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SELF-DRILLING EXPANSION SHELL CHUCK AND ADAPTER FOR USE WITH MANUAL INSTALLATION DEVICE

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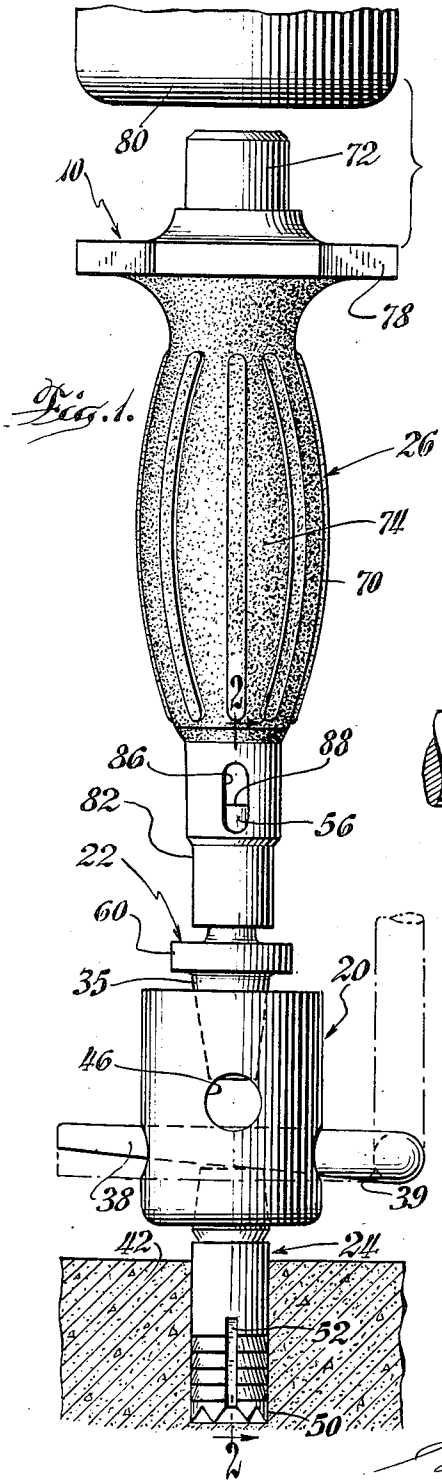


Fig. 1.

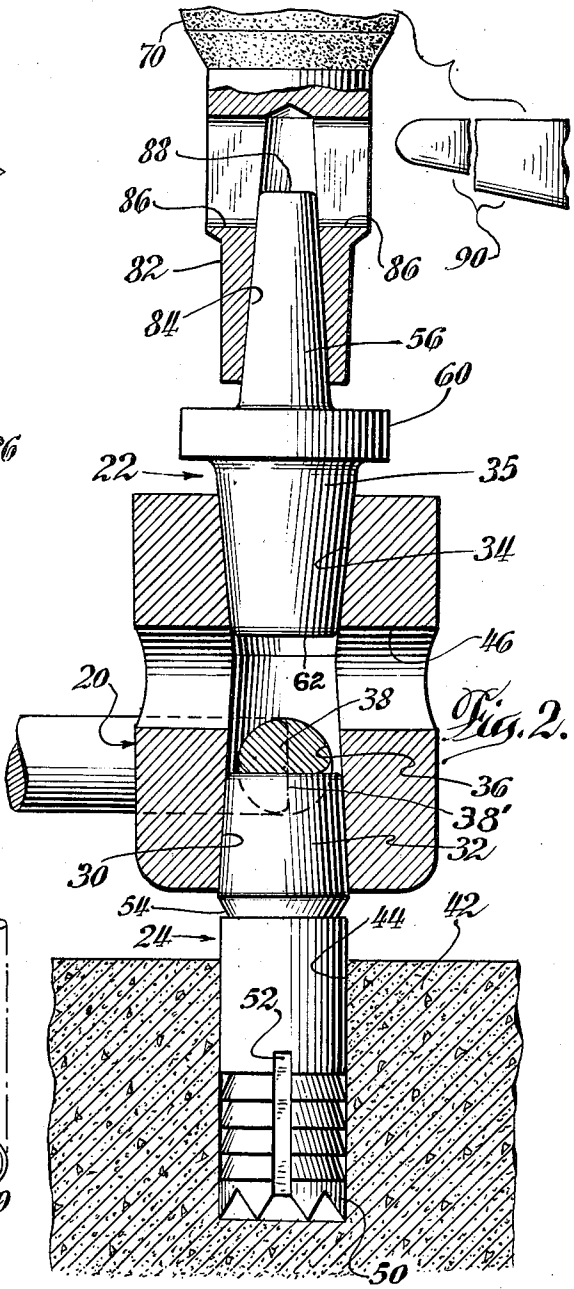


Fig. 2.

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SELF-DRILLING EXPANSION SHELL CHUCK AND ADAPTER FOR USE WITH MANUAL INSTALLATION DEVICE

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7 Claims. (Cl. 279—19)

This invention relates generally to holders for self-drilling expansion shells which enable their installation in concrete or masonry or the like, and more particularly, relates to a novel combination of a shell holder and adapter member with a conventional hand tool which enables manual installations of such shells employing said hand tool in an entirely original manner.

Self-drilling expansion shells, as they are herein referred to, comprise generally structures shown and described in U.S. Letters Patent Nos. 1,746,050, 1,996,121, 1,786,029, among others. Generally, these shells each comprise an elongate, cylindrical member having hardened teeth formed at one end thereof extending axially outward and a tapered frusto-conical formation at the opposite end thereof. The shell has an axial bore therethrough and the toothed end has axially extending fracture grooves cut in the annular wall and extending a substantial distance along the length thereof commencing from the teeth. The fracture grooves are circumferentially spaced about the shell to enable the toothed end to be uniformly split and spread when the shell is anchored in the hole cut by it. The frusto-conical end preferably is separated from the remaining body of the shell by an annular fracture groove which permits said end to be severed by a sharp, laterally applied force. The bore of the shell is threaded to receive a bolt of some standard dimension.

For many years, self-drilling expansion shells were successfully employed in connection with characteristic heavy-duty installations, such as, for hanging sprinkler systems, mounting heavy machinery and other apparatus and for securing beams, pipes and the like in masonry and concrete surfaces. Such installations utilized relatively larger sizes of shells so that mechanically or electrically operated hammers were accepted extensively in the industry for installation of these shells. An example of such a mechanical hammer is shown in U.S. Patent No. 1,484,845 and an electrical hammer for such use is shown in U.S. Patent No. 1,968,055. As for smaller sizes of shells which could be driven into masonry surfaces by a manually wielded hammer, the problems attendant thereto are explained in the pending application of Frank A. Werstein, Serial No. 729,834 filed April 21, 1958 now Patent No. 2,896,212 for the invention entitled Chuck and Handle for Manual Installation of Self-Drilling Expansion Shells, which application and the instant one are owned by a common assignee. The invention of said pending application provides for novel chuck and handle structure especially suited for manual installation of flush end expansion shells and makes available to the home craftsman and skilled tradesman the advantages of expansion shell installations heretofore prevalently enjoyed by personnel skilled in the use of powered hammers.

Thus, the introduction of successful tools for manual installation of such expansion shells was of relatively recent vintage and opened up new avenues of use to which the shells could be put. In the pending application of Frank A. Werstein, Serial No. 681,689 filed September 3, 1957 for the invention Chuck and Adapter for Self-drilling Expansion Shells, also owned by the same assignee as the herein application, a solution to the complicated problems heretofore encountered in connection with storage of complete inventories of chucks for use with different sizes of shells and different models and makes of powered hammers is provided. The invention of this pending application resorts to a unique combination of a shell holder and adapter member which successfully reduces the total number of pieces required to be stored in order to maintain a full inventory with attendant advantages which could not be realized by continued recourse to the so-called integral chuck constructions theretofore prevalently employed in the industry. In addition, said pending application describes and claims a shell holder and adapter member which can be used for manual installations of the shells, said adapter member being constructed with an impact end to which the head of a manually wielded hammer is applied directly.

It will thus be understood that successful realization of manual installations for such expansion shells, especially of the flush end variety, has contemplated the provision of specially constructed tools and parts to be employed in such installations. As a result, the benefits heretofore derived from such expansion shell installations have inured to the relatively unskilled home craftsman who was either reluctant to use a power-operated hammer for diverse reasons or did not have such a hammer available to him and to the more skilled tradesman who had occasion to use the sizes of shells not necessarily required to be driven by power-operated hammers. Of course, the convenience of manual installations under special circumstances can be readily appreciated.

However, there are certain groups of skilled tradesmen and craftsmen engaged in jobs which require them to secure equipment or devices to concrete and masonry surfaces who have used specially provided tool holder structures which are not suitable, per se, for use with such expansion shells. Such tool holder structures are devised to hold drill bits, star drills, punches, reamers and the like and are constructed to be used with manually wielded hammers. For reasons cogent and real to such personnel, there is a reluctance to be divested of their heretofore familiar tools of their trade and hence, a somewhat natural aversion to adopt and use such expansion shells which has nothing whatsoever to do with the quality and efficiency of such expansion shell installations. Another reason for resistance to change to such manual installations for expansion shell may be the change-over cost which would mean disposal of such heretofore employed tool holders which each craftsman might ordinarily provide for himself. An example of such a tool holder structure is described and illustrated herein, said tool holder being commonly used by personnel employed by utility companies to install communication equipment and low-power electrical lines.

The herein invention successfully provides a shell holder and adapter especially intended for manual installations of self-drilling expansion shells, however, with special modifications enabling particular skilled craftsmen to use the too holder structures with which they are already familiar. Further, the invention contemplates that the shell holder described in said Werstein application, Serial No. 681,689 also can be used so that the advantages of the invention of said pending application also are made available to these craftsmen. Thus, all of the various sizes of expansion shells can be installed with such tool holder structures since the shell holders already available for such shells can be used. The herein invention contemplates advantageous modifications in the

adapter member only so that only one adapter member is required by the craftsman for his tool holder structure which can be cooperatively engaged with each of the available shell holders. Accordingly, the invention may be seen to reside in the recognition of the problem of obtaining acceptance by certain skilled craftsmen of such expansion shell installations and providing a chuck and adapter assembly which can be used with such a tool holder member with which he is familiar and in which he has confidence and faith.

A primary object of the invention is to provide a shell holder and adapter member of the character described which is specially constructed to achieve the advantages hereinabove enumerated.

Another object of the invention is to provide a chuck and adapter of the character described in which the adapter member is capable of being cooperably engaged with any one of a group of shell holders each having a tapered socket in one end thereof for a specific size of self-drilling expansion shell which is different than the size of socket provided in any other shell holder of the group, said adapter having a tapered shank for engagement in a socket provided in a hand tool holder commonly used in a particular industry.

Another object of the invention is to provide a combination structure as described in which the shell holder of said copending application may be employed with all of its attendant advantage in combination with an adapter member especially suitable and attractive for use by such skilled craftsmen, with the hand tool holder they ordinarily use in connection with other types of tools entirely different from self-drilling expansion shells.

The foregoing and other objects of the invention will become apparent from the ensuing description. An embodiment of the invention has been described in detail and illustrated in the accompanying drawing for purposes of showing the special application of the invention hereinabove discussed. It is contemplated that minor variations may occur to the skilled artisan for purposes of achieving the same or comparable objectives without departing from the governing principles of the invention.

In the drawing:

Fig. 1 is an elevational view of the combination of shell holder and adapter member operatively associated with a hand tool holder of conventional construction in accordance with my invention, same shown in operative position for installing a self-drilling expansion shell manually in a masonry body, shown in section.

Fig. 2 is a fragmentary sectional view on an enlarged scale taken along the line 2—2 of Fig. 1 and in the direction indicated.

In Fig. 1, there is illustrated the novel combination structure embodying my invention which is designated generally by the reference character **10**. Same is comprised of a group of cooperatively engaged parts which include a shell holder or chuck **20** and adapter member **22**, said shell holder constructed to engage a self-drilling expansion shell **24** at one end thereof and the adapter member specially constructed to be operatively associated with a hand tool holder **26** of known construction.

The shell holder **20** will be recognized as substantially the equivalent of the shell holder or chuck described in said co-pending application Serial No. 681,689. Shell holder **20** comprises a hollow, cylindrical member of steel having a central axial tapered socket **30** in the center thereof opening to one end of the member, the dimensions of the socket being selected to receive the tapered end **32** of the self-drilling expansion shell **24** of a predetermined size. The opposite end of the shell holder has a tapered socket **34** so dimensioned to receive the male tapered extension **35** of the adapter **22**. Shell holder **20** also has a transverse passageway **36** which extends entirely through the holder and intersects the socket **30**, said passageway being intended to receive the operative tapered end **38** of an ejector tool **39** therein.

Such a tool is described in U.S. Patent 2,399,939 and is usually formed as a substantially L-shaped member, in which the longer part is the handle and the shorter part has the taper shown at **38** in the illustrations herein. The tapered end **38** is inserted into the passageway **36** as shown in Fig. 1, with the flat of the taper engaged against the end of the shell **24**, as shown in section in Fig. 2. For ejecting the shell the handle of the tool **39** is rotated through about a quarter of a turn which swings the flat of the taper to the position shown in the broken lines of Fig. 2 at **38'**, with the handle as shown in the broken lines of Fig. 1. This will force the shell **24** out of the socket **30**. In use the shell end **32** is wedgingly forced into its socket and protrudes into the path of the rotatable tool. Obviously, during installation of the shell the tool is not present, but is inserted for removal of the shell or the broken off end **32**.

Since the shell is hollow, as it is driven into the masonry **42**, the cuttings from the hole **44** will work their way through the hollow bore of the shell and be discharged through the passageway **36**.

Another transverse passageway **46** is formed in the holder **20** preferably at a right angle to the passageway **36** and axially dis-spaced therefrom, said passageway **46** intersecting the tapered socket **34**. The function of passageway **46** is the same as passageway **36** except that same is provided for convenient and ready separation of the shell holder **20** and the adapter member **22** as will be subsequently explained.

The expansion shell **24** which is illustrated has hardened teeth **50** on its forward end and several fracture grooves **52** adjacent said toothed end so that the shell can be expanded into its hole **44** for securement. As understood, the shell has a hollow center and in the representation thereof, the shell is intended to be driven into the masonry **42** and broken off from its tapered end **32** by sudden lateral strain. This is done by merely applying a lateral force against the annular fracture groove **54** which provides a weakened area at which the desired separation occurs.

It will be appreciated that the shell holder employed will have a socket **30** which is complementary to the tapered end **32** of a shell and hence, the invention contemplates that there will be provided one shell holder **20** for each size of expansion shell **24**. However, the rear tapered socket **34** at the opposite end of each shell holder will be substantially identical in configuration and size so that the adapter member **22** can be used with each such shell holder regardless of the size of shell intended to be accommodated thereby.

The adapter member is of a particular construction intended for use with the specific tool holder **26** of cooperative construction. Said adapter member **22** has a rear shank portion **56** of elongate frusto-conical configuration separated from the tapered male end part **35** by an annular collar or flange **60**. The dimensions of the male end part **35** are selected to permit telescopic wedging engagement thereof in the socket **34** and disposition of the end **62** thereof aligned opposite the passageway **46**, when fully seated in said socket **34**. The wedging engagement of said male part **35** in socket **34** is intended to prevent both inadvertent axial separation of the engaged components as well as relative rotation therebetween during installation of the shell. The collar **60** prevents entry of the tapered extensions into their respective sockets beyond certain points especially after long use of the adapter. Passageway **46** functions to enable separation of the adapter member and shell holder by means of the same ejector tool **39** in the same way that the segment **32** is discharged.

We consider now the tool holder **26** for which adapter member **22** is especially suited for use. Said holder **26** includes an intermediate body portion **70** which is comprised of an inner tubular rod of metal, one end of which is exposed at **72**, said rod being encased by a hand grip

74 of hard rubber or other suitable traction material providing a generally barrel shaped configuration for the body portion. Elongate ribs provide for obtaining a better purchase on the body portion 70 which may be considered in the nature of a handle. The grip 74 has an integral outwardly flaring collar segment 78 which functions as a protective shield against inadvertent blows from a hammer, the head 80 of which is shown fragmentarily opposite exposed end 72. The opposite end of the body portion 70 has a socket formation provided by an axially depending sleeve or skirt 82 having a central axial bore 84 the configuration and dimensions of which are intended to permit telescopic wedging engagement of the tapered shank 56 thereinto. Said sleeve has a pair of diametrically opposed elongate slots therein which define a passageway 86 adjacent the secured end of the sleeve in communication with the bore 84. As seen in Fig. 1, the end 88 of the shank 56 will protrude into passageway 86 so that the tool holder 26 and adapter 22 may be selectively separated by means of a drift pin such as shown partially at 90 suitably dimensioned to be accommodated in the passageway 86 through either of said slots. The drift pin 90 is used in the conventional way to separate the adapter 22 from the tool holder 26 by driving the same into the passageway 86 of the tool holder to apply a wedging force axially against said end 88. Instead of the ejector tool 39, the same or a similar drift pin suitably dimensioned to be accommodated in either or both of the passageways 36 and 46 may be used to eject the end 32 from its socket 30 and/or the male part 35 from its socket 34. As a matter of convenience, economy, saving of space and weight, and speed of use of the device, it is preferable that each of the three passageways 36, 46 and 86 be engageable by a single drift pin or ejector means in order that one tool may perform all three functions. The adjustment of dimensions can be ascertained by proper design.

The hand tool 26 is of conventional construction and as illustrated, has been commonly used by utilities installation and service personnel for holding star drills, punches and the like. This hand tool is a familiar part of such a workman's tool kit. The herein invention enables such a hand tool 26 to be employed also in the manual installation of self-drilling expansion shells which operation could not heretofore be performed because of the unavailability of the shell holder and adapter member described. It will be appreciated that such hand tools are intended to withstand heavy impacts from a manually wielded hammer and thus, is suited for use in anchoring self-drilling expansion shells. The adapter 22 enables said hand tool to be employed conveniently and simply for all sizes of expansion shells. As the impact end 72 of the hand tool is subjected to blows from the hammer head 80, the operator rotates the hand tool. After the shell 24 has formed the hole 44, it is removed and a plug is inserted in the toothed end 50 thereof and the shell driven home in the hole to be expanded by such a plug and anchored in the hole. A sharp lateral blow or application of lateral strain to the holder 20 or the hand tool 26 is sufficient to sever tapered end 32 from the body of the shell secured in hole 44. Separation of the component parts 20, 22 and 26 by means of the described ejector means or drift pins is thereafter easily accomplished. The ease and simplicity of the manual installation employing the heretofore familiar hand tool 26 overcomes any natural resistance or aversion a workman might have to use of the self-drill shell with a tool heretofore never employed in this capacity.

It will be appreciated from an examination of the above referred to application Serial No. 681,689 that the passageway 46 of the shell holder is ordinarily and usually intended for receiving therein the opposed ends of a handle or bail with which the holder 20 may be rotated back and forth on its axis while the impact hammer is being operated to drive a shell home. For manual installation of shells, such a handle or bail is not only unnecessary, but superfluous, since the workman has only the two hands—one for holding the tool holder 26 and the other for swinging the hammer. The passageway 46 may therefore be eliminated if desired, and in such event, separation of the adapter 22 and the shell holder may be effected either by prying the same apart through the use of an instrumentality inserted between the flange 60 and the top end of the shell holder 20, or by driving a rod up through the center of the shell holder 20. The passageway 46 enables the discharge of debris and cuttings also, and provides a convenient and facile way of removing the adapter 22.

The tapered shank 56 is preferably of considerable length, such as for example at least as long axially as the tapered extension 35, so that the wedging engagement with the interior of the socket 84 will be quite tight. Thus, the shock imparted during hammering will continuously tighten the same to keep the engagement during installation of a shell, even when the shell holder 20 or the tool holder 26 is struck laterally to break off the end 32. This engagement enables the operator to twist the handle 74 back and forth about the axis of the tool holder 26 during the hammering process to cause the hole to be drilled evenly and smoothly.

It is believed that the invention has been described in sufficient detail to enable skilled artisans to understand and practice the same. The invention has been pointed out in the appended claims in language intended to be literally construed commensurate with the broad scope of the innovation in the arts and sciences contributed thereby.

I claim:

1. In combination, a hand tool of conventional construction having an impact end and a tapered socket formation at its opposite end with a first transverse passageway through said opposite end intersecting said socket formation and a hand grip portion intermediate said ends enabling said tool to be gripped and rotated a limited amount as percussive blows are applied to said impact end, a cooperative shell holder and adapter assembled one with the other and together with said hand tool for manual installation of a self-drilling expansion shell having a hollow bore and a tapered end, said shell holder comprising a hollow cylindrical body having a first tapered socket at one end thereof adapted to seat said tapered end of said shell therein and a second tapered socket at its second end, said adapter comprising an annular body having upper and lower tapered extensions at the opposite ends thereof wedgingly engaged respectively in said socket formation and said second tapered socket to maintain said hand tool and shell holder in cooperative assembly, said shell holder having a second transverse passageway intersecting said first tapered socket whereby said end of said shell will extend into said second transverse passageway and will discharge cuttings thereinto during installation of said shell, but will receive ejector means to enable ejection of said shell end when desired, the said upper tapered extension being of such length as to extend into said first transverse passageway whereby an ejector means inserted in said first transverse passageway may be used to eject said upper tapered extension and separate said adapter from said hand tool.

2. The combination as claimed in claim 1 in which there is a flange between the ends of said adapter providing stop means to limiting the extent of movement of said tapered extensions into the respective socket formation and tapered socket.

3. The combination as claimed in claim 1 in which there is provided a single ejection tool which fits both said transverse passageways.

4. The combination as claimed in claim 1 in which said shell holder has a third transverse slot intersecting the said second tapered socket whereby an ejector means may be inserted in said third passageway to separate said adapter and shell holder.

5. The combination as claimed in claim 1 in which said shell holder has a hollow bore coaxial therewith permitting communication between said tapered sockets.

6. The combination as claimed in claim 1 in which said upper tapered extension has an average diameter substantially less than the average diameter of the said lower tapered extension, but in which the axial length of said upper tapered extension is at least as long as the axial length of said lower tapered extension.

7. The combination as claimed in claim 4 in which an ejector tool is provided which operatively fits all three of said transverse passageways.

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