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(56) Documents cited
GB 1458787 GB 0399773
GB 1419357

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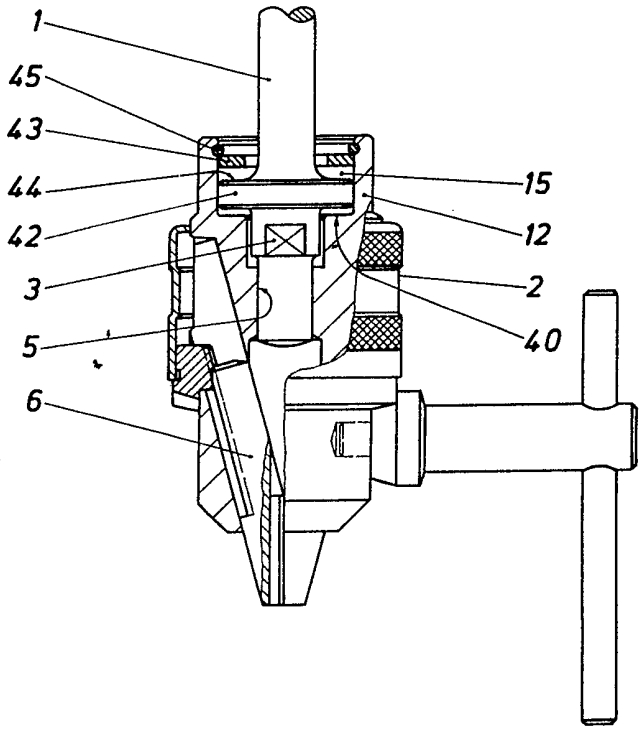
B4C

(54) Hammer drilling apparatus

(57) The drilling chuck (2) which is non-rotatably driven by a hammer drilling spindle (1) has an axial opening (5) through which the action of the hammer drilling spindle (1) can be transmitted onto the end of a drill which is held between radially displaceable chuck jaws (6). The chuck (2) is axially displaceably guided on the spindle (1). The travel is restricted in the direction towards the drill by an abutment means which is formed on the spindle (1) by a collar (42) and on the chuck (2) by an annular shoulder (40) in the chuck body (12), the shoulder being disposed around the spindle. The collar (42) and the annular shoulder (40) can come into contact face to face with each other over a comparatively large area thereby reducing the pressure between them.



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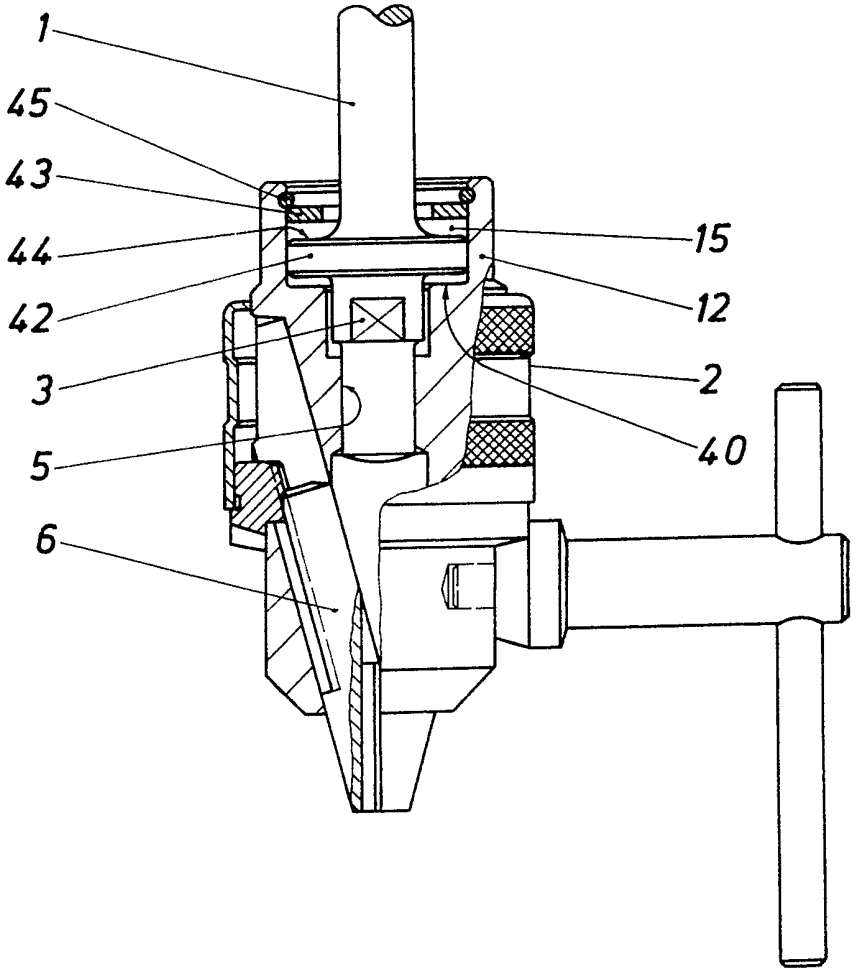

SPECIFICATION

Hammer drilling apparatus

The invention relates to a hammer drilling apparatus having a drilling chuck which is non-rotatably driven by a hammer drilling spindle and which has an axial opening therethrough, through which the hammer action can be transmitted from the hammer drilling spindle onto the end of the drill which is held in the drilling chuck between centrally displaceable chuck jaws, the drilling chuck being axially displaceably guided on the hammer drilling spindle, wherein the travel motion forwardly towards the drill is restricted by an abutment means between the hammer drilling spindle and the drilling chuck.

In a hammer drilling apparatus of that kind, which is disclosed in German Specification (DE-OS) No 31 32 449, the hammer drilling spindle has a transverse opening through which engages a transverse pin which is fixed in the chuck body. The transverse opening is somewhat longer, in the axial direction of the hammer drilling spindle, than the thickness of the transverse pin so that the connection provided by the transverse pin is a non-rotatable connection while however permitting a certain amount of axial free spindle movement which is required for the hammer action of the hammer drilling spindle to be transmitted onto the drill which is held in the drilling chuck. As long as the drill, during the hammer drilling operation, has a drilling resistance of sufficient magnitude at the drilling location, the travel length of its own axial hammer movement as well as that of the hammer drilling spindle is generally less than the free spindle motion which is permitted by the transverse pin. If however the drill is faced with only a small amount of resistance or no resistance at all, the hammer stroke movement may be greater and a considerable proportion of the hammer energy may be transmitted from the hammer drilling spindle directly onto the drilling chuck, by the axial ends of the transverse opening in the hammer drilling spindle striking against the transverse pin. When that occurs, the surfaces which come directly into contact with each other are only small, thus resulting in high specific loadings per unit of surface area, which loadings can result in permanent deformation at the hammer drilling spindle or the transverse pin and, in the long term, can result in damage to the drilling chuck and the hammer drilling spindle.

The invention is based on the problem of so designing a hammer drilling apparatus of the kind set forth in the opening part of this specification, as to avoid excessively hard stresses on the drilling chuck and the hammer drilling spindle.

According to the invention, a hammer drilling apparatus has a drilling chuck mounted to be non-rotatably driven by a hammer drilling spindle and which has an axial opening therethrough, through which hammer action can be transmitted from the drilling spindle onto the end of a drill when held in the drilling chuck between radially displaceable chuck jaws, the drilling chuck being axially displaceably guided on the hammer drilling spindle, wherein the travel motion forwardly towards the drill is restricted by an abutment means between the hammer drilling spindle and the drilling chuck, the abutment means being formed on the hammer drilling spindle by a collar on the drilling chuck by an annular shoulder, around the drilling spindle, and the collar and the annular shoulder being formed to come into contact with each other over faces having a comparatively large area in relation to the cross-section of the hammer drilling spindle.

Desirably, on its rear, the collar forms a further face and arranged in opposite relationship thereto is an annular disc or plate which is held in the chuck body and which, together with the face of the collar, forms an abutment means of large area, for limiting the travel motion of the drilling chuck on the hammer drilling spindle in the direction away from the drill. The annular disc may be a spring ring or washer which is fitted into an annular groove in the chuck body, and that is readily sufficient to hold the drilling chuck on the hammer drilling spindle as the hammer loading of the drilling chuck by the hammer drilling spindle in a rearward direction away from the drill is substantially less than in the opposite direction.

Accordingly, axial movement of the drilling chuck on the hammer drilling spindle may so-to-speak occur automatically, in an alternating mode between two abutment means, wherein the hammer loadings on the respective surfaces which come into contact with each other in the abutment condition, besides being dependent on the size of such surfaces, is also dependent on the magnitude of the axial free motion, which is available between the two abutment means, of the drilling chuck on the hammer drilling spindle, more specifically, the hammer loadings decreasing in proportion to an increasing distance over which the drilling chuck can move freely axially on the hammer drilling spindle between the abutment means.

The invention is described in greater detail hereinafter with reference to an embodiment illustrated in the accompanying drawing in which the single figure shows a view in axial section through a drilling chuck.

In the hammer drilling apparatus illustrated in the drawing, the drilling spindle is denoted by reference numeral 1 while the drilling chuck which is driven by the drilling spindle is denoted by reference numeral 2. The drilling chuck 2 is non-rotatably disposed on the drilling spindle 1, for which purpose the drilling spindle is provided with flat surfaces 3 which co-operate with corresponding flat surfaces (not visible in the drawing) on the chuck body 12 of the drilling chuck 2, to provide for rotary drive for the drilling chuck by the drilling spindle, without however adversely affecting axial displaceability of the drilling chuck 2 on the drilling spindle 1. Instead of being provided by such drive surfaces 3, the non-rotatable connection between the drilling chuck 2 and the hammer drilling spindle 1 may also be provided in a different fashion, for example by axial pins which are let into

grooves disposed in opposite relationship on the hammer drilling spindle 1 and the chuck body 12, whereby the drilling chuck 2 and the hammer drilling spindle 1 are locked to prevent relative rotational movement thereof, without preventing axial relative movement.

The drilling chuck 2 is provided with an axial opening 5 therethrough, through which the hammer movement is transmitted from the hammer drilling spindle 1 onto the end of the drill (not shown in the drawing) which is held in the drilling chuck 2 between radially centrally displaceable clamping jaws 6.

The axial travel motion of the drilling chuck 2 on the hammer drilling spindle 1 is restricted, in a direction forwardly towards the drill, by an abutment means between the hammer drilling spindle and the drilling chuck. The abutment means is formed in respect of the hammer drilling spindle 1, by a collar 42 disposed thereon and, in respect of the drilling chuck 2, by an annular shoulder 40 in the chuck body 12, which is disposed around the hammer drilling spindle. The collar 42 and the annular shoulder 40, in the condition of abutment thereof, come into contact with each other, by way of their mutually facing faces, over such a large area that, even when the drilling chuck is subjected to a harder hammer loading by the hammer drilling spindle, the specific loadings per unit of surface area at the abutment surfaces remain so small that there is no fear of permanent deformation of or damage to the drilling chuck or the hammer drilling spindle.

On its rear, the collar 42 forms a further face 44 while disposed in opposite relationship thereto is an annular disc or plate 43 which is held in the chuck body 12 and which is held by a spring ring or washer 45 which is fitted into an annular groove which is disposed in an opening 15 in the chuck body 12, which accommodates the hammer drilling spindle 1 and the collar 42. The annular disc 43, together with the face 44 of the collar 42, forms an abutment means of large area for restricting the travel movement of the drilling chuck 2 on the hammer drilling spindle 1 in a direction away from the drill. The drilling chuck 2 can move axially freely on the hammer drilling spindle 1 between the abutments formed by the annular shoulder 40 and the annular disc 43, while the magnitude of such axial movement is sufficiently large that in normal hammer drilling operation, the collar 42 of the hammer drilling spindle 1 does not at any event regularly come into contact, in each or almost each hammer stroke movement, against the annular shoulder 40 of the drilling chuck 2.

CLAIMS

1. A hammer drilling apparatus having a drilling chuck mounted to be non-rotatably driven by a hammer drilling spindle and which has an axial opening therethrough, through which hammer action can be transmitted from the drilling spindle onto the end of a drill when held in the drilling chuck between radially displaceable chuck jaws, the drilling chuck being axially displaceably guided on the hammer drilling spindle, wherein the travel motion forwardly towards the drill is restricted by an abutment means between the hammer drilling spindle and the drilling chuck, the abutment means being formed on the hammer drilling spindle by a collar on the drilling chuck by an annular shoulder, around the drilling spindle, and the collar and the annular shoulder being formed to come into contact with each other over faces having a comparatively large area in relation to the cross-section of the hammer drilling spindle.

2. A hammer drilling apparatus according to Claim 1, in which the collar, on the rear thereof, forms a further face in oppositely disposed relationship to which is an annular disc which is held in the chuck body and which together with the said further face forms an abutment means of comparatively large area, for restricting the travel motion of the drilling chuck on the hammer drilling spindle in the direction away from the drill position.

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