July 21, 1959 J. A. W. MADSEN 2,895,360

POWER OPERATED MAGAZINE-TYPE SOCKET WRENCH ATTACHMENT

Filed Aug. 7, 1957 2 Sheets-Sheet 1

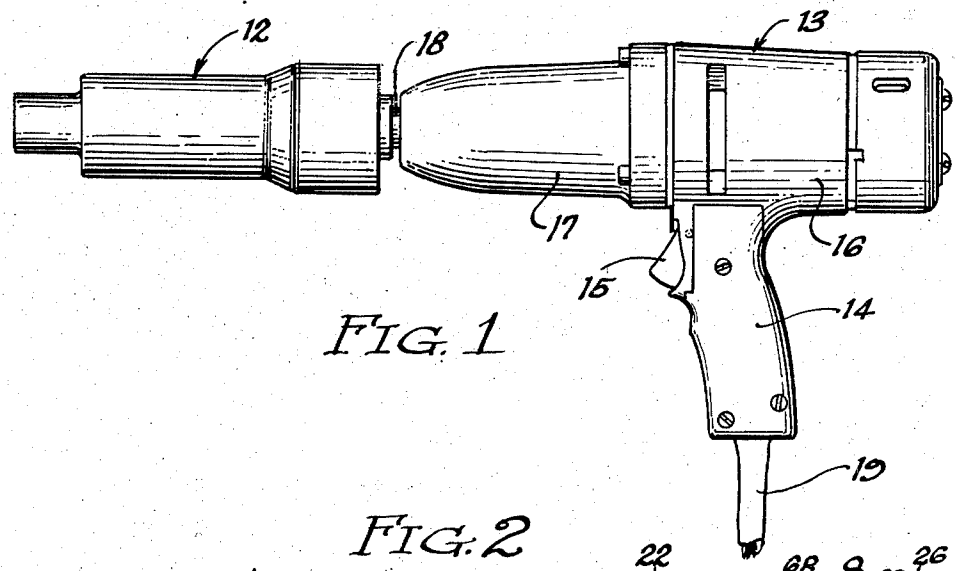


FIG. 1

FIG. 2

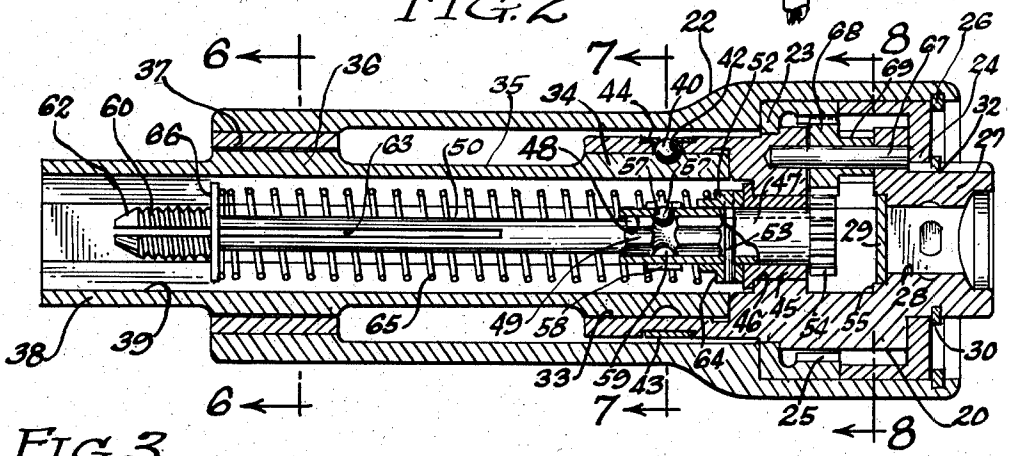


FIG. 3

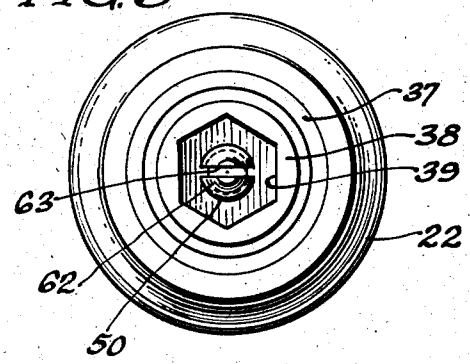
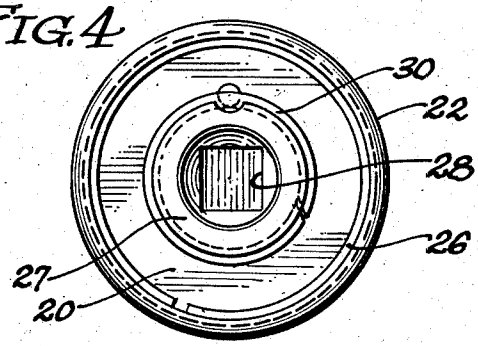


FIG. 4



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POWER OPERATED MAGAZINE-TYPE SOCKET WRENCH ATTACHMENT

Filed Aug. 7, 1957 2 Sheets-Sheet 2

FIG. 5

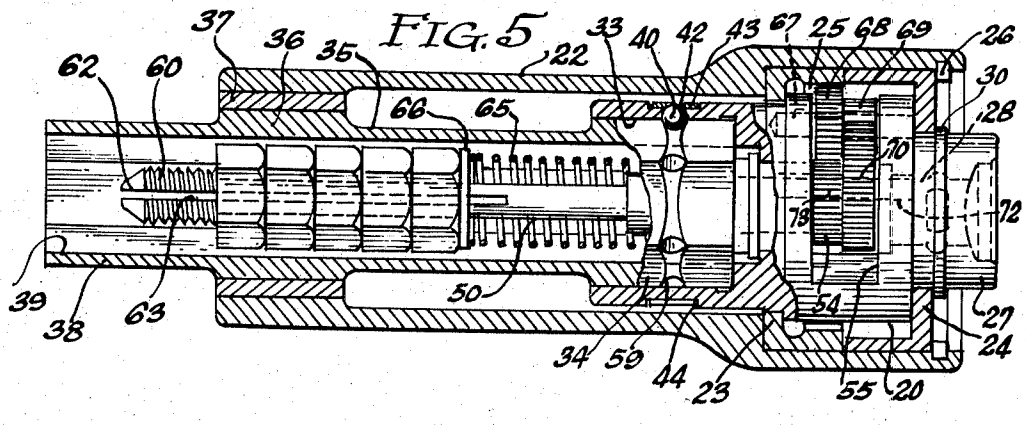


FIG. 6

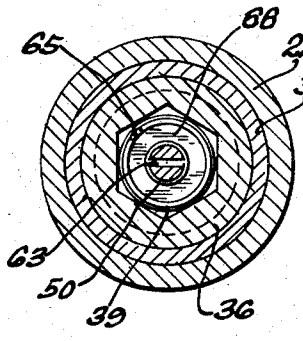


FIG. 7

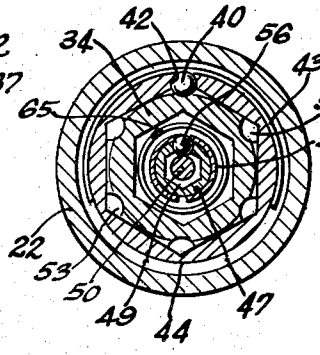


FIG. 8

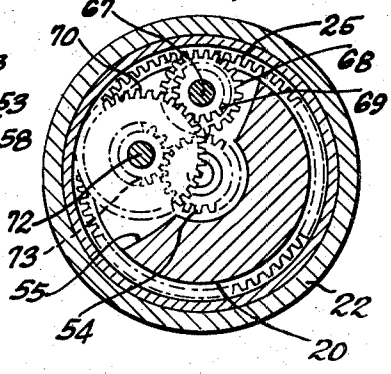


FIG. 9

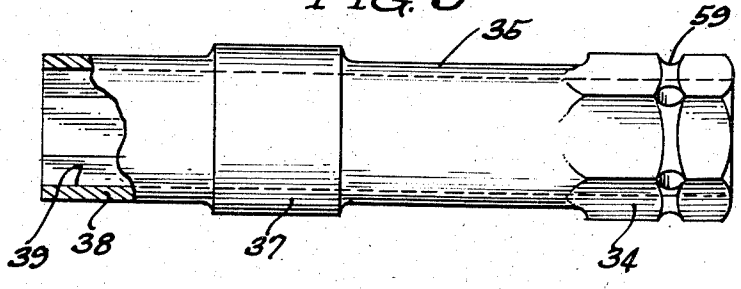
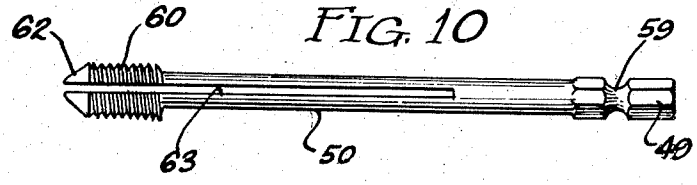


FIG. 10



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2,895,360

POWER OPERATED MAGAZINE-TYPE SOCKET WRENCH ATTACHMENT

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Application August 7, 1957, Serial No. 676,839

16 Claims. (Cl. 81—57)

This invention relates to magazine-type socket wrench attachments for use on tools, such as impact wrenches, adapted to effecting the removal, storage or retention and replacement of a plurality of nuts.

One of the general objects of my invention is to provide a magazine-type socket wrench device which is readily attachable to and detachable from a standard driving part, such as an impact wrench.

Another object of the invention is to provide a magazine-type socket wrench attachment for use on impact wrenches, and wherein the impact is transmitted directly through the wrench socket to the nut which constitutes the workpiece.

As another object, this invention has within its purview the provision of a magazine-type socket wrench device having a centering and retaining pin for holding nuts in the socket and centering the nuts as they are threaded onto a bolt from the socket, so as to prevent the nuts from being driven onto the bolt when the threads of the nut and bolt are crossed.

My invention further comprehends, in a structure of the type described in the preceding object, a magazine-type socket wrench wherein the centering and retaining pin embodies one or both of the following features:

(*a*) It has an exposed end portion which is peripherally grooved and diametrically compressible, as well as normally commensurate in size to the threaded bores in nuts to be stored thereon, so that it will not damage the nut threads as they are moved onto or from the pin;

(*b*) It is releasably retained in the socket of the wrench, so as to be interchangeable with others of different diameter or length and will be disengaged from the socket if too many nuts are accumulated thereon.

It is another object of this invention to provide a magazine-type socket wrench attachment of the type referred to, and which embodies mechanism for providing for relatively slow rotation of the centering and retaining pin with respect to the socket, thereby to spread successive nuts as they are moved from the exposed end portion of the pin and prevent crowding of a nut which is being threaded onto a bolt or stud.

This invention further comprehends the provision of a magazine-type socket wrench device of the type to which reference has been made and in which both the centering and retaining pin and the socket can be readily interchanged to corresponding parts of different diameter or length in the same operating mechanism.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings in which similar characters of reference indicate similar parts throughout the several views.

Fig. 1 is a side elevational view illustrating the adaptation of a preferred embodiment of my magazine-type socket wrench attachment to a power tool which, in the present instance, is an impact wrench;

Fig. 2 is a longitudinal sectional view showing the

internal structure of the magazine-type socket wrench attachment illustrated in Fig. 1;

Figs. 3 and 4 are respectively front and rear end views of the magazine-type socket wrench attachment depicted in Figs. 1 and 2;

Fig. 5 is a longitudinal sectional view of the socket wrench attachment having parts broken away in different planes to illustrate different features of the structure than those shown in Fig. 2 and also depicting the accumulation of a plurality of nuts in the wrench socket;

Figs. 6, 7 and 8 are end sectional views taken respectively on lines **6—6**, **7—7** and **8—8** in Fig. 2 and in the directions indicated by arrows;

Fig. 9 is a side elevational view of the wrench socket shown in Figs. 2 and 5 with an end portion thereof broken away to illustrate internal structure; and

Fig. 10 is a side elevational view of a part of the structure shown in Figs. 2 and 5.

In the exemplary embodiment of my invention which is shown in the accompanying drawing for illustrative purposes, my magazine-type socket wrench attachment **12** is shown in an adaptation for use with an impact wrench **13**, the socket wrench attachment being readily attachable to and detachable from the power driven impact wrench. In the illustrated embodiment, the impact wrench shown has a grip portion **14**, a trigger type control switch **15**, a motor **16**, and an impact mechanism enclosed within a housing **17** for imparting rotational and impact forces to an output shaft **18**. Power for the operation of the motor is supplied through an insulated conductor cable **19**.

Having particular reference to the structure of the magazine-type socket wrench attachment which constitutes the subject matter of this invention, the illustrated embodiment, in the form disclosed, has a driving hub **20** through which rotational and impact forces are imparted to the wrench mechanism and which is directly attachable to a source of such driving forces. The hub is generally cylindrical with longitudinally spaced portions of different diameters and is journalled for rotation at one end of a housing **22** by bearings **23** and **24**, which bearings are spaced axially of the hub. As disclosed, the bearing **23** comprises part of an internal ring gear **25** which is pressed into the housing and the bearing **24** abuts the end of the ring gear and is held in place within the housing by a snap ring **26**. A socket portion **27** projects axially from the outer end of the hub **20** and extends somewhat beyond the adjacent end of the housing **22**. The socket portion **27** of the hub has therein a socket **28** of polygonal section which opens outwardly at a central position at the end of the hub and is adapted removably to receive a fitting of similar section on the end of the driving shaft of the power tool. The inner end of the socket **28** is closed by means such as a disc **29** secured in place, as by staking. Also, for holding the bearing **24** in place on the hub assembly, a snap ring **30** is provided which fits into a groove **32** in the outer surface of the socket portion of the hub adjacent the end surface of the bearing **24**.

At the inner end of the hub **20** and within the housing **22**, a socket **33** of polygonal section is provided which is substantially coaxial with the hub bearings and opens into the housing. The socket **33** provides a direct driving connection between the hub **20** and the polygonal end portion **34** on an elongated wrench socket **35**, which wrench sockets has a bearing portion **36** thereon which is journalled in a bearing **37** at the end of the housing **22** opposite the hub **20**. An end portion **38** on the wrench socket **35** projects from the end of the housing opposite the hub. An opening **39** extends axially through the wrench socket and is of a size and sectional shape

to provide a sliding fit with any one of a plurality of sizes and shapes of nuts. In the present instance, the socket opening is hexagonal.

For providing releasable retention of the wrench socket within the socket **33** of the hub, and to provide for ready replacement of a wrench socket with one of a different size or length, a ball type detent **40** is mounted in a recess **42** in one side of the inner end portion of the hub **20** and projects laterally into the socket **33**. This ball type detent is held in place and biased inwardly by a resilient spring clip **43** mounted in a groove **44** in the outer periphery of the hub. The ball type detent, in its retaining position, engages a recess in the outer surface of the end portion **34** of the wrench socket.

A bearing **45** is mounted in a central opening **46** in the hub **20** adjacent the inner end of the socket **33** and in coaxial relationship thereto. This bearing **45** rotatably supports a sleeve **47**, which sleeve projects into the socket **33** and has a polygonal socket opening **48** therein which fits and supports an end portion **49** of a nut retaining and centering pin **50**. A collar **52** is secured to the exterior of the sleeve **47** by cross pin **53**, which cross pin serves as a stop to limit the axial movement of the end portion **49** of the pin **50** into the sleeve. The collar **52** is adjacent one end of the bearing **45** and a gear **54** which serves as a sun gear of a planetary mechanism is secured to the other end of the sleeve **47** adjacent the other end of the bearing **45** and in lateral alignment with the internal ring gear **25** in the housing. A cross slot **55** in the hub **20** provides space for the gears of the planetary mechanism.

As in the instance of the wrench socket **35**, the nut retaining and centering pin **50** is releasably held in place by a ball type detent **56** mounted in a recess **57** in the sleeve **47** and projecting laterally into the socket opening **48** in the sleeve. This ball type detent is resiliently urged inwardly by a spring clip **58** and engages a peripheral groove **59** in the end portion **49** of the pin to hold the pin in place in the socket portion of the sleeve **47**. The pin **50** is subject to replacement for changing the size or length and, as will become more apparent, may also become disengaged from the sleeve **47** by the accumulation of too many nuts thereon.

The outer or projecting end of the nut retaining and centering pin **50** is disposed within the end portion of the wrench socket **35** in order to permit engagement of nuts in the end portion of the socket opening **39** without interference from the pin. However, the pin **50** has an end portion **60** which is externally grooved peripherally or threaded and which fits into the threaded openings of nuts of a predetermined size with sufficient snugness to engage the nut threads so that rotation of the socket relative to the pin feeds the nuts onto the pin or from the pin, depending upon the direction of rotation. A tapered end portion is also provided on the pin for centering the nuts as they are fed onto and from the pin. In the disclosed structure, a considerable portion of the projecting part of the pin **50** is longitudinally slotted, as at **63**, affording lateral resilience to the end portion of the pin, so that the opposite sides thereof may be compressed toward one another to prevent damage to nut threads if they become crossed with the grooves or threads on the end portion of the pin as the nuts are fed onto or from the pin.

The collar **52** has a peripheral shoulder **64** which faces toward the projecting end of the pin and provides a seat for a coil type compression spring **65** which encompasses and extends along the pin internally of the wrench socket. The outer end of the spring engages a washer **66** which is slidable along the pin. The washer abuts the end surface of the first nut which is fed onto the pin and the spring biases the nuts toward the outer end of the pin to insure their being fed off of the pin when the relative rotation between the socket and pin is in a direction for threading the nuts onto a stud or bolt.

As shown in Figs. 2, 5 and 8, a shaft **67** is mounted in the hub **20** at a position eccentric with respect to the hub axis and extends across the cross slot **55** in the hub to support a planet gear **68** which meshes with the internal ring gear **25**. The planet gear **68** also has an integral and coaxial portion **69** of smaller diameter thereon. As shown in Figs. 5 and 8, the portion **69** of the planet gear meshes with a drive gear **70** carried by a shaft **72** mounted in the hub **20** at a position eccentric to the axis of the hub and displaced from the shaft **67**. The drive gear **70** has a smaller gear **73** made integrally therewith and in coaxial relationship thereto which meshes with the sun gear **54**.

The described gears provide a planetary mechanism which establishes a fixed relationship of rotation between the wrench socket and the nut retaining and centering pin. While the relationships and ratios of the gears of the mechanism may be preselected to hold the nut retaining and centering pin stationary while the wrench socket rotates, it has been considered desirable in the present instance to provide a driving ratio through the gears of this mechanism which establishes a relatively slow rotation of the nut retaining and centering pin in the same direction as the rotation of the wrench socket. A ratio providing one revolution of the nut retaining and centering pin for every seventeen revolutions of the wrench socket has been found, by way of example, to be satisfactory. The function of the rotation of the nut retaining and centering pin as the wrench socket is rotated is to effect a separation between nuts as they are moved from the end portion **60** of the pin, thereby to prevent jamming of one nut against another as they are threaded onto studs or bolts from the wrench socket.

From the foregoing description and reference to the accompanying drawings, it may be understood that the disclosed magazine-type socket wrench device serves as an attachment which is readily mounted on or removed from a power tool such as an impact wrench. It stores nuts as they are removed from successive bolts or studs and is operable in a reverse direction for putting nuts onto bolts and studs. Both the wrench socket and the nut retaining and centering pin are readily removable and replaceable by corresponding parts of different lengths or sizes to accommodate different sizes, shapes or numbers of nuts. Also, if too many nuts are fed onto the nut retaining and centering pin, the pin will release itself during operation to prevent damage to either the nuts or the tool. It is worthy of note that in the disclosed structure, which is adapted to use on impact wrenches, the impact forces are transmitted directly through the hub to the wrench socket. Furthermore, the planetary gear mechanism affords a relationship of relative rotation between the wrench socket and the nut retaining and centering pin which not only accomplishes the desired feeding of nuts onto and from the nut retaining and centering pin, but also separates the nuts as they are fed across the end portion of the pin and thereby avoids jamming of the nuts.

It is understood that the foregoing description is merely illustrative of a preferred embodiment of the invention and that the scope of the invention is not to be limited thereto but is to be determined by the appended claims.

I claim:

1. A magazine-type socket wrench attachment for a power operated tool having a drive connecting means thereon and comprising, in combination, a tubular sleeve-type housing having bearings at opposite ends thereof, a driving hub journalled for rotation by the bearing at one end of the housing and having means thereon and exposed at one end of the housing for drivingly engaging said drive connecting means, said hub having a bearing therein coaxial with the bearings in the housing and having a polygonal socket therein adjacent the bearing in the hub and concentric therewith, an internal ring gear secured in the housing and encompassing a portion of the hub, a pin retaining sleeve

rotatably journalled in said bearing in the hub and having a sun gear secured to one end thereof and a polygonal pin receiving socket in the other end thereof and within the polygonal socket in the hub, planet gear means supported for rotation on the hub and providing a driving connection between the ring gear and the sun gear, an elongated wrench socket drivingly engaged in said socket in the hub and journalled in the other of said bearings in the housings, a nut retaining and centering pin drivingly engaged in said pin receiving socket and extending therefrom in substantially coaxial relationship to the interior of the wrench socket, and a compression spring encompassing the extending portion of the pin and extending therealong from within the socket in the hub.

2. A magazine-type socket wrench attachment as defined in claim 1, and further characterized by means for releasably retaining said wrench socket in the socket in the hub.

3. A magazine-type socket wrench attachment as defined in claim 1, and further characterized by means for releasably retaining said nut retaining and centering pin in the pin receiving socket in the pin retaining sleeve.

4. A magazine-type socket wrench attachment as defined in claim 1, and wherein the ring gear, sun gear and planet gear means have relative sizes such that the nut retaining and centering pin is driven slowly in the same direction and relative to the driven speed of the hub and wrench socket.

5. A magazine-type socket wrench attachment as defined in claim 1, and wherein the end of the nut retaining and centering pin opposite the pin retaining sleeve is axially split so that diametrically opposed side portions thereof are compressible toward one another.

6. A magazine-type socket wrench attachment as defined in claim 1, and wherein said nut retaining and centering pin has and end portion opposite the pin retaining sleeve which is larger in section than the midportion thereof and which is peripherally grooved.

7. A magazine-type socket wrench device adapted to be driven from another mechanism and comprising, in combination, a housing open at its opposite ends, a hub rotatably journalled in and projecting from one end of the housing and having means thereon through which driving force is applied to the device, an elongated wrench socket drivingly connected to the hub in coaxial relationship thereto and projecting from the end of the housing opposite the hub, said wrench socket having an axial opening therethrough, a nut retaining and centering pin extending longitudinally of the central portion of the axial opening in the wrench socket and having an outer end within the wrench socket, and means for supporting said pin from the hub.

8. A magazine-type socket wrench device as defined in claim 7, and further characterized by gear means for effecting rotation of the nut retaining and centering pin at a fixed rate relative to the rotation of the wrench socket.

9. A magazine-type socket wrench device as defined in claim 7, and further characterized by a coil spring engaging said means for supporting the pin from the hub and extending along the pin.

10. A magazine-type socket wrench device as defined in claim 7, and wherein said nut retaining and centering pin is split longitudinally at the end remote from the hub so that laterally opposed portions thereof are compressible toward one another, and the end of said pin remote from the hub having a laterally enlarged portion thereon which is circumferentially grooved.

11. A magazine-type socket wrench device as defined in claim 7, and wherein said means for supporting the pin from the hub includes releasable detent means for normally holding the pin in place axially of the hub.

12. A magazine-type socket wrench device as defined in claim 7, and wherein the driving connection between the wrench socket and hub is provided by a socket of polygonal section in the hub and a portion of polygonal shape on one end of the wrench socket which fits into the socket in the hub.

13. A magazine-type socket wrench device as defined in claim 7, and wherein said housing, said hub and said means for supporting the pin from the hub each carries a gear of a planetary mechanism for coordinating the movements of the hub and pin.

14. A magazine-type socket wrench device comprising, in combination, a housing, a hub journalled for rotation in said housing and providing means through which driving force is applied to the device, an elongated wrench socket having a direct driving connection to the hub and journalled for rotation relative to the housing, said wrench socket having an axial opening polygonal section extending through a major portion of the length thereof, a nut retaining and centering pin of predetermined length extending axially of the opening in the wrench socket from a position at one end to a position near the other end thereof, and means for supporting the pin from the hub.

15. A magazine-type socket wrench device as defined in claim 14, and wherein said means for supporting the pin provides a rotatable connection between the hub and the pin, and said device having means for correlating the relative rotations of the hub and pin.

16. In a magazine-type socket wrench device, the combination comprising an elongated wrench socket having a portion of polygonal internal section extending along a major portion of the length of the socket from an open end thereof, a nut retaining and centering pin of fixed length extending longitudinally of the interior of the socket to a position spaced inwardly of the open end of the socket, means for driving the socket and supporting said pin for rotation relative to the socket, and means providing a predetermined correlation of the rates of rotation of the wrench socket and pin.

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