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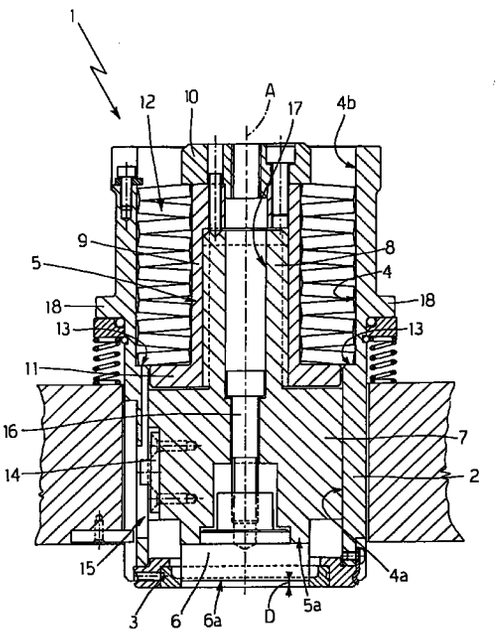
(54) Punch assembly

(57) A punch assembly (1) wherein a toolholder body (5) is fitted in axially-movable manner inside a cylindrical tubular body (2), and is fitted integrally at one end (5a) with a punch (6) engaging in sliding manner a through hole formed in a blankholder disk (3) fitted integrally to one end of the cylindrical tubular body (2); an elastic element (12) being interposed between the cylindrical tubular body (2) and the toolholder body (5) to keep the toolholder body in a rest position wherein the punch (6) is withdrawn inside the cylindrical tubular body; the toolholder body (5) being defined by two elements (7, 9) screwed to each other to permit adjustment of the total axial length of the toolholder body (5), so that, when the toolholder body (5) is in the rest position, the cutting end (6a) of the punch (6) is positioned a given distance (D) from the through hole in the blankholder disk (3).



EP 0 914 880 A1

Description

[0001] The present invention relates to a punch assembly.

[0002] Known punch assemblies comprise a cylindrical tubular body or casing extending coaxially with a reference axis and fitted integrally at the bottom end with a blankholder disk which is placed on the work sheet; and a substantially cylindrical toolholder body extending coaxially with the reference axis, and an end portion of which slides axially inside the casing.

[0003] Known punch assemblies also comprise a punch screwed to the end of the toolholder body inside the casing, so as to engage in sliding manner a through hole in the blankholder disk; and an elastic element located between the top end of the casing which is not provided with the blankholder disk and the end of the toolholder body outside the casing, to keep the punch in a withdrawn position in which the cutting end of the punch engages the through hole in the blankholder disk but does not project outwards of the casing.

[0004] The end of the toolholder body outside the casing is designed to receive a ram, which, for a given time, exerts such pressure as to overcome the resistance of the elastic element and move the punch from the withdrawn position into a work position in which the cutting end of the punch projects outwards of the casing through the hole in the blankholder disk.

[0005] As is khown, the cutting end of the punch is subject to wear, so that, to ensure consistently high-quality work, punch assemblies of the above type must be ground periodically to remove the worn material and so restore the cutting end of the punch to its original shape.

[0006] A major drawback of punch assemblies of the above type is that repeated grinding eventually results in the cutting end of the punch backing up gradually inside the casing, so that the travel of the ram must be checked periodically by the operator to ensure the cutting end of the punch projects as required from the blankholder disk in the work position.

[0007] It is an object of the present invention to provide a punch assembly designed to overcome the aforementioned drawbacks.

[0008] According to the present invention, there is provided a punch assembly comprising a cylindrical tubular body extending coaxially with a given axis; a blankholder disk at one end of the cylindrical tubular body; a toolholder body sliding axially inside said cylindrical tubular body; a punch, which is fitted integrally to the end of the toolholder body facing said blankholder disk, and a cutting end of which engages in sliding manner a through hole formed in the blankholder disk; and an elastic element for keeping said toolholder body in a rest position wherein the punch is withdrawn inside the cylindrical tubular body; the punch assembly being characterized in that said toolholder body is divided into a first and a second element connected to each other in such a manner as to permit adjustment of the total axial length of the toolholder body; the elastic element being interposed between the cylindrical tubular body and said first element; and the punch being fitted integrally to said second element to permit adjustment of the position of the punch with respect to the blankholder disk, and so keep the cutting end at a given distance from the through hole in the blankholder disk, by varying the total axial length of the toolholder body.

[0009] The present invention will now be described with reference to the accompanying drawing, which shows a section of a punch assembly in accordance with the teachings of the present invention.

[0010] Number 1 in the accompanying drawing indicates as a whole a punch assembly for use on a known punching machine, and which, in the example shown, is fitted to the upper turret of a known multiple punching machine.

[0011] Punch assembly 1 comprises a cylindrical tubular body 2 extending coaxially with a longitudinal axis A and fitted integrally at the bottom end with a blankholder disk 3, which is placed on the work sheet. In the example shown, cylindrical tubular body 2 comprises a substantially cylindrical axial cavity 4 divided into two portions of different diameters; and blankholder disk 3 is fitted integrally to the end of cylindrical tubular body 2 corresponding to the smaller-diameter portion - hereinafter indicated 4a - of axial cavity 4.

[0012] Punch assembly 1 also comprises a substantially cylindrical toolholder body 5 fitted in axially-movable manner inside cylindrical tubular body 2; and a khown punch 6 fitted, inside portion 4a of axial cavity 4, to the bottom end 5a of toolholder body 5 facing blankholder disk 3. Punch 6 comprises a cutting end 6a, which engages in sliding manner a through hole formed in blankholder disk 3.

[0013] As shown in the accompanying drawing, toolholder body 5 comprises two elements, in particular a cylindrical body and a sleeve, connected to each other to permit adjustment of the total axial length of toolholder body 5.

[0014] The cylindrical body, hereinafter marked at 7, engages portion 4a of axial cavity 4 in sliding manner, is fitted with punch 6 at one end, and comprises, at the opposite end, a threaded shank 8 projecting inside the larger-diameter portion - hereinafter indicated 4b - of axial cavity 4.

[0015] The sleeve, hereinafter marked at 9, extends coaxially with axis A inside the larger-diameter portion of axial cavity 4, is at least partly screwed to threaded shank 8, and comprises a ring nut 10 at one end and a flange 11 at the other end. More specifically, flange 11 of sleeve 9 engages in sliding manner portion 4a of axial cavity 4, and is of a diameter approximately equal to but no greater than the diameter of portion 4a; and ring nut 10 is screwed to the end of sleeve 9 opposite the end facing cylindrical body 7, inside portion 4b of axial cavity 4.

[0016] Punch assembly 1 also comprises an elastic element 12 (in the example shown, a Belleville washer) extending inside portion 4b of axial cavity 4, so that a first end rests on ring nut 10, and a second end rests on a shoulder 13 separating portions 4b and 4a of axial cavity 4.

[0017] Elastic element 12 provides for keeping toolholder body 5 in a rest position, wherein toolholder body 5 contacts a stop element, punch 6 is fully withdrawn inside cylindrical tubular body 2, and cutting end 6a engages the through hole in blankholder disk 3 without projecting outwards.

[0018] More specifically, elastic element 12 is so formed that the second end rests on both shoulder 13 and flange 11 when toolholder body 5 is in the rest position; in which case, elastic element 12 only assumes its maximum extension when resting on both ends of sleeve 9, i.e. on ring nut 10 and flange 11, and the stop element contacted by toolholder body 5 in the rest position is defined by the second end of elastic element 12.

[0019] Ring nut 10 is designed to receive a known ram, by which sufficient axial force is exerted on ring nut 10 to compress elastic element 12, move ring nut 10 towards shoulder 13 and toolholder body 5 towards blankholder disk 3, and so move punch 6 into a work position wherein cutting end 6a engages the through hole in blankholder disk 3 and projects outwards of cylindrical tubular body 2.

[0020] In the rest position, therefore, sleeve 9 always assumes the same position inside axial cavity 4, whereas the position of cylindrical body 7 inside axial cavity 4 may be adjusted by screwing or unscrewing threaded shank 8 inside sleeve 9. Adjusting the position of cylindrical body 7 inside axial cavity 4 provides for so adjusting the position of punch 6 that, in the rest position, cutting end 6a is located a given distance D from the end of the through hole in blankholder disk 3.

[0021] This is particularly useful when, as a result of grinding, the axial length of punch 6 is reduced so that cutting end 6a withdraws inside the through hole in blankholder disk 3.

[0022] In the example shown, to prevent cylindrical body 7 from rotating about axis A, the lateral surface of cylindrical body 7 is fitted by means of screws with a key 14 engaging in sliding manner a slot 15 formed in the lateral wall of cylindrical tubular body 2. Slot 15 extends parallel to axis A at portion 4a of axial cavity 4 to permit exclusively axial movements of cylindrical body 7, and may possibly also be engaged in sliding manner by a second key extending from said turret to prevent rotation of cylindrical tubular body 2, i.e. of punch assembly 1 as a whole, about axis A.

[0023] As shown in the accompanying drawing, punch 6 is fitted to cylindrical body 7 by means of a screw 16, which is housed inside a seat 17 extending coaxially with axis A through cylindrical body 7, threaded shank 8 and ring nut 10, and permits rapid replacement of punch 6 without dismantling the whole of punch assembly 1.

[0024] As shown in the accompanying drawing, cylindrical tubular body 2 comprises an outer annular projection 18 coaxial with axis A, and on which abuts, in the example shown, an elastic element forming part of the machine turret.

[0025] Operation of punch assembly 1 is clearly understandable from the foregoing description with no further explanation required.

[0026] The main advantage of punch assembly 1 is the possibility, when fitting punch 6 to toolholder body 5, of adjusting the position of punch 6 inside axial cavity 4, so that cutting end 6a of punch 6 is always the same distance from the end of the through hole in blankholder disk 3. As a result, the travel of the ram need no longer be checked each time cutting end 6a of punch 6 is ground, thus greatly reducing the routine maintenance time of the machine.

[0027] Moreover, dividing toolholder body 5 into cylindrical body 7 and sleeve 9 makes for a modular structure and for greatly simplifying assembly of punch assembly 1. Being engaged permanently between ring nut 10 and flange 11 of sleeve 9, elastic element 12, in fact, may be extracted from axial cavity 4 together with sleeve 9, with no need to fully dismantle punch assembly 1, as at present.

[0028] Clearly, changes may be made to punch assembly 1 as described and illustrated herein without, however, departing from the scope of the present invention.

Claims

1. A punch assembly (1) comprising a cylindrical tubular body (2) extending coaxially with a given axis (A); a blankholder disk (3) at one end of the cylindrical tubular body (2); a toolholder body (5) sliding axially inside said cylindrical tubular body (2); a punch (6), which is fitted integrally to the end (5a) of the toolholder body (5) facing said blankholder disk (3), and a cutting end (6a) of which engages in sliding manner a through hole formed in the blankholder disk (3); and an elastic element (12) for keeping said toolholder body (5) in a rest position wherein the punch (6) is withdrawn inside the cylindrical tubular body (2); the punch assembly being characterized in that said toolholder body (5) is divided into a first (9) and a second (7) element connected to each other in such a manner as to permit adjustment of the total axial length of the toolholder body (5); the elastic element (12) being interposed between the cylindrical tubular body (2) and said first element (9); and the punch (6) being fitted integrally to said second element (7) to permit adjustment of the position of the punch (6) with respect to the blankholder disk (3), and so keep the cutting end (6a) at a given distance (D) from the through hole in the blankholder disk (3), by varying the total axial length of the toolholder body (5).

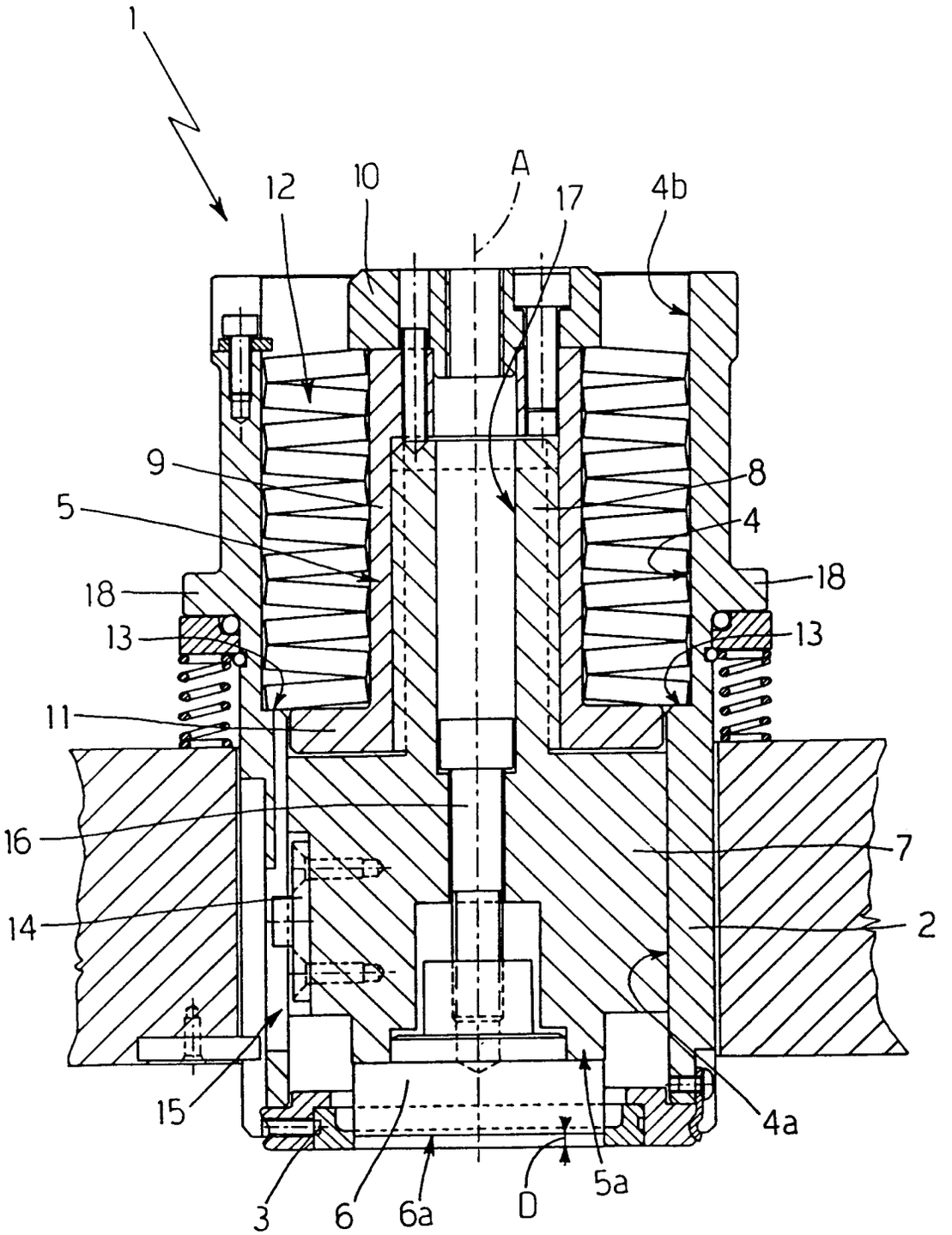
2. A punch assembly as claimed in Claim 1, characterized in that said second element (7) comprises a cylindrical body (7), which is axially movable inside said cylindrical tubular body (2), is fitted with said punch (6) on the end facing the blankholder disk (3), and in turn comprises, at the opposite end, a threaded shank (8) screwed at least partly inside said first element (9).

3. A punch assembly as claimed in Claim 2, characterized in that said first element (9) comprises a sleeve (9), which extends coaxially with said given axis (A), comprises an end portion at least partly screwed onto said threaded shank (8), and is fitted integrally with a ring nut (10) on the opposite end to the cylindrical body (7); said elastic element (12) having a first end resting on said ring nut (10), and a second end resting on said cylindrical tubular body (2), so as to keep the ring nut (10) at a given distance from said blankholder disk (3) when said toolholder body (5) is in the rest position.

4. A punch assembly as claimed in Claim 3, characterized in that said cylindrical tubular body (2) comprises an axial cavity (4) having two portions (4a)(4b) of different diameters separated by a shoulder (13); said cylindrical body (7) engaging in sliding manner the smaller-diameter portion (4a) of the axial cavity (4); said sleeve (9) being movable axially inside the larger-diameter portion (4b) of the axial cavity (4); and said second end of the elastic element (12) resting on said shoulder (13).

5. A punch assembly as claimed in Claim 4, characterized in that the end of the sleeve (9) facing the cylindrical body (7) comprises a flange (11) engaging in sliding manner the smaller-diameter portion (4a) of the axial cavity (4); the elastic element (12) being so formed that said second end rests simultaneously on said shoulder (13) and said flange (11) when the toolholder body (5) is in said rest position.

6. A punch assembly as claimed in Claim 5, characterized in that the elastic element (12) is locked between the ring nut (10) and the flange (11) of the sleeve (9) when the toolholder body (5) is in said rest position.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EUROPEAN SEARCH REPORT

Application Number
EP 97 83 0564

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	WO 94 07663 A (WILSON TOOL INT) * the whole document *	1-3,5,6	B21D45/00
X	DE 195 05 754 C (MATE PUNCH AND DIE GMBH) * the whole document *	1-3,5,6	
A	EP 0 622 135 A (AMADA METRECS CO)		
A	GB 2 038 690 A (MERCER NAIRNE & CO LTD)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B21D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19 March 1998	Peeters, L

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