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R. C. DEAN, JR
PERCUSSIVELY OPERATED TOOL
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2,951,706

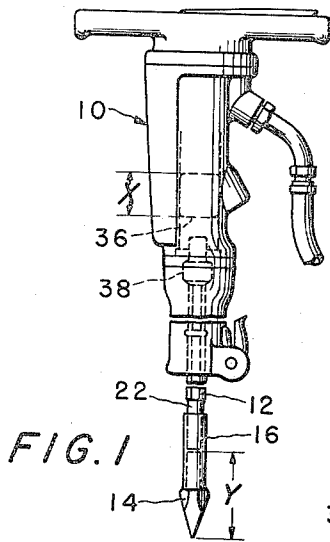


FIG. 1

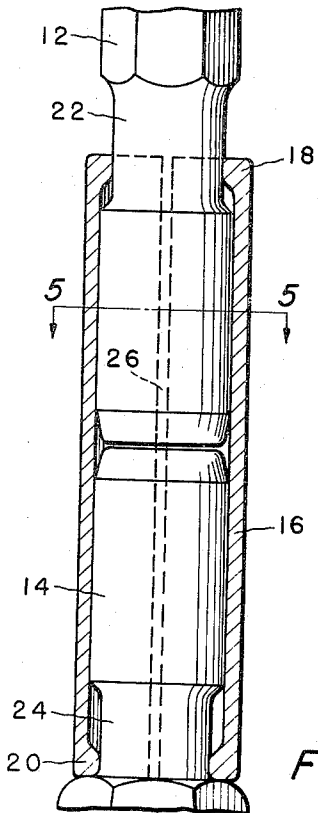


FIG. 3

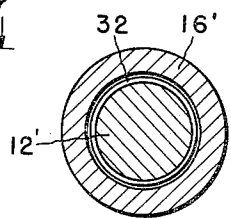


FIG. 4

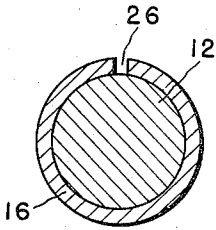


FIG. 5

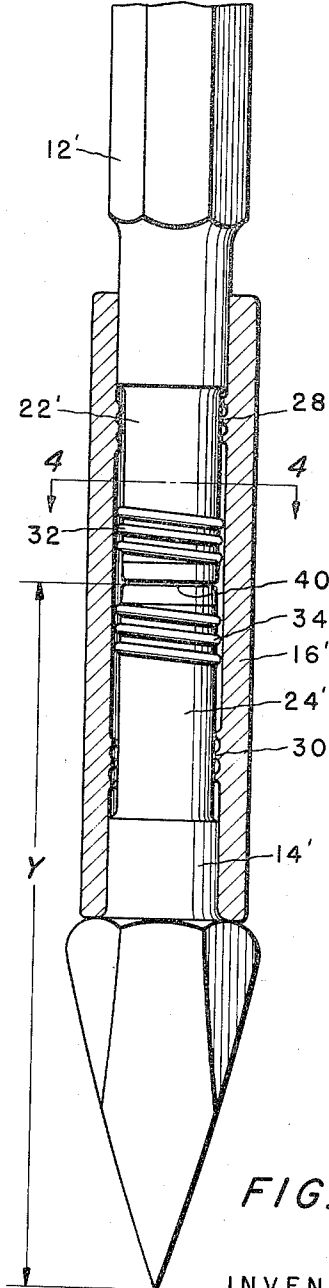


FIG. 2

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PERCUSSIVELY OPERATED TOOL

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This invention relates generally to percussively operated tools, and more particularly to those for breaking concrete and the like.

Heretofore, it has been common practice to use a one piece moil for paving breakers. It has been found, however, that with conventional moils the energy transfer to the material to be broken is not fully effective, due in part to the reflection of a portion of the impact stress waves from the cutting portion of the moil, as explained in detail in the patent application, Serial No. 636,738, filed January 28, 1958, and now abandoned. In addition it has been found that the conventional moil has a tendency to rebound, following impact, from the material to be broken so that often the moil is not in positive contact with such material when the next blow is struck on the moil.

In accordance with the present invention the aforementioned difficulties have been eliminated by providing a moil with a separable working member, and it is the principal object of the present invention to provide a percussively operated tool which is capable of breaking concrete and the like more rapidly than heretofore practiced.

Another object of the present invention is to provide a percussively operated tool in which the impact energy is utilized more effectively than heretofore practiced.

Still another object of the present invention is to provide a percussively operated tool that is economic, efficient and highly resistant to wear.

A further object of the present invention is to provide a percussively operated tool with a moil having a separable working member to provide a means for replacement of the working member in case of damage thereto.

These and other objects and advantages of the present invention will more fully appear from the following description made in connection with the accompanying drawings in which:

Figure 1 is an elevational view of the paving breaker embodying the present invention,

Fig. 2 is an enlarged sectional view of an embodiment of the present invention,

Fig. 3 is an enlarged sectional view of another embodiment of the present invention,

Fig. 4 is a cross sectional view taken along the line 4—4 of Fig. 2 and looking in the direction of the arrows, and

Fig. 5 is a cross sectional view taken along the line 5—5 of Fig. 3 and looking in the direction of the arrows.

In the embodiment shown in Fig. 1, 10 is a paving breaker comprising an impact transmitting member 12 and a separable working member here shown as a cutting tool. The cutting member 14 and the impact transmitting member 12 are held in axial alignment by a retainer sleeve 16 which is slidably connected to both members. It is to be noted that this connection is constructed such to permit each of the members 12 and 14 to move axially relative to each other, and in addition thereto,

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also to move axially relative to the retainer sleeve 16. The retainer sleeve 16 is provided with inwardly projecting ends 18 and 20. The projections 18 and 20 slidably fit in reduced sections 22 and 24 provided in the opposing end portions of the cutting member 14 and the impact transmitting member 12. The length of the reduced sections 22 and 24 is such to permit each of the members and the retainer sleeve to move axially relative to each other. This provision has been made to create a connection in which the retainer sleeve 16 is not subject to the vibration of only one of the members but rather to the vibration of both members. In this manner the retainer sleeve 16, during operation of the tool, will be held "floating" or substantially stationary in its intermediate position relative to both members 12 and 14 as a result of the sliding fit between the projections 18 and 20 and their associated reduced sections 22 and 24 in the members 12 and 14. The "floating" position of the retainer sleeve, as actual tests have demonstrated, eliminates breakage of the retainer sleeve, and is one of the features of the present invention. That is, if the sleeve is rigidly attached to one of the moving members, with a standard paving breaker the sleeve would be moved violently about 1200 times per minute. This results in excessive shock and ultimately, breakage of the retainer sleeve.

Another feature of the present invention is, that, with the provision of a separable cutting member 14 to the impact transmitting member 12, configured to trap substantially all of any stress wave reflected from the end of the cutting member 14 in the cutting member 14, the impact energy of the tool, compared to that of a conventional tool, is utilized more effectively. Furthermore, with a separable cutting member, a positive contact of the separable cutting member 14 with the material to be broken is achieved, and consequently, there will be no rebound, following impact, of the cutting member 14 from the material to be broken. As actual tests have demonstrated, the use of a separable cutting member 14 will effect a steady, continuous penetration of the cutting member 14 into the material to be broken without getting stuck therein and without rebound therefrom. Furthermore, with these features, the causes for easily blunting of the cutting member are substantially reduced, these causes being, as is commonly known when using one piece moil paving breakers, rebound of the moil, and, when the moil gets stuck in the material to be broken, excessive heating, and consequently, easy blunting of its cutting edge.

It is also to be noted that, besides the feature of forming a stress wave trap, the separable cutting member arrangement provides a means for replacement of the cutting member in case of damage thereto.

As for the length of the striker element relative to that of the cutting member 14 in the paving breaker, actual tests have demonstrated that the length relation between the striker element and the cutting member, with respect to the effective utilization of the impact energy of the striker element may vary, depending on the shape of the striker element and the cutting member, but lies within a certain range. In Fig. 1 is shown a striker element 36, an anvil block 38, both members in dotted lines, and the impact transmitting member 12, partly in dotted lines, the latter to transmit the impacts to the cutting member 14. The length of the striker element is designated as X and that of the cutting member 14 as Y (see also Fig. 2). Referring then to the aforementioned length relation, X:Y lies within the range of 1:1 to 1:3. Although actual tests have demonstrated that the most preferable length relation of X:Y appears to be 1:2, the length of the cutting member 14 may be chosen within

the range of 1:1 to 1:3, relative to the length of the striker element 36, without substantially affecting the effective utilization of the impact energy of the striker element 36.

In order to permit disconnection of either one of the members, for instance in cases of replacement of the cutting member 14 for reasons of damage, the retainer sleeve 16 is provided with a slit 26 and acts as a spring clip, permitting the cutting member 14 to be simply snapped out of engagement against the spring action of the retainer sleeve 16, see Figs. 3 and 5.

As an alternative, the connection between the retainer sleeve 16' and the members 12' and 14' can be arranged as shown in Figs. 2 and 4. The projections 28 and 30 of the retainer sleeve 16' are in the form of external screw threads. Adjacent to the reduced sections 22' and 24' of the members 12' and 14', shoulders of external screw threads 32 and 34, identical to the external screw threads of the retainer sleeve 16', are provided. In case either one of the cutting members 12' or 14' is to be replaced, it can be simply screwed out of connection with the retainer sleeve 16'. With this arrangement the projecting screw threads act as a simple means for connection or disconnection of the associated parts, and at the same time form an effective retainer relative to each other to prevent separation, during operation of the tool, of any one of the associated parts.

It should be understood that the description and drawing herein are illustrative only, and that various changes and modifications may be made in the structure disclosed without departing from the spirit of the invention.

I claim:

1. An impact transmitting device comprising an impact transmitting member, a working member positioned axially in end to end relation to said impact transmitting member to be actuated thereby, a retaining sleeve having a bore for receiving the adjacent inner end portions of said members and having each of its end portions provided interiorly with a projection and a relatively smooth bore end section extending outwardly from said projection, the inner end part of each of said member end portions having a reduced section and a shoulder adapted to engage the corresponding projection on the sleeve to prevent unintentional withdrawal of the member from the sleeve, said members each having a relatively smooth section formed outwardly of said reduced portion and slidably fitting the smooth sections of said bore to support said members in axial alignment, each of said reduced sections having a size to permit rotational and longitudinal movement within the projections, the size of said bore between the projections being such to permit longitudinal slidable movement of said shoulders therein.

2. An impact transmitting device comprising an impact transmitting member, a working member positioned

axially in end to end relation to said impact transmitting member to be actuated thereby, and a retaining sleeve having a longitudinal slidable fit with the opposing end portions of said members cooperating therewith to retain said members axially aligned, said retaining sleeve having each of its end portions provided with an inward projection, the opposing end portions of said members having a reduced section to receive said inward projections, the length of said reduced sections being such to permit longitudinal movement of said retaining sleeve relative to each of said members.

3. The device claimed in claim 1 in which said projections and said shoulders are in the form of complementary screw threads to permit connection or disconnection of either of said members relative to said retaining sleeve.

4. An impact transmitting device comprising an impact transmitting member, a working member positioned in end to end relation with said impact transmitting member to be actuated thereby, and a retaining sleeve having an axial bore for receiving the adjacent inner end portions of said members, said sleeve having an introverted projection at each end of the bore and positioned inwardly of the end of the bore, each of said end portions of the members having a relatively smooth portion slidably fitted in the bore portion outwardly of said projections to hold the members in axial alignment, each of said end portions having a shoulder at the inner end thereof adapted to cooperate with the corresponding projection on the sleeve to prevent unintentional withdrawal of the member from the sleeve, and each of said end portions having a reduced section between the shoulder and smooth portion to accommodate said projections, said reduced sections being of such size and length to permit rotational and longitudinal slidable movement of the members relative to the sleeve.

5. A combination of a striker element, an impact transmitting member to receive impacts from said striker element, and a working member to receive impacts from said striker element transmitted by said impact transmitting member, the length of said working member being in the range of 1 to 3 times the length of the striker member.

6. An impact transmitting device comprising an impact transmitting member and a working member positioned axially in end to end relation, a retainer to retain the members axially aligned, said retainer having a longitudinally and rotatably slidable and detachable connection with each of said members to permit both members to move longitudinally and rotatably relative to each other.

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