United States Patent [19]

Trainor

[11] **3,744,286**

[45] **July 10, 1973**

[54] **TUBULAR KEY**

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[73] Assignee: **Fort Lock Corporation,** Chicago, Ill.

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[21] Appl. No.: **222,601**

[52] **U.S. Cl.** **70/404,** 70/408

[51] **Int. Cl.** **E05b 19/02**

[58] **Field of Search** 70/363, 403, 404, 70/408

[56] **References Cited**

UNITED STATES PATENTS

971,451	9/1910	LeBlanc	70/404 X
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Primary Examiner—Robert L. Wolfe

Attorney—Wolfe, Hubbard, Leydig, Voit & Osann, Ltd.

[57] **ABSTRACT**

A tubular key for axial pin tumbler locks which is integrally and unitarily formed from a piece of tubing with the handle end being formed by a flattening of the tube for a predetermined distance from one end.

2 Claims, 7 Drawing Figures

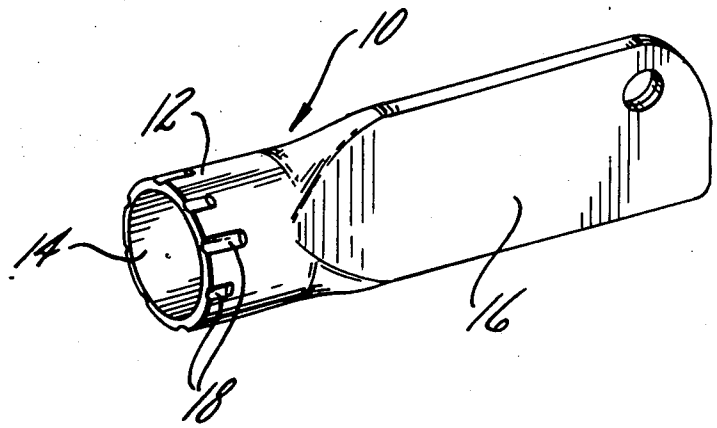


Fig. 1.

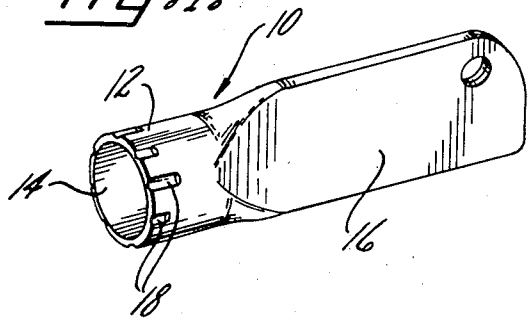


Fig. 2.

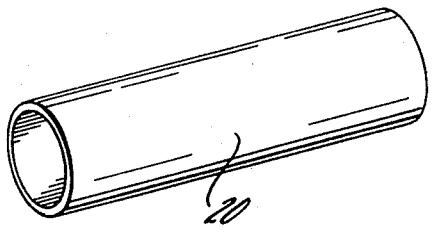


Fig. 3.

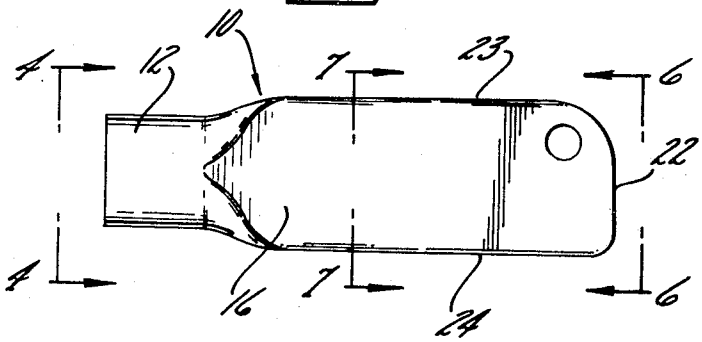


Fig. 4.

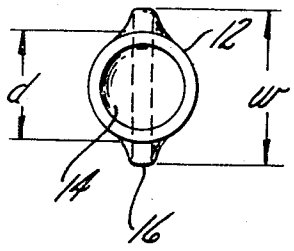


Fig. 5.

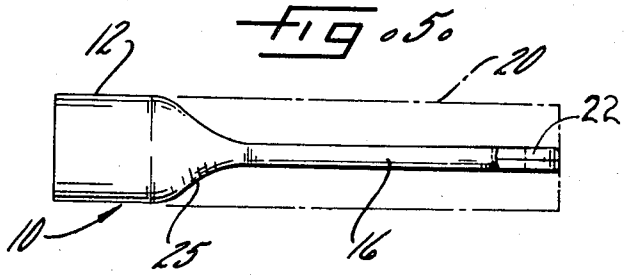


Fig. 6.

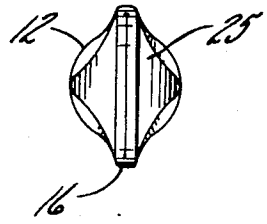
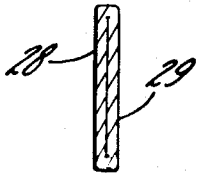


Fig. 7.



TUBULAR KEY

DESCRIPTION OF THE INVENTION

This invention relates generally to tubular keys for axial pin tumbler locks and more particularly to an improved tubular key which is of a simple integral and unitary construction that is extremely low in cost of production, yet which is inherently strong and rigid to withstand vigorous handling and usage.

Axial pin tumbler locks are being used more and more widely for security purposes, principally due to the greater number of possible key combinations available for such lock designs as well as the greater difficulty encountered in attempts at picking such locks. An exemplary lock of this type which provides maximum security as well as a virtually pick-proof construction is disclosed and claimed in Patrick M. Trainor U.S. Pat. No. 3,509,748 assigned to the assignee of the present invention.

The conventional tubular keys utilized with such locks are generally made up of two components, i.e. a flat handle portion and a cylindrical shank which is press fit or otherwise secured to the handle portion. The cylindrical shank is commonly a machined member made from solid rod stock by several cutting operations. These includes cutting a stepped and slotted portion adjacent the shank end receiving the handle and drilling a central opening forming the hollow tubular portion at the opposite end thereof. The key blank thus formed is not only a fairly costly item but it is not too uncommon for the handle portion to separate from the shank in use of handling particularly when the key is subjected to very high torques at one time or another. Where the shank has been loosened it can fall off and be lost when the key is carried on a holder passing through an opening usually provided in the handle.

Accordingly, it is a primary object of the present invention to provide an improved tubular key construction for use with axial pin tumbler locks which is extremely low in cost of production, yet maintains the strength and rigidity required of such keys. A related object is to provide a tubular key of the foregoing type which is integral and unitary in construction and which may be easily fabricated on a production basis without the necessity of numerous costly machining operations.

It is still another object of the present invention to provide a unitarily formed tubular key construction which is more attractive in styling and design than conventionally known tubular key arrangements.

Other objects and advantages of the invention will become apparent as the following description proceeds, taken in conjunction with the accompanying drawing, in which:

FIG. 1 is a perspective view of a tubular key in accordance with the present invention;

FIG. 2 is a perspective view of a cylinder blank exemplary of the type from which the key of FIG. 1 is made;

FIG. 3 is a side view of the key of FIG. 1;

FIG. 4 is an end view taken along the line 4—4 in FIG. 3.

FIG. 5 is a top view of the key of FIG. 3;

FIG. 6 is a view taken along the line 6—6 in FIG. 3;and

FIG. 7 is a view taken along the line 7—7 in FIG. 3.

While the invention has been described in connection with a preferred embodiment, it will be understood that I do not intend to limit the invention to the particular embodiment shown but intend to cover the various alternatives and equivalent constructions included within the spirit and scope of the appended claims.

Turning now to the drawing, there is shown a completely formed tubular key constructed in accordance with the present invention, indicated at **10**. The key is integral and unitary in construction and includes a tubular end portion **12** with central opening **14** therein and a generally flat handle **16**. The tubular end portion **12** receives the circumferentially spaced notches **18** which are properly combinated for a particular lock to engage and align the axially directed combination pins of the lock when inserted and thereby permitting rotation of the lock cylinder.

In accordance with the present invention, the tubular key **10** is formed as an integral unit from a preselected appropriate length of tubing **20** as shown in FIG. **2.** The tubing which may be made from a material such as type **304** stainless steel or the like having an O.D. and I.D. which correspond to the circular lock cylinder opening of the axial pin tumbler locks with which the finished keys are to be used.

To produce the key blank of the present invention all that is necessary as a production step is to flatten the cylinder or tubing **20** adjacent one end for a predetermined distance to form a handle portion **16** (FIG. 3) which may be easily accomplished with any suitable clamping or press apparatus. The flattened end may then be chamfered or rounded as indicated at **22** to provide a visual manner of identifying reference sides for orienting the key to insert it into the lock. For example, the shorter side **23** may indicate the top of the key while the longer side indicates the bottom or vice-versa.

Referring to FIGS. **3** and **4,** conjointly, it will be seen that the width w of the handle portion formed from flattening the tube is greater than the outer diameter d_o of the tubular shank **12.** This additional width provides sufficient gripping surface when held between the thumb and index finger as conventionally used to rotate a key and impart sufficient torque for rotating the lock cylinder once the key is inserted in the lock.

To ordinary flattening operation performed on the tube end will provide a gradually tapering surface connection **25** (FIGS. **5** and **6**) between the handle portion **16** and tubular shank **12.** Consequently, there is sufficient rigidity between the handle portion and the shank portion to resist transverse bending forces as well as rotational twisting forces. In addition, the flattening operation provides a handle portion **16** which is composed of two layers **28,29** (FIG. **7**) so that the handle is effectively twice the thickness of the tube material.

It will be appreciated by those skilled in the art that a suitable opening may be provided in the handle portion to receive a key holder or the like. Also, a lug may be formed on the shank end to provide a polarization guide for inserting the key in the lock as well as to turn the lock cylinder where the pins are not used as the force transmitting means for turning the cylinder.

I claim as my invention:

1. For use with an axial pin tumbler lock having an annular keyway and axially directed combination pins, a tubular key comprising a tubular shank and an integrally formed handle portion, said key being a unitary preselected length of tubing and having said handle portion formed from flattening an end of said tube to a predetermined distance from said end so that said

handle portion includes a bi-layered thickness, said flattened portion gradually tapering into the tubular shank on both sides of said flattened portion and the tubular shank end containing circumferentially spaced combinated notches about its periphery for engaging and aligning the axially directed combination pins of said lock when inserted in the annular keyway.

2. A tubular key as claimed in claim 1 wherein said flattened handle portion is chamfered adjacent its end.

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