flange 77 and substantially adjacent to the end of flange 77. Channel 78 is large enough to receive the end of block 28. FIGURE 3 shows block 27, as seen from the bottom in FIGURE 2. Block 27 is prevented from sliding by block 24 at the left and by block 26 at the right. When block 26 is moved in an upward direction, channel 76 thereof comes into line with flange 77, and block 27 may be slid to the right, flange 77 passing into channel 76.

Block 28 is provided with a lateral channel 79, large enough to receive flange 80 on block 29. FIGURE 3 shows block 28 as seen from the left side of FIGURE 2. Block 28 is prevented from moving by flange 77 of block 27, against which it abuts, and by block 33, against which it also abuts. When block 27 is moved to the right channel 78 comes into line with block 28, and the latter may be moved in an upward direction, the end of block 28 fitting into channel 78.

Block 29 is cut away at one end to form flange 80. In FIGURE 3, block 29 is shown as viewed from the bottom of FIGURE 2. Block 58 prevents block 29 from moving to the left and block 28 prevents block 29 from moving to the right. When block 28 is moved in an upward direction, channel 79 is brought into line with flange 80, and block 29 may be slid to the right, flange 80 passing through channel 79.

Block 30 has a channel 81 shaped to receive flange 82 on block 31. Block 30, as seen from the left in FIGURE 2, is shown in FIG. 3. Block 30 is prevented from moving by blocks 29 and 23. Movement of block 29 to the right allows block 30 to be raised into the space thereby vacated.

Block 31 is cut away at one end to form flange 82 (see FIGURE 3). Block 31 is prevented from moving by blocks 28 and 30. Upward movement of block 30 brings channel 81 into line with flange 82, permitting block 31 to be slid to the left.

Block 32 is prevented from moving by blocks 31 and 33. The lower end of block 32 fits into channel 83 in block 33. When block 31 is moved to the left, block 32 may be raised.

Block 33 is provided with a channel 83 formed therein, which channel receives the lower end of block 32. Block 33 is prevented from moving by block 32 which extends downwardly into channel 83. When block 32 is raised, it moves out of channel 83, thereby allowing block 33 to move to the left.

Block 34 is cut away to form vertical flange 84 at its right end (see FIGURE 3). Raised horizontal lip 85 is at the opposite end of block 34. Block 34 is prevented from moving by block 33 on the left and by right outer wall 7 and block 21 on the right. Movement of block 33 leaves a space into which block 34 may be moved.

Block 35 is provided with flange 86, formed therein at one end. Movement of block 35 is limited by block 34 on the left and by back 3 of box 2. When block 34 is moved to the left, a space is formed into which block 35 may be slid.

Block 36 has stubby flanges 87, 88 at each end. Flange 87 abuts against flange 86 on block 35, and limits the downward movement of block 36. Upper movement of block 36 is prevented by lid 1. When block 35 is moved to the left, flange 86 vacates space, thereby permitting block 36 to move downward. After downward movement of block 36, the end thereof abut against flange 86.

Block 37 has stubby flanges 89 and 90 at each end. Movement of block 37 to the right is limited by block 36, and to the left movement is limited by flange 91 of block 38 and spacer block 18. When block 36 moves downward, block 37 may move to the right, the extent of the movement being limited by back 3 of box 2, against which flange 89 abuts.

Block 38 is provided with a stubby flange 91 at its upper end, and a relatively wide channel 92, perpendicular to flange 91. Channel 92 is wide enough to allow arm 93 on block 47 to pass therethrough when block 38 is in its raised and lowered positions. FIGURE 3 shows block 38, as viewed from the left side of FIGURE 2. Downward movement of block 38 is prevented by block 35 and upward movement is limited by flange 90, against which flange 91 abuts, and block 37 against which block 38 abuts. When block 37 is slid to the right a space is vacated into which block 38 may be raised, the upward movement being limited by flange 91 abutting against lid 1, and block 38 abutting against flange 90.

Block 39 is provided with flange 94 at one end, and stubby flange 95 at the other end. Block 39 is confined by block 38 at the left and by block 36 and flange 96 at the right. When block 38 is moved in an upward direction, block 39 may be slid to the left into the vacant space created.

Block 40 is a rectangular piece cut away at its lower end to form stubby flange 96. Channel 97 is also provided, said channel being large enough to receive flange 98 on block 41. Block 40 is prevented from moving by block 37 at its upper end, and by block 39 and flange 95 at its lower end. Movement of block 39 to the left permits block 40 to be moved in a downward direction until channel 97 is in line with flange 98.

Block 41 is a rectangular piece with flange 98 formed at one end. Block 40 prevents movement of block 41 to the right. When, however, block 40 is lowered, block

41 may slide to the right, flange 98 moving into channel 97.

Block 42 is provided with a flange 99 at its upper end and a channel 100, perpendicular to flange 99, in the lower portion of said block. Channel 100 is large enough to receive the end of block 43. FIGURE 3 shows block 42, as viewed from the left in FIGURE 2. Movement of block 42 is limited by block 37 and block 41. When block 41 is allowed to slide to the right, block 42 may be moved downwardlly, thereby bringing channel 100 in line with block 43.

Note that if block 42 is allowed to move downward as far as it will go (that is, until it abuts against flange 94 of block 39), channel 100 will not be aligned with the end of block 43, and block 43 will still be unable to slide to the left. The correct way to position block 42 is to tap the box gently until channel 100 is directly opposite the end of block 43. Then block 43 may be moved to the left into channel 100.

Block 43 is a rectangular piece, the movement of which is prevented by blocks 42 and 44. When block 42 is moved downwardly, block 43 may be slid to the left into channel 100.

Block 44 is provided with stubby flange 101 and channel 102. Channel 102 is large enough to receive the end of block 45. Blocks 43 and 37 confine block 44. Movement of block 43 to the left allows block 44 to be moved downwardly until channel 102 is aligned with the end of block 45.

Note that if block 44 is allowed to move downward as far as it will go (that is, until flange 101 rests against flange 98), channel 102 will not be directly opposite the end of block 45, and block 45 will still be prevented from moving by abutting against the side of block 44. The correct unlocking procedure is to tap the box gently until channel 102 moves into line with the end of block 45 (and no farther). Then block 45 can be slid to the right into channel 102.

Block 45 has flange 103 at its left end, and is prevented from moving by blocks 46 and 44. Downward movement of block 44 allows block 45 to be rightwardly slid into channel 102.

Block 46 is cut away at its top end to form flange 104, which fits into channel 106 in block 47. The lower end of block 46 is formed into step-like surfaces 105. Block 46 is prevented from moving by blocks 47 and 45. Movement of block 45 to the right permits block 46 to be slid downwardly.

Block 47 has a large head portion 107 with channel 106 therein. Channel 106 is large enough to receive therein flange 104. Extending laterally to the left from head 107 is a narrower arm piece 93. Block 47 is shown, as viewed from the bottom in FIGURE 2 in FIGURE 3. Block 47 is prevented from moving by block 46 which extends upwardly into channel 106. When block 46 is lowered, block 47 may then be slid to the right.

Block 48 has flange 108 and channel 109 in its right end, channel 109 being large enough to permit projection 110 on block 49 to pass therethrough. FIGURE 3 shows block 48 viewed from the bottom in FIGURE 2. Movement of block 48 is limited by arm 93 of block 47, and by block 56. When block 47 is moved to the right, a space is vacated into which block 48 may be slid, thereby aligning channel 109 with projection 110.

Block 49 has a substantially square projection 110 extending upwardly from the top thereof. Block 49 is held in position at each end by blocks 48 and 34. When block 48 is moved to the right, and channel 109 is thereby brought into line with projection 110, block 49 may then be moved upwardly, projection 110 passing into channel 109.

Block 50 has a tongue 112 in its left end and channel 111 near its right end. Block 50 is prevented from sliding by block 49 on the right and by lip 85 on block 34, on the left. When block 49 is raised, block 50 may then

be slid in a rightward direction until the end thereof abuts against block 21.

Block 51 has a wide central channel 114 in its lower end. Perpendicular to channel 114 is groove 115, adapted to receive tongue 112. The lower end of block 51 is also cut away at 115a to fit against lip 85. Block 51, as seen from the left side in FIG. 2, is shown in FIGURE 3. Block 51 is normally held in position by blocks 48 and 50. After block 50 is slid to the right, block 51 may be moved downwardly until the end thereof abuts against block 34.

Block 52 is an "L" shaped piece with a tongue 113 on its lower end. A groove 116, in the side of block 52, is large enough to receive tongue 117 on block 62. A groove 118 is formed in the upper part of the "L" shaped block 52, said groove being large enough to receive lip 119 on flange 120 of block 53. Normally, block 52 is prevented from moving at its upper end by block 48, and at its lower end by tongue 113 thereof abutting against block 50. When block 50 is moved to the right, block 52 may be moved downwardly, tongue 113, falling into groove 111.

Block 53 has a flange 120 with a lip 119 thereof. Block 53 also has a lateral channel 121 in its bottom side large enough to receive the end of block 54. Block 53 is held normally in position by blocks 51 and 52. For block 53 to be movable, block 51 must be lowered until it abuts against block 34, and block 52 must be raised so that lip 119 is not within groove 118.

Block 54 is confined by blocks 53 and 55. Movement of block 53 to the left brings channel 121 into line with the end of block 54, thereby allowing block 54 to be raised into channel 121.

Block 55 has a lateral channel 122 through its center. Extending leftwardly from channel 122 is projection 123, which passes through a channel 124 in block 56. Block 55 is held in position by the end of block 54 which extends into channel 122. When block 54 is raised, block 55 is free to slide to the right, projection 123 thereby sliding out of channel 124.

Block 56 has a channel 124 formed in it, through which passes projection 123 of block 55. Block 56 is held in position by projection 123. When block 55 is moved to the right, projection 123 moves out of channel 124, permitting block 56 to be moved in a downward direction.

Movement of block 56 downwardly vacates a space into which block 57 may be slid. Movement of block 57 to the left, into a space vacated by block 56, disengages latch 67 from catch 64, unlocking the lid.

A plurality of dummy blocks 58, 59, 60, 61, 62 and 63 are provided at various points throughout the lattice of movable blocks. Their presence lends to the difficulty in deducing the sequence in which the blocks must be manipulated in order to disengage the latch from the catch. The dummy blocks may be of any convenient size, and additionally may be formed with tongues, grooves, channels, flanges, projections, and the like to further contribute to the difficulty in solving the puzzle. For example, in FIGURE 2, blocks 61 and 62 are formed with grooves and channels similar to those on other adjacent blocks, and improper movement of the dummy blocks may prevent successful completion of the sequence of moves necessary to unlock the box.

With the blocks in the initial position shown in FIGURE 2, the following is a step by step explanation of the moves necessary to disengage latch 67 from catch 64. Each block must be moved either to the left, or to the right, or toward the top or bottom. (The directions given will be as they appear in FIGURE 2). Block 20 is moved to the left; block 21, up; block 22, right; block 23, right; block 24, down; block 25, left; block 26, up; block 27, right; block 28, up; block 29, right; block 30, up; block 31, left; block 32, up; block 33, left; block 34, left; block 35, left; block 36, down; block 37, right; block 38, up;

block 39, left; block 40, down; block 41, right; block 42, down; block 43, left; block 44, down; block 45, right; block 46, down; block 47, right; block 48, right; block 49, up; block 50, right; blocks 51 and 52 down; block 50, left; block 52, up; block 53, left; block 54 up; block 55, right; block 56, down; and block 57, left.

The sequence of moves of blocks 50, 51, 52 and 53 is particularly unusual. Block 50 is first slid to the right, permitting blocks 51 and 52 to be lowered. However, block 50 must then be moved back to the left, to immobilize block 51 in its lowered position, so that blocks 52 alone, can be raised. Rasing of block 52 frees block 53, and permits it to be moved to the left into the space formerly occupied by block 51. Also, if after blocks 51 and 52 have been moved downwardly, dummy blocks 62, 61 and 60 are erroneously moved in that order, it will be impossible to successfully complete the puzzle without retracing these moves. This result is obtained because movement of the three dummy pegs immobilizes block 52 in its lowered position, which in turn prevents movement of block 53.

When the blocks have been moved according to the predetermined sequence, the latch will have been disengaged from the catch and the lid may be opened. A novel feature of the puzzle box shown in FIGURE 1 is that the lid may be closed and relocked without retracing the sequence of block movements in reverse. The slidable spring catch 64 is simply moved to its other locking position, located in such a position that when lid 1 is closed catch 64 will engage latch 68 on block 20, which is adjacent to spacer block 17. The lid may then be unlocked by carrying out the reverse sequence of block moves, commencing with the movement of block 57 to the right until it is adjacent to spacer block 17, and ending with the movement of block 20 to the right, thereby disengaging latch 68 from catch 64.

FIGURES 4 and 5 indicate more clearly how the double locking mechanism operates. Blocks 125, 126, 127, 128 and 129 are shown in a simple schematic arrangement. Block 125 has latch projection 130 and groove 131 at one end. Block 129 is similarly provided with a latch projection 132 and a groove 133. Spring catch 134 is mounted on mounting plate 135. Mounting plate 135 is slidably mounted to lid 136 by means of screws 137. Spacer block 138 is fixed in position, and is provided with projecting tongues 139 and 140 adapted to fit in grooves 131 and 133.

Mounting plate 135, with spring catch 134 mounted thereon, is slidable between a left-locking position shown in FIG. 4, and a right-locking position, shown in FIGURE 5.

The locking-unlocking sequence proceeds as follows, starting with the blocks in the position shown in FIGURE 4. Block 129 is moved to the left until it is adjacent to block 138, tongue 140 sliding into groove 133. Block 128 is then raised into the space vacated by block 129. Block 127 is next moved to the right, block 126 downwardly, and block 125 to the left, latch 130 at the same time being disengaged from catch 134, permitting lid 136 to be opened.

In order to relock the lid, mounting plate 135 is moved into the right-locking position, shown in FIGURE 5, and the lid is closed. Catch 134 engages latch 132, since block 129 is in position adjacent to block 138. Thus, the lid can be relocked by simply shifting the catch to the other locking position, and closing the lid, rendering it unnecessary to reverse the sequence of the block movements.

FIGURES 6, 7, 8 and 9, taken in conjunction with FIGURES 4 and 5, illustrate in greater detail the slidable spring catch mechanism. Mounting plate 135 has shallow longitudinal channels 141 and 142 in each side. An opening 143 is cut through the center of plate 135, opening 143 being wider at the bottom than at the top. Side walls 144 and 145 of opening 143 are shown in the cross sectional view of FIGURES 7 and 9. A leaf spring 146 with three mounting arms 147, substantially perpendicular to the main portion thereof fits downwardly into opening 143, with arms 147 fitting into channel 142. A pair of longitudinal slots 148 and 149 are provided in each end of plate 135. Plate 135 is attached to lid 136 by screws 137, spring washers 150, and guide bushings 151.

Plate 135 is thus slidable on lid 136, the longitudinal extent of the movement being controlled by screws 137 abutting against the ends of slots 148 and 149. Guide bushings 151 are attached permanently to the lid and both the guide bushings 151 and the lid 136 are tapped at the same time to receive screws 137. Spring washers 150 hold plate 135 against lid 136 at a constant pressure, offering a slight resistance to movement of piece 135, so that plate 135 cannot move by itself and accidently disengage the catch from the latch.

Catch 152 has a vertical slot 154, the top of which is enlarged to form a lateral hole 155. A portion of the top of catch 152 is cut away to form a recess 156. Lateral holes 157 are provided through mounting plate 135, perpendicular to channels 141 and 142, and communicating with opening 143. Leaf spring arms 147 are grooved to form grooves 158 which, when spring 146 is positioned in opening 143 of plate 135, are concentric with holes 157. Leaf spring 146 fits within slot 154 of catch 152, bringing grooves 158 into line with hole 155. Catch 152 and spring 146 are themselves in such a position in opening 143 that holes 157, 155 and grooves 158 are concentric, thus permitting the entire assembly to be pivotally anchored to plate 135 by pivot pin 159, which passes through the holes and grooves.

Catch 152 has projecting faces 160, adapted to contact and engage the face 161 of a latch member. The lower surface 162 of catch 152 is curved so that catch 152 will cam against the latch projection as the lid is lowered. FIGURE 9 shows the camming action of catch 152 against left side latch 130. As the lid moves down, the catch 152 continues to cam againt latch projection 130 until catch face 160 is below latch face 161, at which point spring 146 snaps catch 152 back to its normal vertical position, engaging catch face 160 with latch face 161. With the catch mechanism in the right locked position the same thing occurs, except that catch 152 cams to the left against latch 132.

Slots 148 and 149 are designed and screws 137 are positioned so that the extreme positions to which plate 135 may be moved allow catch 152 to be positioned over latch projections 130 and 132 respectively when each of the latter is in its locking position, abutting against spacer block 138.

FIGURES 10, 11 and 12 show another puzzle box utilizing the present puzzle locking device. The puzzle box in these figures differs from those previously described in that it is not provided with a two-way locking device. Thus, after the box has been unlocked by moving the blocks selectively and sequentially according to the predetermined pattern necessary to effect the disengagement of the catch member from the latch member, it is necessary to repeat the sequence of block moves, in reverse, to relock the box. In FIGURE 10 puzzle box 163 is provided with a lid 164, a back 165, transparent outer walls 166, 167, 168, inner walls 169, 170 and 171. A catch member 172 is fixed in position on lid 164. Inner walls 169, 170 and 171 and outer walls 166, 167 and 168 define a confined zone wherein are disposed a plurality of blocks 173. On one of said blocks latch members 174 are provided, which are adapted to engage and disengage catch member 172.

The disposition of the plurality of blocks 173 can more clearly be seen in FIGURE 11, which is a uniplanar projection of left side 175, front side 176 and right side 177 of puzzle box 163. Blocks 178, 179, 180, 181 and 182, cross-hatched in FIGURE 11, are spacer blocks that are fixed in position. Catch means 172, also cross-hatched in

FIGURE 11, is shown in the position obtained when lid 164 of box 163 is closed. The remainder of the blocks in said confined zone, indicated by numbers 184 to 216, are not attached to the box 163, but are so arranged that they abut against or interlock with adjacent or nearby blocks in such a manner that all but one of them is prevented from sliding or moving. Blocks 184 to 216 are all substantially rectangular pieces, some of which are provided with such flanges, channels, grooves and the like as will be hereinafter described.

Block 184 is a rectangular piece that is free to be moved upwardly, into space 217, until the upper end of block 184 abuts against block 194.

Block 185 is provided with thick flange 218 at its right end and a thin flange 219 at its left end. Block 185 is prevented from moving to the right by block 184, and to the left by block 186. When block 184 is moved in an upward direction, block 185 may then be moved to the right into the space vacated by block 184.

Block 186 has a flange 220 adapted to fit within channel 221 in block 187. Block 186 is normally prevented from moving by block 187 and by flange 219 of block 185. When block 185 is moved to the right a space is freed, into which block 186 may be moved.

Block 187 has channel 221 adapted to receive flange 220. Block 187 also has flange 222 adapted to fit within channel 223 on block 188. Block 187 is normally prevented from moving by flange 220 extending upwardly into channel 221. When, however, block 186 is moved downwardly and flange 220 moves out of channel 221, block 187 can be moved to the right.

Block 188 has a channel 223, large enough to receive flange 222, and has a flange 224. Flange 222 extending into channel 223 prevents block 188 from moving. When block 187 is moved to the right, and flange 222 is withdrawn from channel 223, block 188 is then free to be moved in a downward direction.

Block 189 has a tongue 225 adapted to fit in groove 226 on block 190. Block 189 is held in position by flange 224 on block 188 and by block 190. When block 188 is moved downwardly, block 189 can be moved to the left.

Block 190 has groove 226 adapted to receive tongue 225. The upper portion of block 190 is cut away to form a long flange 232, under which extends flange 227 of block 195. Tongue 225 extending inside groove 226 normally prevents block 190 from moving. When tongue 225 moves outside of groove 226, block 190 can then be moved in a downward direction.

Block 191 has a flange 228 at its left end. Block 191 is prevented from moving by block 192 and by block 190. When block 190 is moved in a downward direction, block 191 can then be moved to the right.

Block 192 abuts against flange 228 on block 191. When block 191 is moved to the right, block 192 can then be moved downwardly.

Block 193 is prevented from moving by blocks 192 and 194. When block 192 moves downwardly, block 193 is then permitted to be moved to the left.

Block 194 is cut away at the bottom to form a flange 233 which permits the passage of flange 227 of block 195 when block 194 has been moved upwardly. Block 193 prevents block 194 from moving in this direction, normally, but when block 193 is moved to the left, block 194 can then be slid upwardly.

Block 195 has a long flange 227 at its right end. Block 194 normally precents block 195 from sliding to the right. However, when block 194 is raised, block 195 can be slid to the right, flange 227 passing under the flange on block 194.

Block 196 has a flange 229 at its right end and is also provided with a channel wide enough to receive flange 230 of block 197. The channel in block 196 is located so that it comes into line with block 197 when block 196 is moved to the right. Block 196 is prevented from moving to the right by the end of block 195, but when block 195 is moved to the right, a space is vacated into which block 196 can be moved, thereby bringing the channel in block 196 into line with block 197.

Block 197 is cut away to form flange 230. Block 197 is held in position by blocks 196 and 200. When block 196 is moved to the right and the channel therein is aligned with flange 230, block 197 can be moved upwardly, flange 230 passing into said channel.

Block 198 has a flange 234 at its left end which extends into channel 235 on block 199. Block 198 is maintained in position by blocks 197 and 199. When block 197 is moved upwardly, block 198 can then be moved to the right into the vacated space, flange 234 at the same time moving out of channel 235.

Block 199 has a channel 235 adapted to receive flange 234 on block 198. Flange 234 extending into channel 235, prevents block 199 from moving. When block 198 is moved to the right, flange 234 moving out of channel 235, block 199 is free to be slid upwardly.

Block 200 is provided with a flange 236 adapted to extend into the channel in block 201. Block 200 is prevented from sliding by blocks 199 and 201. When block 199 is moved upwardly, block 200 is free to move to the left, flange 236 passing out of the channel in block 201.

Block 201 has a flange 237 in its lower end, and a central channel, perpendicular to flange 237, said channel being adapted to receive flange 236 of block 200. Block 201 is prevented from moving by flange 236 extending into the central channel. When, however, block 200 is moved to the left, flange 236 moves out of the channel, and block 201 is free to move in an upward direction.

Block 202 is prevented from moving by left outer wall 166 and by flange 237 of block 201. When block 201 is raised, block 202 can be moved to the right.

Block 204 is prevented from moving to the right by block 202. When block 202 is slid to the right, block 203 can also be slid to the right.

Block 204 is prevented from moving by blocks 203 and 207. When block 203 is moved to the right, block 204 can then be moved in a downward direction.

Block 205 has a flange 238 adapted to extend into a channel in block 206. Blocks 206 and 204 prevent block 205 from moving, but when block 204 is slid downwardly, block 205 can then be moved to the left.

Block 206 has a central channel big enough to receive flange 238, which normally prevents block 206 from sliding. When block 205 is moved to the left, flange 238 passing out of the channel, block 206 can then be moved in a downward direction.

Block 207 has a flange 239 adapted to extend into a channel in block 208. Block 207 is prevented from sliding by blocks 206 and 208. When block 206 is slid downwardly, block 207 can be slid to the right, flange 239 thereby passing out of the channel in block 208.

Block 208 has a channel cut in its back side big enough to receive flange 239, which prevents block 208 from moving. When block 207 is moved to the right and flange 239 passes out of the channel in block 208, block 208 can then be slid downwardly.

Block 209 has a flange 240 adapted to extend into a channel cut in the back side of block 210. Block 209 is normally prevented from moving by blocks 208 and 210. When block 208 is moved downwardly, block 209 can be moved to the left, flange 240 passing out of the channel in block 210.

Block 210 is provided with a channel adapted to receive flange 240 of block 209, which flange prevents block 210 from moving. When block 209 is moved leftwardly pulling flange 240 out of said channel, block 210 can be slid downwardly.

Block 211 is prevented from moving by back 165 of puzzle box 163 and by block 210. When block 210 is moved downwardly, block 211 can be moved to the right.

Block 212 is cut away at its lower end to form a thick flange 241. Block 212 is prevented from moving by

block 211 and the bottom of the puzzle against which flange 241 abuts. When block 211 is moved to the right a free space is vacated into which block 212 can be moved.

Block 213 is prevented from sliding by flange 241 of block 212 against which it abuts, and by front outer wall 167 of puzzle box 163. When block 212 is moved upwardly, block 213 can be slid to the left.

Block 214 is prevented from moving by block 213 and the right outer wall 168 of puzzle box 163. When block 213 is moved to the left, block 214 can be moved to the left also.

Block 215 has a flange 242 formed in its upper end. A channel 243 is formed in flange 242, channel 243 being large enough to receive the end of block 195 therein. Block 215 is prevented from moving by spacer block 179 and by block 214. When block 214 is moved to the left, block 215 can be moved downwardly.

Block 216 has a pair of latch members 174 extending upwardly therefrom. Each of the latch members 174 comprises a vertical flange 244 with a flange lip 245. Catch member 172 comprises a pair of vertical flanges 246, with flange lips 247 thereon, extending downwardly from a mounting strip 248. FIGURE 12 illustrates cross-sectionally, the relationship of catch member 172 and a latch member 174, when they are engaged. Movement of block 216 laterally to the right, in FIGURE 11, disengages latch members 174 from catch member 172, and permits the lid 164 to be opened. Block 216, in the locked position, is normally prevented from moving by left outer wall 166 on the left, and by flange 242 of block 215 on the right. When block 215 slides in a downward direction, block 216 can be moved to the right, thereby disengaging latch members 174 from catch members 172.

The following is a step-by-step explanation of the moves necessary to disengage latches 174 from catch 172, with the blocks initially in the position shown in FIGURE 11. Each block must be moved either to the left, or to the right, or toward the top or bottom. (The directions will be given as they appear in FIGURE 11.) Block 184 moves upwardly into space 217; block 185, right; block 186, down; block 187, right; block 188, down; block 189, left; block 190, down; block 191, right; block 192, down; block 193, left; block 194, up; block 195, right; block 196, right; block 197, up; block 198, right; block 199, up; block 200, left; block 201, up; block 202, right; block 203, right; block 204, down; block 205, left; block 206, down; block 207, right; block 208, down; block 209, left; block 210, down; block 211, right; block 212, up; block 213, left; block 214, left; block 215, down; and block 216, right, thus, disengaging latch members 174 from catch member 172, and allowing lid 164 to be opened.

In order to relock the box, lid 164 is closed, and the sequence of block movements is carried out in reverse order. Thus, block 216 is moved to the left engaging latch members 174 and catch member 172. Block 215 is moved upwardly, and so on throughout the sequence until block 184 is moved downwardly, leaving space 217 open above the upper end of block 184.

It is contemplated that the blocks of the instant puzzle locking device be made of substantially any suitable solid material. It is preferred, however, that the blocks be formed from plastic or wood. The stationary spacer blocks are of substantially the same thickness as the movable blocks. The spacer blocks may either be separate pieces affixed to the inner wall of the puzzle box, or they may be formed as an integral part of the inner wall.

In the puzzle boxes shown in FIGURES 1 and 10, the force of gravity is utilized in moving the blocks. By tilting the box in the proper direction, a block can be made to slide into a vacant space in the block lattice. For example, to move block 20 in FIGURE 2 to the left, front side 13 of box 2 is held uppermost and the box tilted to the left. The force of gravity then causes block 20 to slide leftwardly until it abuts against spacer block 17. By carrying out the correct series of manipulations with the puzzle box, the blocks may be made to move according to the predetermined sequence, and the lid unlocked.

While it is preferred that gravity be used as the force for moving the blocks, it is also possible to utilize other forces. For example, magnetic forces may be used. If it is desired to use magnetic forces, the movable blocks should, wholly or in part, be made of a magnetic material such as iron. A magnet could then be used to move the blocks and unlock the box by tracing over the blocks in proper sequence.

The puzzle boxes shown in FIGURES 1 and 10 have transparent outer walls. These walls may be made of lucite, plexiglass or other clear material. This permits the operator to view the arrangement of blocks as he performs the series of manipulations. It is not always necessary, however, that the outer walls be transparent. For example, if magnetic forces are used to move the blocks, the outer walls may be opaque, with a pattern or grid of lines, or other guide means on the outside of the opaque walls to indicate the proper tracing sequence.

The puzzle boxes in FIGURES 2 and 11 are double walled on three sides. However, the number of double walled sides may be varied, depending on the complexity of the block arrangement. Thus, a puzzle box, utilizing the arrangement of blocks shown in the puzzle locking device of FIGURES 4 and 5, would require only one double walled side.

It is also contemplated that, where transparent outer walls are used, that a design may be imprinted or otherwise affixed or applied to the movable blocks. The design then either takes shape, or falls apart, or forms a new and different design when the blocks are moved according to the predetermined sequence. FIGURES 13 and 14 illustrate a simple embodiment of such an arrangement. In these figures, a design, represented by cross-hatching, is imprinted or affixed to the blocks. The blocks, indicated by numbers 249 to 259, are all rectangular and movable. If the blocks, in the configuration shown in FIG. 13 are moved in the following sequence, block 249 to the right into space 260; block 250, down; block 251, left; block 252, up; block 253, right; block 254, down; block 255, left; block 256, up; block 257, right; block 258, down; and block 259, left, vacating space 261, the random design becomes the star, as shown in FIGURE 14. It is possible to utilize almost any design, the only limitation being the size of the design and the arrangement of the movable blocks.

The present puzzle locking device may be used on boxes of any size or shape. In particular, the device is not limited to use with cubical boxes of the type shown in FIGURES 1 and 10. Furthermore, the puzzle boxes may be used for many purposes—children's toys, candy and cigarette boxes, novelty puzzles and the like. The embodiment of the device using magnetic blocks and opaque outer walls is well suited for use on strong boxes, trunks, small safes, cash boxes, doors and the like. The device may be made in varying degrees of complexity, depending upon the type of use to which it will be put. There are any number of possible arrangements of movable blocks, and it is understood that the invention is not limited to any particular arrangement of blocks.

The puzzle boxes, shown in the drawings herein, all feature a movable latch member disengageable, through the sequential movement of a series of movable blocks arranged inside a confined zone defined by outer and inner side walls of the box from a catch member fixed to the lid of the box. It is equally possible that the latch member be fixed to the side of the box, and that a movable catch be disengageable from the latch member by the sequential movement of a series of movable blocks arranged inside a confined zone inside the lid of the box.

The invention is hereby claimed as follows:

1. A puzzle locking device comprising walls defining an enclosure with a bottom wall and four side walls, at least one of said side walls being a hollow wall defined by two spaced wall panels, the outer of which is transparent, and

(a) said hollow wall forming a confined zone;

(b) a plurality of movable members in said confined zone with a variable free space in said zone between at least two of said members, said members being slidable within a limited space in said confined zone in a stepwise manner as said free space changes when said members are moved;

(c) latch means on at least one of said movable members;

(d) closure means; and

(e) catch means mounted on said closure means engageable by said latch means and disengageable therefrom upon movement of said movable members in a predetermined sequence which ultimately permits said member with said latch means thereon to move into a free space in said confined zone.

2. A puzzle locking device comprising

(a) means defining a confined zone;

(b) a plurality of movable members in said confined zone with a variable free space in said zone between at least two of said members, said members being slidable within a limited space in said confined zone in a stepwise manner as said free space changes when said members are moved;

(c) latch means on two of said members;

(d) closure means;

(e) catch means mounted on said closure means and slidable thereon between a first locking position, in which said catch means engages one of said latch means, and a second locking position, in which said catch means engages the other of said latch means;

(f) said one of said latch means being disengageable from said catch means in said first locking position by the stepwise movement of said movable members according to a predetermined sequence, commencing with said member with said other latch means thereon and ending with said member with said one latch means thereon, said catch means being then rendered engageable with said other latch means by moving said catch means to said second locking position; and

(g) said other of said latch means being disengageable from said catch means in said second locking position by the stepwise movement of said movable members in an order which is the reverse of said predetermined sequence, commencing with said member with said one latch means thereon and ending with said member with said other latch means thereon, said catch means being then rendered engageable with said one latch means by moving said catch means to said first locking position.

3. In a box, a puzzle locking device comprising walls defining an enclosure with a bottom wall and four side walls, at least one of said side walls being a hollow wall defined by two spaced wall panels, the outer of which is transparent, and

(a) said hollow wall forming a confined zone;

(b) a plurality of movable members in said confined zone with a variable free space in said zone between at least two of said members, said members being slidable within a limited space in said confined zone in a stepwise manner as said free space changes when said members are moved;

(c) latch means on at least one of said movable members;

(d) closure means on said box;

(e) catch means mounted on said closure means engageable by said latch means and disengageable therefrom upon movement of said movable members in a predetermined sequence which ultimately permits said member with said latch means thereon to move into a free space in said confined zone.

4. In a box, a puzzle locking device comprising walls defining an enclosure with a bottom wall and side walls, at least one of said side walls being a hollow wall defined by two spaced wall panels, and

(a) means defining a confined zone in said hollow wall;

(b) a plurality of movable members in said confined zone with a variable free space in said zone between at least two of said members, said members being slidable within a limited space in said confined zone in a stepwise manner as said free space changes when said members are moved;

(c) latch means on two of said members;

(d) closure means;

(e) catch means mounted on said closure means and slidable thereon between a first locking position, in which said catch means engages one of said latch means, and a second locking position, in which said catch means engages the other of said latch means;

(f) said one of said latch means being disengageable from said catch means in said first locking position by the stepwise movement of said movable members according to a predetermined sequence, commencing with said member with said other latch means thereon and ending with said member with said one latch means thereon, said catch means being then rendered engageable with said other latch means by moving said catch means to said second locking position; and

(g) said other of said latch means being disengageable from said catch means in said second locking position by the stepwise movement of said movable members in an order which is the reverse of said predetermined sequence, commencing with said member with said one latch means thereon and ending with said member with said other latch means thereon, said catch means being then rendered engageable with said one latch means by moving said catch means to said first locking position.

5. A puzzle box comprising

(a) outer walls, at least one of which is transparent;

(b) at least one inner wall opposite to and spaced from a respective transparent outer wall;

(c) a bottom,

(d) said transparent wall and its respective inner wall and said bottom defining a confined zone;

(e) a plurality of movable members in said confined zone with a variable free space in said zone between at least two of said members, said members being slidable within a limited space in said confined zone in a stepwise manner as said free space changes when said members are moved;

(f) latch means on one of said movable members;

(g) a lid on said box; and

(h) catch means on said lid engageable by said latch means and disengageable therefrom upon movement of said movable members in a predetermined sequence which ultimately permits said member with said latch means thereon to move into a free space in said confined zone.

6. A puzzle box comprising

(a) outer walls, at least one of which is transparent;

(b) at least one inner wall opposite to and spaced from a respective transparent outer wall;

(c) a bottom,

(d) said transparent wall and its respective inner wall and said bottom defining a confined zone;

(e) a plurality of movable members in said confined zone with a variable free space in said zone between at least two of said members, said members being slidable within a limited space in said confined zone in a stepwise manner as said free space changes when said members are moved, two of said members being longitudinally disposed in the topmost portion of said confined zone;

(f) latch means on the facing ends of said two last mentioned longitudinally disposed members;

(g) a lid on said box;

(h) catch means mounted on said lid slidable thereon between a first locking position, in which said catch means engages one of said latch means, and a second locking position in which said catch means engages the other of said latch means;

(i) said one of said latch means being disengageable from said catch means in said first locking position by the stepwise movement of said movable members, according to a predetermined sequence, commencing with the movable member with said other latch means thereon, and ending with said member with said one latch means thereon, said catch means being then rendered engageable with said other latch means by moving said catch means to said second locking position; and

(j) said other of said latch means being disengageable from said catch means in said second locking position by the stepwise movement of said movable members, in an order which is the reverse of said predetermined sequence, commencing with said movable member with said one latch means thereon and ending with said movable member with said other latch means thereon, said catch means being then rendered engageable with said one latch means by moving said catch means to said first locking position.

7. The puzzle box claimed in claim **5** in which said plurality of movable members has a design on its outer surface.

8. The puzzle box claimed in claim **6** in which said plurality of movable members has a design on its outer surface.

9. The puzzle box claimed in claim **5** in which said confined space has therein immovable spacer members in addition to said movable members.

10. The puzzle box claimed in claim **6** in which said confined space has therein immovable spacer members in addition to said movable members.

11. The puzzle box claimed in claim **5** in which not all of said movable members are movable as a part of said predetermined sequence.

12. The puzzle box claimed in claim **6** in which not all of said movable members are movable as a part of said predetermined sequence.

13. The puzzle box claimed in claim **5** in which said confined zone is disposed in three sides of said box.

14. The puzzle box claimed in claim **6** in which said confined zone is disposed in three sides of said box.

15. The puzzle box claimed in claim **5** in which said movable members are movable according to said predetermined sequence by inclining said box so that gravitational forces cause said members, in turn, to slide into the free space in said confined zone.

16. The puzzle box claimed in claim **6** in which said movable members are movable in sequence by inclining said box so that gravitational forces cause said members, in turn, to slide into the free space in said confined zone.

17. The puzzle box claimed in claim **5** in which said movable members comprise, at least in part, magnetic material and in which said members are movable by the application of magnetic force to said members.

18. The puzzle box claimed in claim **6** in which said movable members comprise, at least in part, magnetic material, and in which said members are movable by the application of magnetic force to said members.

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