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ELECTRIC HAMMER DRILL ATTACHMENT

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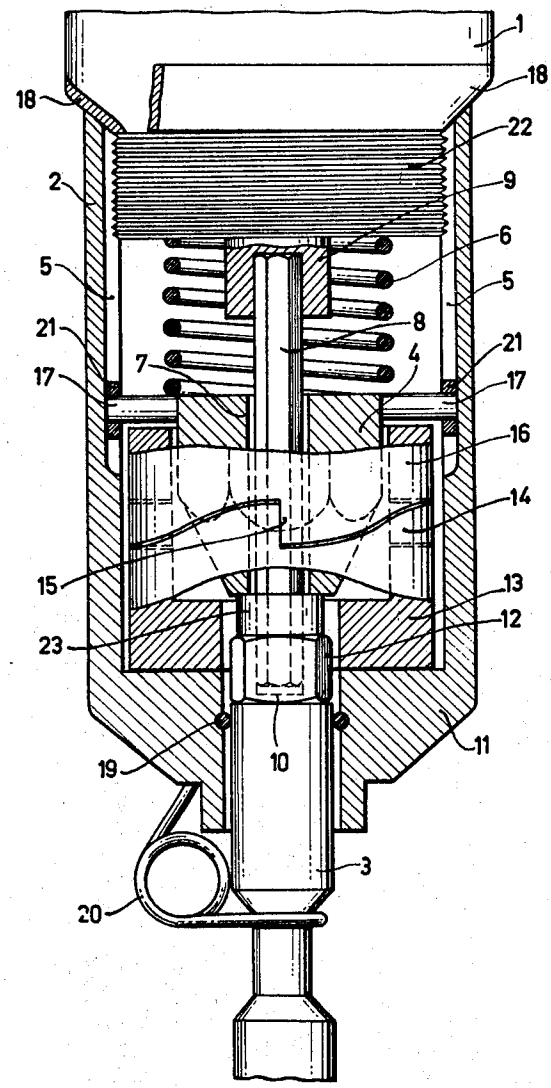

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ELECTRIC HAMMER DRILL ATTACHMENT

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ABSTRACT OF THE DISCLOSURE

A barrel has a front end in which a tool holder is coaxially journalled for rotation and for limited sliding movement from a first position, to which it is urged, to an extended second position. A hammer member is reciprocable in the barrel and is normally urged into engagement with the inner end of the tool holder. A drive shaft drives the tool holder for rotation thereof. A pair of cooperating cam rings are so arranged in the barrel that, when the tool holder is in its second position, the tool holder only is rotated, and when the tool holder is in its first position, rotation of the tool holder is transmitted to one of the cam rings which in turn effects axial reciprocation of the other cam ring and thereby of the hammer which is operatively associated with the same, so that the hammer will strike axial blows upon the tool holder while the same rotates.

Background of the invention

The invention relates to an attachment which is fixable to the motor housing of an electric drill and comprises a barrel wherein a spring loaded hammer is reciprocated by means of at least one cam ring member through relative rotation of the latter with respect to the hammer. The latter imparts its impact on the top of a tool holder inserted in the outer bottom end of the barrel.

The invention is an improvement over a former construction of a hammer drill attachment of this type by the same inventors, comprising two cam rings having an outer diameter only slightly smaller than the inner diameter of the barrel in order to obtain a sufficient circumferential length for providing large cams and thereby a large lifting height for the hammer.

Summary of the invention

It is an object of the present invention to maintain the advantages of such easily replaceable cam rings in a simplified construction wherein the number of moving parts and frictional surfaces is reduced.

It is a further object of the invention to provide an arrangement by which the striking action of the hammer is automatically stopped when retracting the drill from the bore while rotation of the drill, however, continues. By continuing the rotation of the drill the retraction from the bore is made easy while stopping of the hammering action enables the drill to carry the loose grit particles along from the just drilled hole when it is retracted therefrom.

It is a still further object of the invention to open, by providing for a relatively light and cheap but still durable hammer, a field of application in which so far the known hammer drills were hardly applied, for example in drilling holes in concrete with a diameter ranging from 5 to 10 mm., for instance, for the use of an electrician.

These and other objects and features of the invention will appear more clearly from the following description with reference to the accompanying drawing.

Brief description of the drawing

The single figure illustrates an embodiment of the invention in axial section.

Description of the preferred embodiments

The motor housing is indicated by **1**. The barrel **2** of the hammer drill attachment is screwed onto a stub **22** of the motor housing **1**. The tool holder **3** is rotatably inserted in a bore provided at the bottom end **11** of the barrel **2** and serving as a bearing for the tool holder **3**. The barrel encloses a hammer block **4** loaded by a spring **6** which is placed between the upper surface of the hammer **4** and the motor housing stub **22**. The hammer block **4** is provided with a central bore **7** through which a driving shaft **8** extends. This shaft **8** is coupled at one end to the motor shaft **9** for which purpose the shaft **8** has a polygonal cross section and the upper end is fitted in a cavity of the motor shaft **9** of corresponding cross section. In the same way the polygonal driving shaft **8** is coupled at its other end to the head of the tool holder **3** by means of a corresponding polygonal cavity **10** provided therein. The part **12** of the head of the tool holder **3** has also a polygonal shape corresponding to the shape of the inner walls of a central aperture in the bottom of the cup shaped cam ring **13** so that the tool holder head can slide in axial direction therein, but in the shown engaging position the cam ring **13** is rotated by the tool holder head, which in its turn is driven by the motor shaft **9** via the shaft **8**. The bottom of the cam ring **13** bears upon the bottom **11** of the barrel and is guided by the inner wall of the barrel **2**. The cams **14** cooperate with corresponding cams **15** of an upper cam ring **16**. Side arms **17** attached to the head of the hammer block **4** rest upon the rim of the cam ring **16** and extend into longitudinal guiding grooves **5** in the inner wall of the barrel **2**. Roller rings **21** are provided for this purpose on the outer ends of the arms **17**. The outer wall of the hammer block **4** has a polygonal shape corresponding to the shape of the inner wall of the cam ring **16**, so that the latter is secured against rotation with respect to the hammer block **4**, the latter being secured against rotation by means of the arms **17**, which are guided in the grooves **5**. Thus the cams **14** will move relatively to the cams **15**, the hammer block **4** will be alternately lifted and thereupon fall downward again upon the top of the tool holder **3** in a hammering action under the pressure of the spring **6**.

By the means as described a very compact construction is obtained, though the parts can be made very solid. The diameter of the hammer block **4** is even a little larger than half the distance between the tool holder **3** and the front of the motor housing stub **22**. The diameter of the barrel **2** is large compared with its length and because of the above-mentioned relatively short distance a good stability of the tool holder is obtained. The different parts, especially the loose cam rings **13** and **16**, can easily be replaced and because they take the full inner width of the barrel **2**, they can be built as solid bodies offering a large circumferential length for providing large cams which in turn provide a large lifting height for the hammer block **4**.

The head of the tool holder **3** has above the coupling part **12** an upper end portion **23** of a smaller diameter than the part **12**, so that the portion **23** is freely rotatable within the central aperture of the driven cam ring **13**. Further, the length of engagement of the coupling end of the shaft **8** within the tool holder head surpasses the height by which the polygonal coupling part **12** extends into the cam ring **13** in the working position as shown. Now when the drill is retracted from the drilled hole the polygonal part **12** is retracted from the central aperture

in the cam ring **13**, because of the known fact that frictional forces by the walls of the drilled hole make it necessary to pull the drill with some force from the drilled hole. This retracting action is made easier if the drill rotates during such withdrawal as will be the case in the present construction. However, in the way as described the coupling part **12** will leave the central aperture of the cam ring **13** and will be discoupled therefrom, so that the hammer block is no longer driven during the withdrawal. The spring **20** prevents the tool holder **3** in a known way from becoming dislodged and will bring the tool holder again in a position wherein it is coupled to the cam ring **13**, when the drill has left the just drilled bore.

An elastic sealing ring **18** is interposed between the motor housing and the open end of the barrel **2** and another sealing ring **19** is interposed between the tool holder and the inner wall of the bearing thereof at the bottom end **11** of the barrel **2**. Therefore, it is possible to fill the entire inner space of the barrel **2** with a lubricant. Further, the sealing ring **18** prevents the barrel **2** from being loosened from the motor housing under vibration.

What we claim is:

1. An electric hammer drill attachment, comprising a barrel which is fixable to a motor housing; a bearing provided in a leading end of said barrel; a rotatable tool holder received in said bearing and being movable axially of said barrel between a first and a second position, said tool holder having an end portion provided with an abutment face located in said barrel; biasing means biasing said tool holder to said first position; a motor shaft at the trailing end of said barrel; a drive shaft located in said barrel extending axially thereof between said motor shaft and said tool holder; an axially slidable rotary first cam ring surrounding said drive shaft in said barrel adjacent said tool holder and being provided with an axial recess facing said trailing end, and an axially slidable second cam ring concentric with said first cam ring and located intermediate the same and said motor shaft, said rings having opposed end faces provided with circumferentially curved and axially inclined abutting cam faces whereby, when said first cam ring rotates, said second cam ring is alternately urged away from said first cam ring and free to move toward the same; a spring-loaded hammer received and guided in said recess of said first cam ring and in the aperture of said second cam ring for reciprocatory movement relative to said first cam ring, said hammer being provided with a central bore through which said drive shaft extends and having a front portion normally urged into engagement with said abutment face, and said hammer further being operatively connected with said second cam ring for slowing the axial movements thereof; first coupling means coupling said drive shaft to said motor shaft for rotation therewith; and second coupling means coupling said drive shaft to said tool holder for joint rotation, and coupling said tool holder to said first cam ring in rotation-transmitting relationship with the latter when said tool holder is in said first position thereof, whereby, when said tool holder is in said first position and said first cam ring is rotated, said tool holder is simultaneously rotated and subjected

to hammer blows, whereas when said tool holder is in said second position, said tool holder is merely rotated.

2. An attachment as defined in claim **1**, wherein said second cam ring has an aperture of polygonal cross-section, and wherein said hammer is of substantially complementary cross-sectional configuration at least in the region thereof which is received in said aperture, whereby rotation of said second cam ring with reference to said hammer is precluded.

3. An attachment as defined in claim **1**, wherein said second coupling means comprises a central aperture in said first cam ring communicating with said recess and having a polygonal cross-section, a first section of said end portion of said tool holder having a complementary polygonal cross-sectional configuration and being slidably received in said central aperture when said tool holder is in said first position, and a second section located in said recess when said tool holder is in said first position and adapted to be freely rotatably and slidably received in said central aperture when said tool holder is in said second position.

4. An attachment as defined in claim **1**, wherein said second coupling means further comprises an axial cavity of polygonal cross-section extending inwardly from said abutment face and having a length greater than the axial movement of said tool holder between said first and second positions thereof, and a terminal portion of said drive shaft received in said cavity and having a complementary polygonal cross-section.

5. An attachment as defined in claim **1**, wherein said barrel is provided with at least two axially extending internal guide grooves, said hammer including at least two arms each projecting into one of said grooves radially of said hammer and in engagement with said second cam ring.

6. An attachment as defined in claim **1**, wherein said hammer is reciprocable through a predetermined maximum distance, and wherein said hammer has a transverse cross-sectional dimension at least equal to one half of said predetermined distance.

7. An attachment as defined in claim **1**, wherein said barrel is provided with an axial bore in said leading end thereof and constituting said bearing; and further comprising an elastic sealing ring received in said bore and sealingly surrounding said tool holder in engagement with the same and with a circumferential wall surface bounding said bore.

8. An attachment as defined in claim **7**; and further comprising an additional sealing ring sealing said barrel from a motor housing to which it is fixed.

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