United States Patent

Denney

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[45] **Oct. 17, 1972**

[54] **FASTENER ACTUATOR**

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[52] **U.S. Cl.** **81/185,** 81/179, 269/266

[51] **Int. Cl.**.....**B25b 13/58,** B25b 13/12

[58] **Field of Search** ...81/129, 179, 185, 71; 269/266

[56] **References Cited**

UNITED STATES PATENTS

3,349,655	10/1967	Locke	81/185
1,529,605	3/1925	Moncey	81/129 X
2,754,708	7/1956	Peterson	269/266 X

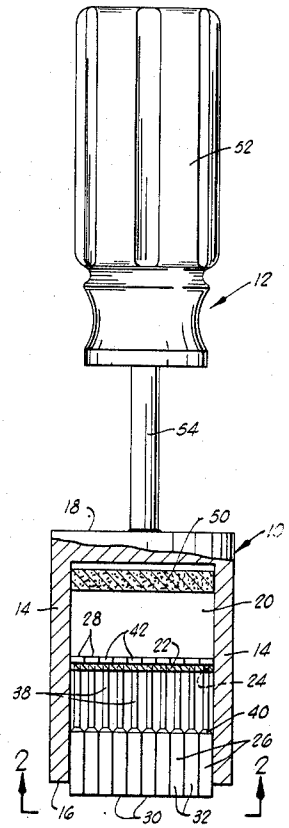
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[57] **ABSTRACT**

A fastener actuator having a plurality of fastener engaging elements, each fastener engaging element being independently positionable in an engaging proximity to a fastener, the fastener engaging elements being adapted to cooperate to remove or tighten the fastener.

10 Claims, 12 Drawing Figures



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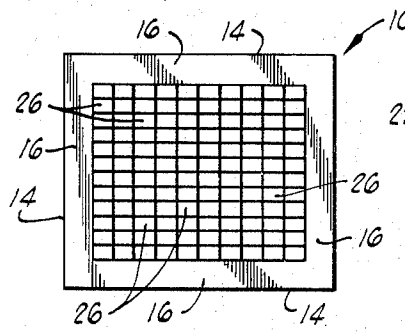
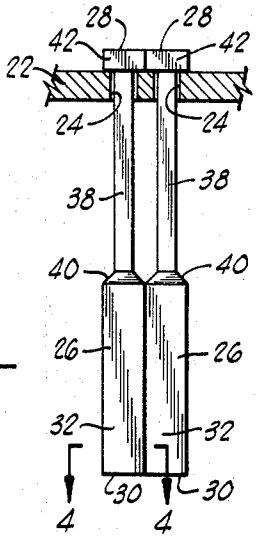


Fig. 2



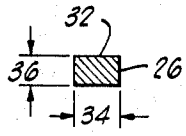


Fig. 4

Fig. 3

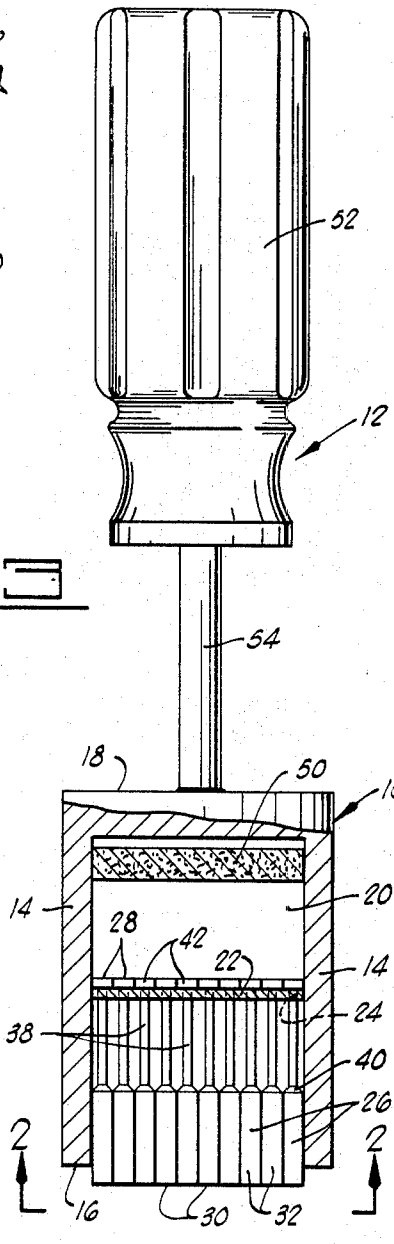


Fig. 1

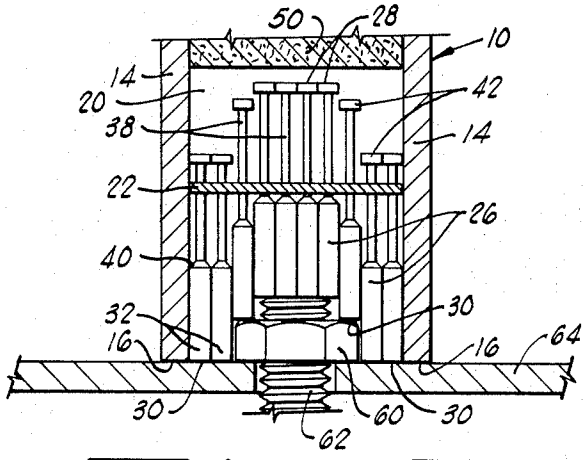


Fig. 5

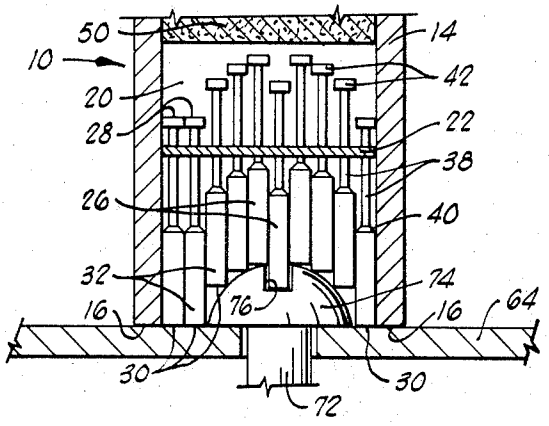


Fig. 6

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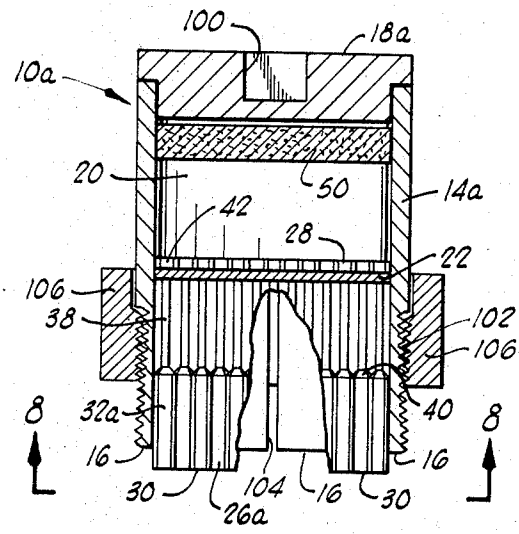


FIG. 7

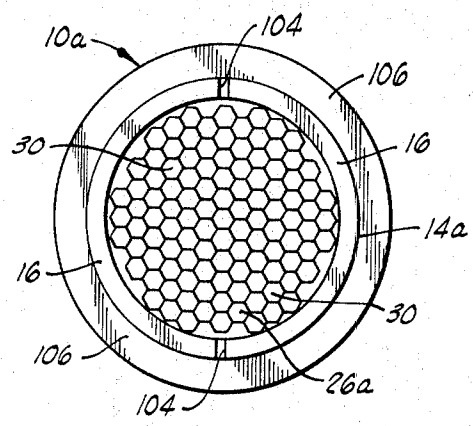


FIG. 8

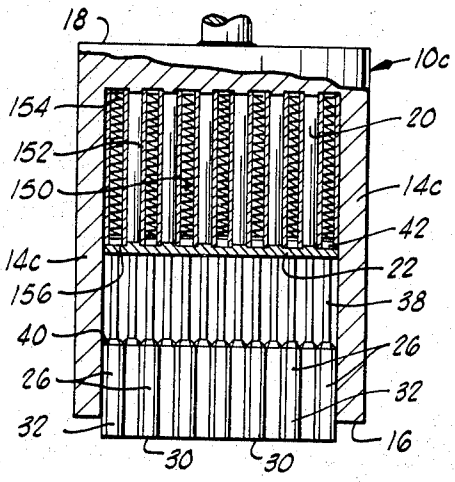


FIG. 11

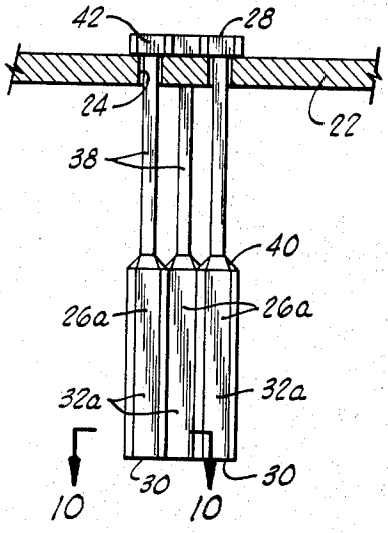


FIG. 9



FIG. 10

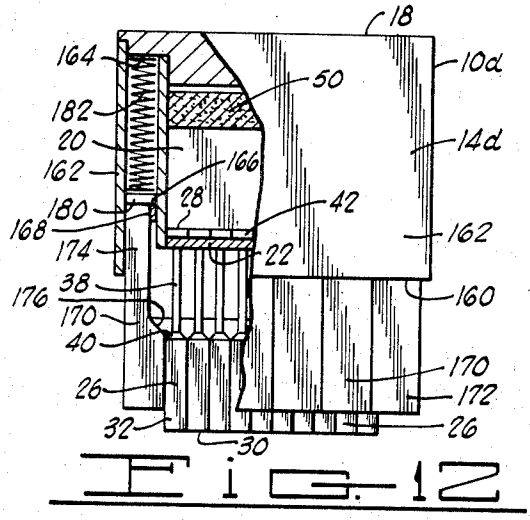


FIG. 12

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FASTENER ACTUATOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to improvements in fastener actuators, and more particularly, but not by way of limitation, to a fastener actuator having independently positionable fastener engaging elements.

2. Description of the Prior Art

In the past there have been various devices or fastener actuators for removing or tightening fasteners, such as nuts and screws. There have also been many attempts to construct such devices to incorporate a maximum versitility.

One such device was an adjustable wrench of the type commonly referred to as a "crescent" wrench. Although this device could remove nuts of various sizes, within limits, it was limited in that it had to be placed at a right angle to the fastener being removed and in that it could not be utilized to remove different types of fasteners, such as screws.

There have also been screw drivers having a split driving head. The basic theory of such devices was that by altering the degree of overlap between the split portions of the driving head, the same screw driver could be utilized to remove screws having various slot widths. This device was of course limited to removing screws and it had also been found that the split portions of the driving head rapidly became deformed to an extent that, for all practical purposes, rendered the device inoperable.

One other such device utilized a number, usually three or four, socket head type of wrench elements concentrically positioned, one element within the other, in a single driving head. The basic theory of this device was that only a particular socket head would drop into an engaging position about a nut, while the remaining socket heads would remain suspended. This device was of course limited to removing fasteners having a particular configuration corresponding to the three or four socket heads utilized in the device. It was also found that each socket head had to be constructed utilizing a relatively thin supporting wall so that the socket heads could be concentrically disposed. This latter limitation of course limited the torque capability of the device.

The increase in the number of machines utilizing fasteners sized in accordance with the metric system has posed an additional limitation in the versitility of fastener removers. These particular fasteners generally have required a special fastener actuator for their removal.

There has thus developed a need for a single fastener actuator which is adapted to remove or tighten fasteners of various configurations, including screws and nuts, and fasteners sized in accordance with various mathematical measurement systems.

SUMMARY OF THE INVENTION

The present invention contemplates a fastener actuator for removing and tightening fasteners. The fastener actuator includes a housing having a support connected thereto. A plurality of fastener engaging elements are supported in the support. Each fastener engaging element is independently positionable in an engaging proximity to a fastener.

An object of the invention is to provide a fastener actuator capable of tightening and removing fasteners having various configurations.

Another object of the invention is to provide a fastener actuator capable of tightening and removing fasteners having various configurations and yet maintaining maximum torque characteristics.

A further object of the invention is to provide a single fastener actuator capable of tightening and removing screws and nuts.

A still further object of the invention is to provide a fastener actuator capable of removing and tightening fasteners notwithstanding the mathematical basis used to size the particular fastener.

One additional object of the invention is to provide a fastener actuator which is economical in construction and operation.

Other objects and advantages of the invention will be evident from the following detailed description when read in conjunction with the accompanying drawings which illustrate the various embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional view of a fastener actuator having a turning handle, shown in elevation, attached thereto.

FIG. 2 is a view of the fastener actuator of FIG. 1, taken substantially along the lines 2—2 of FIG. 1.

FIG. 3 is an enlarged elevational view of some of the fastener engaging elements of the fastener actuator of FIG. 1, shown in one position thereof in the support plate.

FIG. 4 is a sectional view of the fastener engaging element of FIG. 3, taken substantially along the lines 4—4 of FIG. 3.

FIG. 5 is a sectional view of the fastener actuator of FIG. 1, showing the fastener engaging elements in engaging proximity about a fastener.

FIG. 6 is a view similar to FIG. 5, but showing the fastener engaging elements in engaging proximity about another fastener.

FIG. 7 is a sectional view of a modified fastener actuator.

FIG. 8 is a view of the modified fastener actuator of FIG. 7, taken substantially along the lines 8—8 of FIG. 7.

FIG. 9 is an enlarged elevational view of some of the fastener engaging elements of the fastener actuator of FIG. 7, shown in one position thereof in the support plate.

FIG. 10 is a sectional view of the fastener engaging element of FIG. 9, taken substantially along the lines 10—10 of FIG. 9.

FIG. 11 is a sectional view of another modified fastener actuator.

FIG. 12 is a partial sectional, partial elevational view showing yet another modified fastener actuator.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings in general, and to FIGS. 1 and 2, in particular, shown therein and designated by the general reference character 10 is a fastener actuator, having a turning handle 12 connected to one end thereof.

The fastener actuator **10** includes a housing **14** having an open and a closed end **16** and **18**, respectively, and a hollow inner portion **20**, intersecting the open end **16** thereof. As shown more clearly in FIG. **2**, the housing **14** is basically rectangularly shaped and, in a preferred form, is constructed of a metal or reinforced plastic.

A support plate **22** is disposed in a central portion of the hollow portion **20** of the housing **14**, and is secured therein. The support plate **22** has a plurality of spaced apertures **24** extending therethrough.

A plurality of fastener engaging elements **26** are movably disposed in a portion of the hollow portion **20** of the housing **14**. A portion of each fastener engaging element **26** is slidingly disposed in one of the apertures **24**, and, as shown more clearly in FIG. **3**, each fastener engaging element **26** has an upper most end **28** and a lower most end **30**.

An engaging portion **32** is formed on a portion of each fastener engaging element **26**, extending a distance generally from the lower most end **30** toward the upper most end **28** thereof. As shown more clearly in FIGS. **3** and **4**, the engaging portion **32** has a basically rectangularly shaped cross-section, having a length **34** and a width **36**. In a preferred form and as shown in FIG. **4**, the length **34** is larger than the width **36**.

A sliding portion **38** is formed on each fastener engaging element **26**, generally between the engaging portion **32** and the upper most end portion **28** thereof. In a preferred form, the sliding portion **38** has a circularly shaped cross-section and is sized to slidingly extend through one of the apertures **24** in plate **22**.

In a preferred form, the cross-sectional area of each sliding portion **38** is smaller than the cross-sectional area of the respective engaging portion **32**, thereby forming an upwardly facing surface **40** encircling each fastener engaging element **26**, generally between the engaging portion **32** and the sliding portion **38** thereof. The upwardly facing surface **40** of each fastener engaging element **26** is sized and disposed to engage the plate **22**, in one position thereof, to limit the movement of each fastener engaging element **26** in one direction.

It should also be noted, that the cross-sectional area of each sliding portion **38** is sized with respect to the cross-sectional area of each engaging portion **32** such that, in the assembled position, the engaging portion **38** of each fastener engaging element **26** are positioned in a close proximity with respect to the engaging portions **38** of the adjacent fastener engaging element **26**.

In practice and as shown in FIGS. **1** through **6**, each fastener engaging element **26** should be sized and disposed in an approximate abutting relationship to the adjacent fastener engaging element **26**. In this form, it may be desirable to coat the outer periphery of the engaging portion **32** of each fastener engaging element **26** with a bearing material, such as teflon to prevent the occurrence of corrosion or rust between the various fastener engaging elements **26**.

A stop **42** is formed on the upper most end **28** of each fastener engaging element **26**. Each stop **42** has a larger diameter that the respective aperture **24** in the plate **22**, and each stop **40** will, therefore, engage the plate **22** and limit the movement of each fastener engaging element **26** in one direction.

It is apparent from the foregoing, that each fastener engaging element **26** is shaped such that each fastener engaging element **26** will slide in a generally upwardly and downwardly direction within one of the apertures **24** within the limits defined by the respective stop **42** and the respective upwardly facing surface **40**, for reasons to be made more apparent below.

A permanent magnetic **50** is disposed in a portion of the hollow portion **20** of the housing **14**, generally near the closed end **18** thereof, and is secured therein. In the form of the invention shown in FIGS. **1** and **2**, each fastener engaging element **26** is preferrably constructed of a permanent type, magnetic material. The magnetic **50** is disposed such that the magnetic **50** repels each fastener engaging element **26**, thereby biasing each fastener engaging element **26** to a position wherein the stop **42** of each fastener engaging element **26** is in engagement with the plate **22**. In an alternate form, each fastener engaging element **26** could be constructed of a reinforced plastic, and the stop **42** constructed of a permanent type, magnetic material.

As shown more clearly in FIG. **1**, each fastener engaging element **26** is sized such that when the fastener actuator **10** is in the non-operating position, that is in a position wherein the stop **42** of each fastener engaging element is in engagement with the plate **22**, the ends **30** of the fastener engaging elements lie generally in the same horizontal plane, for reasons to be made more apparent below. In this position and in a preferred form, the open end **16** of the housing **14** is disposed in a horizontal plane slightly above the horizontal plane formed by the ends **30** of the fastener engaging elements **26**.

It is apparent from the foregoing, that each fastener engaging element **26** is independently positionable with respect to the plate **22**, that is each fastener element **26** may be moved in an upward direction, against the repelling force of the magnetic **50**, independent of the movement of the other fastener engaging elements **26**.

As shown more clearly in FIG. **2**, the housing **14** forms an outer periphery, encircling the fastener engaging elements. In a preferred form, the gap between the housing **14** and the engaging portions **32** of the adjacent fastener engaging elements **26** should be minimized. The housing **14** cooperates with the fastener engaging elements **26** to define the torque capability of a particular fastener actuator **10**, as will be described in greater detail below.

The turning handle **12** has a hand-grip portion **52** and a connecting portion **54**. One end of the connecting portion **54** is secured to the hand-grip **52** and the opposite end of the connecting portion **54** is secured to the closed end **18** of the fastener actuator **10** at a central portion thereof. It is therefore apparent, that a turning motion of the hand-grip **52** is transmitted to the fastener actuator **10** via the connecting portion **54**, for reasons to be made more apparent below.

OPERATION OF FIGS. 1, 2, 3 AND 4

The fastener actuator **10** is adapted to remove or tighten any fastener notwithstanding the configuration or sizing of the particular fastener. The fastener actuator **10** may thus be utilized to tighten or remove such fasteners, as nuts or screws, regardless of the particular mathematical basis utilized to size such fasteners.

The fastener actuator **10** is normally in a non-operative position, that is a position wherein each fastener engaging element **26** is biased outwardly to a position wherein the stop **42** of each fastener engaging element **26** is in engagement with the plate **22**. When the fastener actuator **10** is utilized to remove or tighten a particular fastener, the open end **16** of the fastener actuator is first positioned adjacent the fastener, and the fastener actuator **10** is moved downwardly over the fastener. In this position the open end **16** of the fastener actuator **10** encompasses the fastener, and each fastener engaging element **26** is independently positioned in an engaging proximity to the fastener. The hand-grip **52** is then turned in a direction, the particular direction of course depending on whether the fastener is to be tightened or removed, thereby turning the fastener actuator **10**. Each fastener engaging element **26** engages the fastener and cooperates with the other fastener engaging elements **26** to engage and tighten or remove the particular fastener.

Referring to FIG. **5**, the operation of the fastener actuator **10** may be more particularly described with reference to a particular type of fastener. As shown in FIG. **5**, the fastener actuator **10** has been placed in an engaging proximity, or in other words in an operating position, about a nut **60** having a hexagonally shaped cross-section. The nut **60** has been threaded on a bolt **62**, and is in engagement with a plate **64**.

More particularly, the fastener actuator **10** has been placed about the nut **60**, such that the open end **16** of the housing **14** encompasses the nut **60**, and such that the open end **16** is in engagement with the plate **64**. In this position, some of the fastener engaging elements **26** have been forced a distance in an upwardly direction against the biasing force of the magnetic **50** by the engagement of the fastener engaging elements **26** with the plate **64**, some of the fastener engaging elements **26** have been forced a distance in an upwardly direction against the biasing force of the magnetic **50** by the engagement of the fastener engaging elements **26** with an upper portion of the nut **60**, and some of the fastener engaging elements **26** have been forced a distance in an upwardly direction against the biasing force of the magnetic **50** by the engagement of the fastener engaging elements **26** with an upper end portion of the bolt **62**. Thus, the fastener engaging elements **26** have been independently positioned in an engaging proximity about the nut **60**, as shown in FIG. **5**.

It is apparent that the fastener engaging elements **26** cooperate to form an engaging surface about the outer periphery of the nut **60**. Therefore, when the handle **12** is turned, the engaging surface formed by the fastener engaging elements **26** will engage the outer periphery of the nut **60**, and therefore turn or rotate the nut **60**.

The fastener engaging elements **26** in effect cooperate to provide a laminated working area within the fastener actuator **10**, and in cooperation with the additional strength provided by the portion of the housing **14** generally adjacent the open end **16** thereof, provide the turning strength or torque requirements of the fastener actuator **10**.

As shown in FIG. **6**, the fastener actuator **10** has been placed in an operating or engaging proximity to a screw **72** having a screw head **74** with a slot **76** formed therein. In this position, some of the fastener engaging elements **26** have been forced a distance in an upwardly direction against the biasing force of the magnetic **50** by the engagement of the fastener engaging elements **26** with the plate **64**, some of the fastener engaging elements **26** have been forced a distance in an upwardly direction against the biasing force of the magnetic **50** by the engagement of the fastener engaging elements **26** with the upper portion of the head **74** of the screw **72**, and some of the fastener engaging elements **26** have been forced a distance upwardly against the biasing force of the magnetic **50** by the engagement of the fastener engaging elements **26** with the portion of the screw head **74** formed by the slot **76** therein. It is apparent from the foregoing and from FIG. **5**, that some of the fastener engaging elements **26**, have been disposed in the slot **76** of the screw **72** and are, therefore, in an engaging proximity to the screw **72**. Therefore, when the handle **12** is turned, the engaging surface formed by the fastener engaging elements **26**, particularly those fastener engaging elements **26** which are disposed in the slot **76**, will engage the screw **72** and turn or rotate the screw **72**.

It is apparent from the foregoing that the fastener engaging elements **26** of the fastener actuator **10** are adapted to cooperate with the plate **22** and the magnetic **50**, such that each fastener engaging element **26** is independently positionable in an engaging proximity to a fastener. The fastener engaging elements **26** cooperate to provide various configurations of engaging surfaces and the fastener actuator **10** is thus constructed to remove various fasteners, such as screws or nuts, notwithstanding the particular configuration, that is for example hexagonal or triangular, and regardless of the mathematical basis used to size the particular fastener, that is for example metric or otherwise. It should also be noted that in a preferred form, the particular number of fastener engaging elements **26** utilized in a fastener actuator should be as large as possible, or in other words, the cross-sectional area of the fastener engaging elements **26** should be as small as possible, within the torque limits of the particular fastener actuator. In this manner, the maximum engaging surface is assured about a particular fastener.

EMBODIMENT OF FIGS. 7, 8, 9 AND 10

The fastener actuator **10*a*** is constructed similar to the fastener actuator **10**, described before. One difference being that the closed end **18*a*** has a recess **100** formed in a central portion thereof. The recess **100** is sized to interconnectingly receive the rectangularly shaped end of a rachet-type wrench (not shown), such that the fastener actuator **10*a*** may be turned by rotating the wrench. Various forms of such rachet-type wrenches are well known in the art, and no further description is required herein.

The outer periphery of housing **14*a*** generally adjacent the open end **16** thereof, is tapered in a generally outwardly direction, and a portion **102** thereof is threaded. As shown in FIG. **7**, a slot **104** is formed in a portion of the housing **14*a*** generally adjacent and intersecting the open end **16** thereof, for reasons to be made more apparent below.

As shown more clearly in FIG. **8**, the housing **14*a*** has a generally cylindrical shape forming a circular shaped inner wall about the fastener engaging elements **26*a***.

The fastener engaging elements **26***a* are constructed similar to the fastener engaging elements **26**, shown more clearly in FIGS. **3** and **4**, the salient differences being that the engaging portion **32***a* of each fastener engaging element **26***a* has a hexagonal-shaped cross-section, as shown more clearly in FIGS. **9** and **10**.

The fastener actuator **10***a* also includes a nut **106** disposed about a portion of the housing **14***a* generally adjacent the open end **16** thereof. The nut **106** is sized and disposed to threadingly engage the threaded portion **102** of the housing **14***a*.

It is apparent from the foregoing and from FIGS. **7** and **8**, that as the nut **106** is threaded downwardly toward the open end **16** of the housing **14***a*, the portion of the housing **14***a* adjacent the open end **16** thereof will be moved into a closer proximity to the adjacent fastener engaging elements **26***a*, and will ultimately force each fastener engaging element **26***a* into a closer proximity with the adjacent fastener engaging elements **26***a*. The housing **14***a* will move in the manner described above due to the cooperation between the nut **106** and the tapered portion **102** of the housing **14***a*, for reasons to be made more apparent below.

OPERATION OF FIGS. 6, 7, 8 AND 9

The fastener actuator **10***a* will operate substantially the same as the fastener actuator **10**, described before, one difference being that the fastener actuator **10***a* is adapted to cooperate with various forms of rachets and turning handles.

Each fastener engaging element **26***a* is constructed to be slidingly supported in the apertures **24** of the plate **22**, such that each fastener engaging element **26***a* is independently positionable in an engaging proximity to a fastener in a manner as described before with respect to the fastener engaging elements **26**. The particular cross-sectional shaping of the fastener actuators **26***a* may be more desirable and result in more engaging surface being available about a particular fastener, in some applications.

After the fastener actuator **10***a* has been placed in an operating or engaging position about a particular fastener, in a manner generally as described above, the nut **106** may be threaded downwardly about the housing **14***a*, thereby forcing a portion of the housing **14***a* to move into a closer proximity to the adjacent fastener engaging elements **26***a*. The nut **106** therefore, cooperates with the housing **14***a* to more securely position the fastener engaging elements **26***a* in an engaging proximity about a particular fastener. This particular construction may be more desirable, particularly in smaller sizes of the fastener actuator **10** involving high torque applications.

EMBODIMENT OF FIG. 11

The fastener actuator **10***c* shown in FIG. **11**, is constructed similar to the fastener actuator **10**, shown in FIGS. **1** and **2**, the salient difference being that the fastener actuator **10***c* does not utilize a permanent magnetic as the biasing force for the fastener engaging elements **26**, but rather utilizes a plurality of springs **150**.

One end of each of the springs **150** is disposed adjacent the stop **42** of one of the fastener engaging elements **26** and the opposite end of each spring **150** is in engagement with a portion of the closed end **18** of the housing **14***c*. Each spring **150** is sized and disposed to bias the respective fastener engaging element in an outwardly direction, to a position wherein the stop **42** of each fastener engaging element **26** is in engagement with the plate **22**.

Each spring **150** is held in position within the hollow portion **20** of the housing **14***c* by a cylindrically shaped retainer **152**. One end of each retainer **152** is disposed in a recess **154** formed in the closed end **18** of the fastener actuator **10**, and the opposite end of each retainer **152** is disposed in a recess **156** formed in the plate **22**. It is apparent from the foregoing that the recesses **154** and **156** cooperate to secure each retainer **152** in an assembled position, as shown in FIG. **11**.

OPERATION OF FIG. 11

The fastener actuator **10***c* will operate similar to the fastener actuator **10**, the salient difference being that each fastener engaging element **26** is biased toward the plate **22** by the springs **150**. This particular construction may be more desirable, particularly in larger sizes of a fastener actuator.

EMBODIMENT OF FIG. 12

The fastener actuator **10***d*, shown in FIG. **12**, is constructed similar to the fastener actuator **10**, described before. The salient difference being the adjustable housing **14***d*.

As shown in FIG. **12**, the lower end of the housing **14***d* terminates with a lower most end **160**, at a point generally adjacent the plate **22**. A retaining sleeve **162** is secured about the outer periphery of the housing **14***d*, generally between the closed end **18** and the end **160** thereof. The sleeve **162** has opposite ends **164** and **166**.

A plurality of spaced apertures **168** are formed in the end **166** of the sleeve **162**. The apertures are sized to slidingly receive a plurality of housing elements **170** which are slidingly disposed therein.

Each housing element **170** has an engaging portion **172** formed adjacent one end thereof, and a sliding portion **174** formed adjacent the opposite end thereof. As shown in FIG. **12**, the sliding portion **174** of each housing element **170** is sized to slidingly extend into one of the apertures **168** in the sleeve **162**, and has a smaller width than the adjacent engaging portion **172** thereby forming an upwardly facing surface **176** therebetween. The upwardly facing surface **176** is disposed and sized to engage a portion of the end **166** of the sleeve **162**, thereby limiting the movement of each housing element **170**, in one direction.

A stop **180** is formed on one end of each housing element **170**, and each stop **180** is sized and disposed to engage a portion of the end **166** of the sleeve **162**, thereby limiting the movement of each housing element **170**, in one direction.

A plurality of springs **182** are disposed in the sleeve **162**. One end of each spring is secured to the stop **180** of one of the housing elements **170** and the opposite end of each spring **182** is disposed adjacent the end **164** of the sleeve **162**. Each spring **182** is sized to bias one of the housing elements **170** to a non-operating position, wherein the stop **180** thereof is in engagement with the end **166** of the sleeve **162**.

The housing elements **170** are sized, such that, in the non-operating position thereof, as generally described above, the engaging portions **172** cooperate to provide a retaining wall about the fastener engaging elements **26** and, in this position, the housing elements **170** provide substantially the function as the housing **14**, shown in FIG. 1. However, each housing element **170** is independently positionable about the fastener engaging elements **26**, which is desirable in some applications as will be described below.

OPERATION OF FIG. 12

The fastener actuator **10***d* will operate similar to the fastener actuator **10**, described before, in that each fastener engaging element **26** is supported in the plate **22** and each fastener engaging element **26** is independently positionable in an engaging proximity to a fastener. The fastener actuator **10***d* is therefore constructed to remove or tighten fasteners of various configurations in a manner as described before with respect to the fastener actuator **10**.

The salient difference in operation being that the fastener actuator **10***d* is constructed such that it can be utilized to remove a fastener between and adjoining two pipe sections. When the fastener actuator **10***d* is utilized in this manner, the fastener actuator **10***d* is disposed about the fastener and the pipe sections and the fastener engaging elements **26** are moved into an engaging proximity about the fastener and the pipe sections. Each housing element **170** is also independently positionable about the pipe sections, thereby permitting the fastener actuator **10***d* to be so utilized.

The fastener actuators described herein provide a versitile, single-element hand tool. The same fastener actuator can be utilized to remove or tighten virtually any type of fastener, such as screws or nuts, regardless of the particular configuration of the fastener. This type of actuator is particularly useful where one periodically encounters a fastener sized in accordance with a metric system. The fastener actuators described herein are adapted to remove or tighten any fastener regardless of the mathematical basis used to sized the particular fastener.

Changes may be made in construction and arrangement of the parts or the elements of the various embodiments as disclosed herein without departing from the spirit and the scope of the invention as defined in the following claims.

What is claimed is:

1. A fastener actuator for removing and tightening fasteners, comprising:

a housing having an open end and a closed end and a hollow portion formed therein intersecting the open end thereof;

a support plate connected to the housing spaced from the open end and the closed end of the housing, having a plurality of aperture means formed therethrough;

a plurality of fastener engaging elements, each fastener engaging element, having an upper end and a lower end, the lower end of each fastener engaging element disposed generally near the open end of the housing, an engaging portion formed on the lower end portion and a sliding portion of a smaller cross-sectional area than the engaging portion formed on the upper end portion thereby forming an upwardly facing surface between the engaging portion and the sliding portion, and stop means formed on the upper end thereof, the sliding portion of each fastener engaging element being slidingly disposed through one of the aperture means of the support plate, each stop means engaging the support plate to limit the movement of one of the fastener engaging elements in one direction and each upwardly facing surface engaging the support plate to limit the movement of one of the fastener engaging elements in one other direction, each fastener engaging element being supported in the support plate and being independently positionable in an engaging proximity to a fastener; and

biasing means secured in the housing and disposed between the support plate and the closed end of the housing biasing each fastener engaging element in one direction.

2. The fastener actuator of claim **1** wherein the biasing means is further defined as being adapted to bias each fastener engaging element in a direction generally toward a non-operating position wherein the upper end portion of each fastener engaging element engages a portion of the support means.

3. The fastener actuator of claim **2** wherein the biasing means is further defined to include a permanent magnetic supported in a portion of the housing, said magnetic being sized and disposed to repelling bias each fastener engaging element generally toward a non-operating position.

4. The fastener actuator of claim **2** wherein the biasing means is further defined to include a plurality of springs, each spring having opposite ends, one of said opposite ends of each spring being in engagement with a portion of the housing, the other end of each spring being in engagement with the upper end of one of the fastener engaging elements, each of said springs being sized to bias one of the fastener engaging elements generally toward a non-operating position.

5. The fastener actuator of claim **1** wherein each fastener engaging element is defined further as being sized and disposed such that the engaging portion of each fastener engaging element is in close proximity to the engaging portions of the adjacent fastener engaging elements.

6. The fastener actuator of claim **5** wherein the fastener engaging elements are further defined as being sized such that the lower ends of the fastener engaging elements lie in substantially the same plane when the fastener engaging elements have been biased to the non-operating position.

7. The fastener actuator of claim **6** wherein the open end of the housing is sized to substantially encompass the fastener engaging elements and to support the fastener engaging elements in a position wherein the engaging portion of each fastener engaging element is in close proximity to the engaging portions of the adjacent fastener engaging elements.

8. The fastener actuator of claim **7** wherein the housing includes an outer periphery, a portion of said outer periphery generally adjacent the open end thereof being threaded and tapered, a slot being formed in a portion of the outer periphery intersecting a portion of

the open end of the housing; and wherein the fastener actuator is defined further to include a nut disposed about a portion of the housing, said nut being sized and disposed to threadingly engage the threaded portion of the outer periphery, such that as the nut is threaded downwardly toward the open end of the housing, the open end of the housing is closed about the fastener engaging elements.

9. The fastener actuator of claim **6** wherein the housing is defined further to include a plurality of housing elements, said housing elements being sized and disposed to substantially encompass the fastener engaging elements and to support the fastener engaging elements in a position wherein the engaging portion of each fastener engaging element is in close proximity to the engaging portions of the adjacent fastener engaging elements, each of said housing elements being adjustably supported about the housing.

10. A fastener actuator for removing and tightening fasteners, comprising:

support means;

a plurality of fastener engaging elements, each fastener engaging element having an upper end and a lower end and an engaging portion formed on the lower end portion thereof, each fastener engaging element being supported in the support means and being independently positionable in an engaging proximity to a fastener; and

a housing, having a hollow portion, the support means and the fastener engaging elements each being supported within the hollow portion of the housing, the housing comprising:

a plurality of housing elements, the housing elements sized and disposed to substantially encompass the fastener engaging elements and to support the fastener engaging elements in a position wherein the engaging portion of each fastener engaging element is in close proximity to the engaging portions of the adjacent fastener engaging elements, each of the housing elements being adjustably supported about the housing.

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