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SHAFT KEYING AND LOCKING CONSTRUCTION

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Fig. 1.

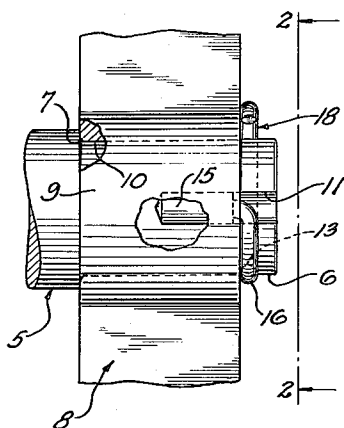


Fig. 2.

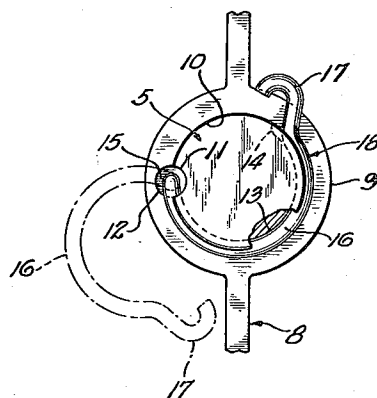


Fig. 3.

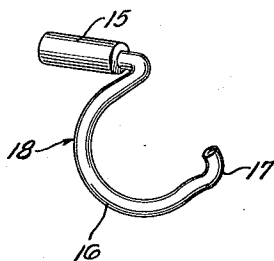


Fig. 4.

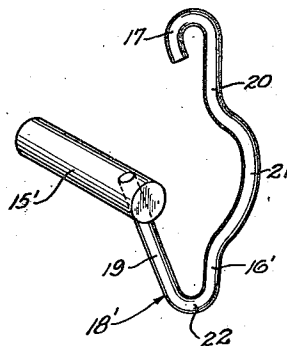
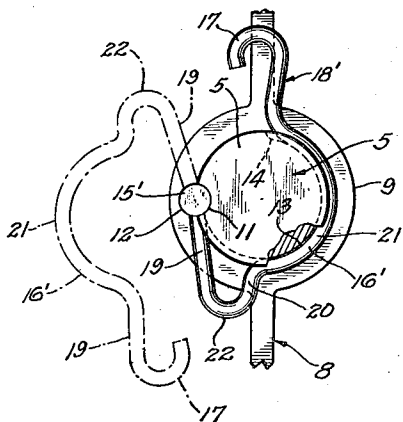


Fig. 5.



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SHAFT KEYING AND LOCKING
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9 Claims. (Cl. 287-53)

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This invention relates to improvements in shaft keying and locking constructions.

There are many applications wherein it is desired to removably fix a member, such as an impeller, gear, or the like, onto a driving shaft. Heretofore it has been customary to key the impeller or like member to the shaft. This served to prevent rotation of the member on the shaft, but it did not alone prevent relative axial movement. As a result, it has been customary to utilize additional means such as a cotter pin or nut.

In certain equipment, such as that used in the food industry, it is of utmost importance that the use of inaccessible irregularities such as holes, screw threads, corners, grooves and the like, which might form a lodging place for food particles, be minimized. It is also important that this type of equipment be designed for quick and easy disassembly and cleaning.

With the above in mind, it is a general object of the invention to provide a novel construction for simultaneously keying an impeller or the like to a shaft and for locking said impeller against axial movement.

A further object of the invention is to provide a construction of the class described which permits an impeller or the like to be readily and quickly mounted on or removed from a shaft.

Another object of the invention is to provide an improved construction of the class described having a keying and locking member which is formed with a key portion and with a resilient snapping portion, the last-mentioned of which may be manually snapped into or out of operative position when the key portion is in place, said snap ring portion serving to prevent displacement of said keying portion, as well as to prevent displacement of the impeller.

A further object of the invention is to provide a construction of the class described which is easily cleaned and which has no inaccessible corners, holes or screw threads in which food particles may collect.

A further object of the invention is to provide a construction of the class described which is simple in construction, strong and reliable, and easy to manufacture.

With the above and other objects in view, the invention consists of the improved keying and locking means, and all of its parts and combinations, as set forth in the claims, and all equivalents thereof.

In the drawing accompanying and forming a part of this specification, wherein is shown one complete embodiment of the preferred form of

the invention, and wherein the same reference characters indicate the same parts in all of the views:

Fig. 1 is a fragmentary side view of an impeller showing it keyed and locked onto a shaft by means of one form of improved keying and locking member, parts being broken away;

Fig. 2 is a fragmentary end view taken approximately along the line 2-2 of Fig. 1, the dot and dash lines illustrating the keying and locking member in a released position;

Fig. 3 is a perspective view of the improved keying and locking member of Figs. 1 and 2 shown alone;

Fig. 4 is a perspective view of a modified form of improved keying and locking member; and

Fig. 5 is a fragmentary end view similar to Fig. 2 but showing the modified form of keying and locking member in both locking and released position.

Referring more particularly to the drawing, the numeral 5 indicates a shaft which may have an end portion 6 of reduced diameter to form a shoulder 7. The numeral 8 indicates an impeller or other device having a hub 9 formed with a smooth, unthreaded bore 10 which is of substantially the same diameter as the portion 6 of the shaft 5. The impeller 8 is positioned on the portion 6 of the shaft 5 with one end of the hub 9 in abutment with the shoulder 7.

The portion 6 of the shaft 5 is formed with a longitudinally extending, substantially semi-circular groove or keyway 11. The bore 10 of the hub 9 is formed with a complementary longitudinally extending, substantially semi-circular groove or keyway 12 which, when in registration with the groove 11, forms a cylindrical cavity in conjunction with said groove. The shaft 5, adjacent the outer face of the hub 9, is formed with a circumferential groove 13, which may communicate with the groove 11. If desired, the groove 13 may extend completely around the shaft 5, but satisfactory results have been obtained with a groove 13 which terminates at about the point 14 shown in Fig. 2. This point is located substantially more than 180° from the groove 11 in a counterclockwise direction (as viewed in Fig. 2).

An improved keying and locking member 15 is formed with a cylindrical stem or key portion 15 having a diameter substantially equal to the diameter of the cylindrical cavity formed by the registering grooves 11 and 12. The member 15 is also preferably formed with an integral locking clip or snap ring 16 having spring-like quali-

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ties and which is connected to one end of the key 15. The clip 16 extends in a plane substantially at a right angle to the axis of the shaft 5 and the key 15 and is substantially C-shaped as shown. The clip 16 has a radius of curvature preferably equal to or smaller than that of the groove 13. At its free end the clip 16 is formed with a handle portion 17.

To install the keying and locking member 18, the grooves 11 and 12 of the shaft 5 and the hub 9 respectively are positioned in registration, and the cylindrical key 15 is slidably inserted into the cylindrical cavity formed by said grooves with the clip 16 thereof in the dot and dash line position of Fig. 2. After the key 15 has been inserted sufficiently far to bring the clip 16 into the same plane as the peripheral groove 13 on the shaft 5, the clip 16 is swung toward the shaft 5 and into the groove 13. During such movement the clip 16 swings about the key 15 as a pivot. Since the radius of curvature of the clip 16 is equal to or smaller than that of the groove 13 it will be spread apart slightly as it is snapped into the position on the shaft 5, which is shown in Fig. 2. This snapping action holds the member 14 in operative position and prevents its displacement.

When the improved keying and locking device is in the operative position shown in Figs. 1 and 2, it effectively prevents rotation of the hub 9 relative to the shaft 5, and it also effectively prevents axial movement of the hub 9 relative to said shaft. The latter is true because when the clip 16 is seated in the groove 13, it abuts the outer face of the hub 9 and prevents outward movement thereof.

To remove the keying and locking member 18 from its operative position it is only necessary to snap the clip 16 off of the shaft 5 by grasping the handle 17 of said clip and swinging it to the dot and dash line position of Fig. 2. The device can then be completely removed by slidably withdrawing the key portion 15 from the cavity in which it is positioned. The impeller 8 may then be slid off of the shaft 5.

Figs. 4 and 5 disclose a modified form of improved keying and locking member 18' which may be used alternatively with the keying and locking member 18. The member 18' has a generally V-shaped retaining clip also having spring-like qualities and which is connected to one end portion of a key 15'. The clip 16' extends in a plane substantially at a right angle to the axes of the shaft 5 and the key 15', and has a substantially straight leg 19 and a leg 20 which is formed with an arcuate portion 21. The arcuate portion 21 preferably has a radius of curvature substantially equal to that of the groove 13. At its free end the clip 16' is formed with a handle portion 17.

The looped portion 22 formed at the juncture of legs 19 and 20 provides the tensioning required to urge said legs toward each other when said legs are forced outwardly, as for example when the clip 18' is in installed position on the shaft 5. When the clip 18' is removed from the shaft the legs 19 and 20 are preferably disposed at a smaller angularity than when said clip is in locking position on the shaft.

When the member 18' is in keying and locking position, the arcuate portion 21 of the clip 16' engages a portion of the groove 13 diametrically opposite from the grooves 11 and 12. The installation and removal of the modified form of keying and locking member 18' is substantially the same as that of the member 18. Fig. 5 shows

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the member 18' in keying and locking position, and the dot and dash lines in said figure show the clip 16' swung free of the shaft 5 and in position to permit withdrawal of the key 15.

It is apparent that the invention provides a simple construction for positively fixing an element, such as an impeller, to a shaft. The improved construction is especially well adapted for use in the food industry because it does not require the use of any screw threading either on the shaft or on the element fixed thereto. In addition, the improved construction eliminates inaccessible sharp corners and holes in which food particles may collect. All of the grooves in the improved construction are smooth, rounded, and easily cleaned, and the improved keying and locking member 14 is also of a shape which simplifies the cleaning operation.

Various changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated, as may come within the scope of the claims.

What I claim is:

1. In combination, a shaft formed with a keyway; an element having a bore within which said shaft is positioned, said element having a complementary keyway formed in said bore, said shaft being formed with a circumferentially extending groove outwardly of and adjacent one end of said element; and a keying and locking member having a stem forming a key rotatably and removably positioned in said complementary keyways and having an elongated snap portion connected at one extremity to said stem, said snap portion being positioned in said circumferential groove adjacent the end portion of said bored element, said latter portion being swingable upon rotation of said stem to a position out of said groove and away from said shaft to permit removal of said stem from said keyways.

2. In combination, a shaft formed with a substantially semi-cylindrical keyway; an element having a bore within which said shaft is positioned, said element having a complementary substantially semi-cylindrical keyway formed in said bore and said shaft being formed with a circumferentially extending groove outwardly of and adjacent one end of said element; and a keying and locking member formed with a substantially cylindrical keying portion removably positioned in said complementary keyways and having an elongated shaft embracing portion connected to one extremity to said keying portion and removably positioned in said circumferential groove adjacent the end portion of said bored element.

3. In combination, a shaft formed with a keyway; an element having a bore within which said shaft is positioned, said element having a complementary keyway formed in said bore and said shaft being formed with a circumferentially extending groove outwardly of and adjacent one end of said element; and a keying and locking member formed with a keying portion removably positioned in said complementary keyways and having a C-shaped snap-ring portion connected at one extremity to said keying portion and removably positioned in said circumferential groove adjacent the end portion of said bored element.

4. In combination, a shaft formed with a keyway; an element having a bore within which said shaft is positioned, said element having a complementary keyway formed in said bore and

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said shaft being formed with a circumferentially extending groove outwardly of and adjacent one end of said element; and a keying and locking member formed with a keying portion rotatably and removably positioned in said complementary keyways and having a C-shaped snap-ring portion fixed at one extremity to said keying portion and removably positioned in said circumferential groove adjacent the end portion of said bored element, said C-shaped snap-ring portion being swingable out of said groove and away from said shaft upon rotation of said keying portion.

5. In combination, a shaft formed at one end with a substantially semi-cylindrical keyway and with a circumferentially extending groove; shoulder means on said shaft spaced inwardly from said end thereof; an element having a bore within which said shaft is positioned with said shoulder means in abutment with one end of said element and with the circumferentially extending groove outwardly of and adjacent the other end of said element, said element having a complementary substantially semi-cylindrical keyway formed in said bore; and a keying and locking member formed with a substantially cylindrical keying portion removably positioned in said complementary keyways and having a snap-ring portion fixed at one extremity to said keying portion and removably positioned in said circumferential groove in embracing relationship with respect to said shaft and in abutment with the adjacent end portion of said bored element, whereby said element is locked against both rotative and axial movement relative to said shaft.

6. In combination, a shaft formed with a keyway; an element having a bore within which said shaft is positioned, said element having a complementary keyway formed in said bore and said shaft being formed with a circumferentially extending groove outwardly of and adjacent one end of said element; and a keying and locking member formed with a keying portion removably positioned in said complementary keyways and having a V-shaped retaining clip, having the extremity of one of its legs connected to said keying portion said clip having an arcuate portion removably positioned in said circumferential groove diametrically opposite said shaft keyway.

7. In combination, a shaft formed with a keyway; an element having a bore within which said shaft is positioned, said element having a complementary keyway formed in said bore and said shaft being formed with a circumferentially extending groove outwardly of and adjacent one end of said element; and a keying and locking member formed with a keying portion removably positioned in said complementary keyways and having a V-shaped retaining clip, said clip having a substantially straight first leg connected at its extremity to said keying portion and hav-

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ing a second leg formed with an arcuate portion, said arcuate portion being removably positioned in said circumferential groove in abutment with the end portion of said bored element.

8. In combination, a shaft formed with a keyway; an element having a bore within which said shaft is positioned, said element having a complementary keyway formed in said bore and said shaft being formed with a circumferentially extending groove outwardly of and adjacent one end of said element; and a keying and locking member formed with a keying portion removably positioned in said complementary keyways and having a V-shaped retaining clip, said clip having a substantially straight first leg fixed at the extremity thereof to said keying portion and having a second leg formed with an arcuate portion having a radius of curvature substantially equal to that of the circumferential groove, said arcuate portion being removably positioned in said circumferential groove diametrically opposite said shaft keyway and in abutment with the adjacent end portion of the bored element.

9. In combination, a shaft formed with a keyway; an element having a bore within which said shaft is positioned, said element having a complementary keyway formed in said bore and said shaft being formed with a circumferentially extending groove outwardly of and adjacent one end of said element; and a keying and locking member formed with a keying portion removably positioned in said complementary keyways and having a V-shaped retaining clip, said clip having a substantially straight first leg fixed at its extremity to said keying portion and having a second leg formed with an arcuate portion having a radius of curvature substantially equal to that of the circumferential groove, said arcuate portion being removably positioned in said circumferential groove diametrically opposite said shaft keyway and in abutment with the adjacent end portion of the bored element, the angular relationship of the first and second legs of said clip when removed from the shaft being normally equal to or less than the angular relationship of said legs when said clip is in locking position on said shaft.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Country	Date
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