(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 342 539 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.07.2018 Bulletin 2018/27

(51) Int Cl.:
B25B 23/06 *(2006.01)*

(21) Application number: **17210661.9**

(22) Date of filing: **27.12.2017**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD TN

(30) Priority: **27.12.2016 IT 201600131218**

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(54) AUTOFEED AUTOMATIC SCREWDRIVER

(57) An autofeed automatic screwdriver (1) comprising: a bit-holding head (2) that houses inside a rotatable screw bit (3) and is adapted to receive at inlet a succession of screws (100) that are arranged in sequence in front of the screw bit (3), and a motor assembly (4) which is adapted to drive into rotation the screw bit (3) about its longitudinal axis; the bit-holding head (2) comprising: an outer casing (6) internally provided with a substantially straight, main duct (7) open at the bottom and which accommodates said screw bit (3) inside an upper portion of the duct, and a substantially straight, secondary duct (8) that branches off obliquely from the main duct (7) and is dimensioned so as to convey a succession of screws (100) into the main duct (7), below the screw bit (3); and a deflector assembly (17) which is located substantially at the joining/connecting point between the main duct (7) and the secondary duct (8), and is adapted to channel the screws (100) coming out from the secondary duct (8) towards the lower portion of the main duct (7); the deflector assembly (17) being provided with a movable shutter (20) with a guillotine-like movement.

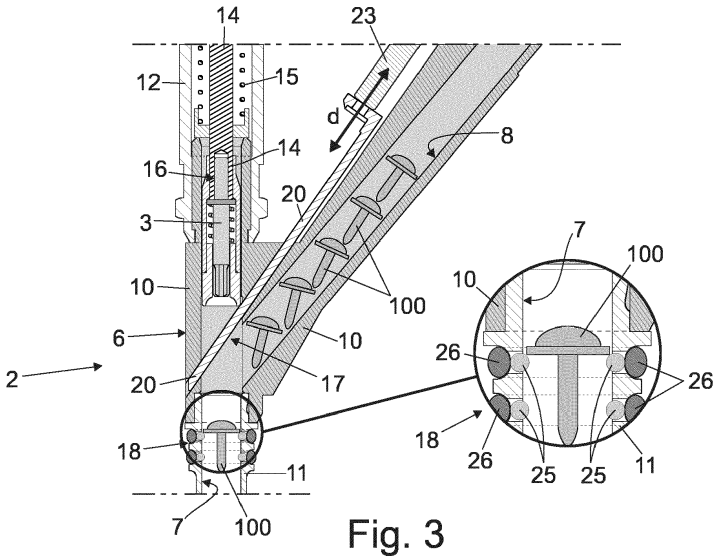

Fig. 3

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Description

PRIORITY CLAIM

[0001] This application claims priority from Italian Patent Application No. 102016000131218 filed on December 27, 2016, the disclosure of which is incorporated by reference.

[0002] The invention relates to an autofeed automatic screwdriver.

[0003] More in detail, the present invention relates to the bit-holding head of an electrically- or pneumatically-operated autofeed automatic screwdriver, to which the following disclosure will make explicit reference without however losing in generality.

[0004] As it is known, autofeed automatic screwdrivers are electrically- or pneumatically-operated devices that receive in input a succession of screws usually of the self-tapping type, and are adapted to screw in a completely automatic manner the screws into a generic support.

[0005] Usually autofeed automatic screwdrivers comprise: a bit-holding head that houses inside itself the screw bit, receives in input the screws to be screwed, and is adapted to place, in succession, each screw in front of the screw bit, locally coaxial to the same screw bit; and an electric or pneumatic servo-motor which is able to drive into rotation the screw bit around its longitudinal axis and, optionally, also to axially move the screw bit back and forth inside the bit-holding head, so as to cyclically bring the screw bit in abutment against the head of the screw and then push the screw against the support stationary beneath the bit-holding head.

[0006] More in detail, the bit-holding head is usually provided with a rigid and oblong in shape, outer casing which is provided with a straight main duct, from which the single screws come out in succession and which accommodates the screw bit in axially slidable and rotatable manner, and with a straight secondary duct that branches off from the straight main duct with an inclination angle of about 45° and is dimensioned so as to convey the screws to be screwed in succession in the straight main duct, immediately below the screw bit.

[0007] The bit-holding head additionally also comprises: a bit-holding rod that firmly carries the screw bit at the bottom end and extends inside the outer casing locally coaxial to the straight main duct, with the capability of freely rotating and sliding parallel to its longitudinal axis; a contrast spring which is adapted to elastically hold the bit-holding rod and the screw bit inside the upper portion of the straight main duct, i.e. inside the portion of the straight main duct located upstream of the joining/connecting point with the straight secondary duct; and a screw-stop device which is arranged along the lower portion of the straight main duct, immediately downstream of the joining/connecting point with the straight secondary duct, and is capable of stopping the screw inside the straight main duct with the head of the screw facing the screw bit, until the moment when the screw bit reaches and the engages the head of the screw.

[0008] The electric or pneumatic servo-motor is adapted to rotate the bit-holding rod around its longitudinal axis and usually also to axially move the bit-holding rod with respect to the outer casing, so as to cyclically move the screw bit back and forth inside the straight main duct.

[0009] Finally, to prevent the screws from getting stuck in the joining/connecting point between the two ducts thus jeopardizing the operation of the automatic screwdriver, the bit-holding head is moreover provided with a movable deflector member which is located at the joining/connecting point between the two ducts and is structured so as to selectively channel the screws coming out of the straight secondary duct towards the bottom portion of the straight main duct.

[0010] In the Chinese utility model no. CN2813218Y, the deflector member consists of a rocker arm which is arranged on the side of the straight main duct, opposite with respect to the mount of the straight secondary duct, and is hinged on the outer casing so as to be capable of rocking on the lying plane of the straight main duct between a first operating position in which the body of the rocker arm projects into the straight main duct, towards the mouth of the straight secondary duct, thus forming an inclined chute that guides the screws coming out of the straight secondary duct towards the bottom portion of the straight main duct, and a second operating position in which the body of the rocker arm does not project into the straight main duct and, hence, allows the screw bit to freely move in the lower portion of the straight main duct.

[0011] A contrast spring elastically keeps the rocker arm in the first operating position, whereas the screw bit is adapted to laterally move the rocker arm in the second operating position when it descends along the straight main duct in order to reach and engage the head of the screw stationary at the screw-stop device.

[0012] Unfortunately, experimental tests have shown that the repeated impact of the screw bit on the body of the rocker arm tends to prematurely wear out both the rocker arm and the screw bit, with all the problems that this entails.

[0013] In addition, the automatic screwdrivers described above tend to jam with a particularly high frequency when they are used to screw self-tapping screws with a small-sized stem, such as the ones that are usually used to fix the boards of the printed circuit boards. Problem that leads to a significant decrease in the productivity of the assembly line that mounts the boards on the relative supports.

[0014] In fact experimental tests have shown that this type of self-tapping screws, when coming out of the secondary duct, can hit and laterally move the movable deflector enough to have sufficient space to rotate and get stuck crosswise inside the straight main duct.

[0015] Aim of the present invention is to provide an electrically- or pneumatically-operated autofeed auto-

matic screwdriver that does not jam in the presence of self-tapping screws with a small-sized stem.

[0016] In compliance with the above aims there is provided an autofeed automatic screwdriver as defined in Claim 1 and preferably, though not necessarily, according to any one of the claims depending on it.

[0017] The invention will now be described with reference to the accompanying drawings, which show a non-limiting embodiment thereof, wherein:

- Figure 1 is a perspective view of an autofeed automatic screwdriver realized according to the teachings of the present invention;
- Figure 2 is a side view of the bit-holding head of the automatic screwdriver shown in figure 1, sectioned along the midplane and with parts removed for clarity; whereas
- Figures 3 and 4 are two partial and enlarged views of the bit-holding head shown in figure 2, during operation of the automatic screwdriver.

[0018] With reference to figures 1, 2, 3 and 4, number 1 denotes, as a whole, an autofeed automatic screwdriver which is adapted to screw, into a generic support and in automatic manner, a succession of screws 100 preferably made of metal material and preferably of the self-tapping type.

[0019] More in detail, the automatic screwdriver 1 can be advantageously used to screw a succession of screws with a small-sized stem, preferably made of metal material and preferably of the self-tapping type, into a generic board for electronic printed boards or other support.

[0020] In other words, the automatic screwdriver 1 is adapted to receive in input a succession of screws, preferably made of metal material and preferably of the self-tapping type, and to screw in sequence and in automatic manner the single screws into a terminal board for electronic printed boards or other support.

[0021] The automatic screwdriver 1 comprises: a bit-holding head 2 which houses inside itself a known rotatable screw bit 3 and is adapted to receive, in input, a succession of screws 100 that it places in sequence in front of the screw bit 3, locally substantially coaxial to the same screw bit 3; and a motor assembly 4, preferably of the electric or pneumatic type, which is preferably rigidly connected/fixed to the bit-holding head 2 via a straight sleeve 5, and is adapted to drive into rotation the screw bit 3 about its longitudinal axis and, optionally, also to axially move the screw bit 3 inside the bit-holding head 2, so as to bring the screw bit 3 in abutment against the head 100 of the screw and then push the screw 100 out of the bit-holding head 2, against the board or other support stationary beneath the bit-holding head 2.

[0022] With reference to Figures 1 and 2, the bit-holding head 2 firstly comprises a preferably substantially V- or Y- shaped, outer casing 6 which is preferably made of metal material and is internally provided with a substantially straight main duct 7 that preferably has a circular cross-section, is open at an end 7a and is dimensioned so as to accommodate the screw bit 3 and be engaged in axially rotatable and slidable manner by the screw bit 3 and the single screws 100 to be screwed; and with a substantially straight secondary duct 8 preferably having a circular cross section, which obliquely branches off from the main duct 7 and is dimensioned so as to be able to convey a succession of screws towards the main duct 7, immediately beneath the screw bit 3.

[0023] More in detail, the longitudinal axis B of secondary duct 8 is inclined with respect to the longitudinal axis A of main duct 7 by an angle α preferably lower than 75° and preferably, though not necessarily, ranging between 35° and 45°.

[0024] Preferably, the longitudinal axes A and B moreover lie on the midplane of the outer casing 6.

[0025] The secondary duct 8 furthermore divides the main duct 7 into an upper portion and a lower portion, both substantially straight and coaxial to one another.

[0026] The upper portion of main duct 7 houses the screw bit 3 with the tip facing the joining/connecting point with the secondary duct 8. The lower portion of main duct 7, on the other hand, ends at the open end 7a of main duct 7 and is adapted to be engaged in axially slidable and rotatable manner by the screw bit 3 and by the single screws 100 to be screwed.

[0027] In other words, the screw bit 3 is housed inside the portion of main duct 7 located above the joining/connecting point with secondary duct 8 and is capable of axially moving inside the main duct 7 to and from the beneath-located open end 7a, going beyond the joining/connecting point with secondary duct 8.

[0028] In the example shown, in particular, the outer casing 6 is preferably substantially Y-shaped and preferably comprises: a central block 10 which preferably has a monolithic structure and is substantially V-shaped, with an inclination angle between the two straight branches preferably lower than 75° and preferably ranging between 35° and 45°; and a straight tubular segment 11, preferably with a circular cross section, that projects from the central block 10 starting from the bottom vertex of the V, while remaining substantially coaxial to a first straight branch of the central block 10.

[0029] The axial cavity of the straight tubular segment 11 is dimensioned so as to be engaged, in axially slidable and axially rotatable manner, by the screw bit 3 and by the screws 100 to be screwed; whereas the central block 10 is provided with a first straight hole with a circular cross section, that extends in pass-through manner inside the first straight branch of the central block 10, while remaining coaxial to the longitudinal axis of the straight tubular segment 11, and is dimensioned to form an extension of the axial cavity of the straight tubular segment 11.

[0030] The central block 10 is moreover provided with a second straight hole with a circular cross section, that branches off obliquely from the first straight hole, extends in pass-through manner inside the second straight

branch of central block 10, and is dimensioned so as to be engaged in axially sliding manner by the screws 100 to be screwed.

[0031] The axial cavity of straight tubular segment 11 and the first straight hole of central block 10 form the main duct 7.

[0032] The longitudinal axis of straight tubular segment 11, therefore, coincides with the longitudinal axis A of main duct 7.

[0033] The second straight hole of central block 10, on the other hand, forms the secondary duct 8.

[0034] In other words, the upper portion of main duct 7 and the entire secondary duct 8 are preferably entirely contained in central block 10.

[0035] In addition, the joining/connecting point between the secondary duct 8 and main duct 7 is preferably located inside the central block 10, immediately above the junction with the straight tubular segment 11.

[0036] Preferably, the outer casing 6 furthermore includes a second straight tubular segment 12 preferably having a circular cross section, which projects from the central block 10 on the opposite side with respect to the straight tubular segment 11, while remaining substantially coaxial to the longitudinal axis A of main duct 7 so as to form an extension of main duct 7.

[0037] In other words, the straight tubular segment 12 projects from the distal end of the first straight branch of central block 10, while remaining locally coaxial to the first straight hole of central block 10 and to the straight tubular segment 11.

[0038] Preferably, the central block 10, the straight tubular segment 11 and/or the straight tubular segment 12 is/are made of metal material.

[0039] With reference to Figures 2, 3 and 4, the bit-holding head 2 furthermore comprises: a straight bit-holding rod 14 preferably made of metal material, which extends coaxial to the longitudinal axis A of main duct 7, is inserted in axially slidable and angularly rotatable manner in the outer casing 6 so as to partially project into the upper portion of main duct 7, and is finally integral to the screw bit 3; and a contrast spring 15 which is interposed between the outer casing 6 and the bit-holding rod 14 and is adapted to elastically counteract the advancing/descent of the bit-holding rod 14 inside the main duct 7, towards the open end 7a.

[0040] More in detail, the bit-holding rod 14 is firmly fixed on the rear shank 16 of the screw bit 3, and is mechanically connected to the motor assembly 4 so as to be driven into rotation about its longitudinal axis, i.e. around the longitudinal axis A of main duct 7.

[0041] Preferably, the screw bit 3 is furthermore firmly fixed onto the lower end of bit-holding rod 14 in manually removable manner.

[0042] The contrast spring 15, on the other hand, is adapted to elastically hold and bring back the ensemble of screw bit 3 and bit-holding rod 14 above the joining/connecting point between the main duct 7 and the secondary duct 8.

[0043] Preferably, the motor assembly 4 is moreover adapted to axially move the bit-holding rod 14 inside the outer casing 6, so as to be able to move the screw bit 3 along the main duct 7, towards the duct open end 7a.

[0044] In the example shown, in particular, the upper end of bit-holding rod 14 is preferably provided with a coupling shank (not shown in the figures), which is specifically structured so as to be coupled in rigid manner to the motor assembly 4.

[0045] With reference to Figures 2, 3 and 4, in the example shown, in particular, the screw bit 3 is preferably located inside the central block 10 with the tip facing the straight tubular segment 11; whereas the bit-holding rod 14 projects from the central block 10 and extends inside the straight tubular segment 12, preferably for the whole length of the sleeve, so as to also jut out from the distal end of the straight tubular segment 12.

[0046] In addition, the bit-holding rod 14 is preferably dimensioned so as to also project into the straight sleeve 5, up to reach and stably couple with the motor assembly 4.

[0047] Preferably, on the other hand, the contrast spring 15 is fitted on the bit-holding rod 14 so as to have a first end in abutment against the central block 10, inside the straight tubular segment 12, and a second end in abutment against a cup, disk or other stop member (not shown in the figures), which is firmly fixed on the bit-holding rod 14, preferably close to the upper end of the same bit-holding rod 14.

[0048] More in detail, in the example shown the contrast spring 15 preferably consists of a helical spring.

[0049] With reference to Figures 1, 2, 3 and 4, the bit-holding head 2 additionally comprises a deflector assembly 17 and, preferably, also a screw-stop device 18.

[0050] The deflector assembly 17 is arranged substantially at the joining/connecting point between main duct 7 and secondary duct 8, and is adapted to selectively channel the screws 100 coming out of secondary duct 8 towards the lower portion of main duct 7, with the tip turned towards the open end 7a of the same main duct 7.

[0051] The screw-stop device 18, on the other hand, is arranged along the lower portion of main duct 7, preferably immediately downstream of the joining/connecting point with secondary duct 8, and is adapted to stop each screw 100 descending along the main duct 7 towards the open end 7a, preferably until the moment when the screw bit 3 reaches and engages the head of the screw 100. the motor assembly 4 is therefore adapted to axially move the screw bit 3 inside the main duct 7 of bit-holding head 2, so as to bring the screw bit 3 in abutment against the head of the screw 100 stationary at the screw-stop device 18, and then push the screw 100 along the lower portion of main duct 7, towards the open end 7a.

[0052] With particular reference to Figures 2, 3 and 4, the deflector assembly 17 comprises: a movable shutter 20 preferably with a plate-like structure, which is inserted in slidable manner in the outer casing 6, or rather in the central bock 10, so as to be able to move in a guillotine-

like manner on a sliding plane P oblique/inclined with respect to the longitudinal axis A of main duct 7, between a first operating position (see Figure 3) in which the movable shutter 20 obliquely intersects the main duct 7 at the joining/connecting point with the secondary duct 8, and a second operating position (see Figures 2 and 4) in which the movable shutter 20 does not project into the main duct 7; and a preferably electrically- or pneumatically-operated, moving device 21 which is preferably firmly fixed on the outer casing 6, or rather on the central block 10, beside the movable shutter 20 and is adapted to move the movable shutter 20 with respect to the outer casing 6, so as to be able to alternatively place the movable shutter 20 in the first or in the second operating position.

[0053] More in detail, when it is in the first operating position (see Figure 3), the movable shutter 20 is adapted to form an extension of the upper wall of secondary duct 8 that obliquely and preferably entirely crosses the main duct 7 and is capable of deflecting/directing the screws 100 coming out of the second secondary 8 towards the lower portion of main duct 7.

[0054] In other words, when it is in the first operating position (see Figure 3), the movable shutter 20 is adapted to form an extension of the upper wall of secondary duct 8 that entirely crosses the main duct 7 up to reach and preferably also engage the area of the lateral wall of the main duct 7 which is located on the opposite side of the mouth of secondary duct 8.

[0055] The moving device 21, on the other hand, is preferably adapted to automatically move the movable shutter 20 from the first to the second operating position (see Figures 2 and 4) when the screw bit 3 starts its descent along the main duct 7, so as to allow the screw bit 3 to freely descend in the lower portion of main duct 7; and to automatically move the movable shutter 20 from the second to the first operating position (see Figure 3), when the screw bit 3 returns into the upper portion of main duct 7.

[0056] Preferably, the moving device 21 is moreover an electrically- or pneumatically-operated linear actuator adapted to move the movable shutter 20 back and forth in the outer casing 6.

[0057] In addition, the movable shutter 20 is preferably inserted in the outer casing 6 so as to be able to slide on the oblique sliding plane P in a given direction d which is substantially coplanar to the longitudinal axes A and B of main duct 7 and of secondary duct 8.

[0058] With reference to Figures 2, 3 and 4, in particular, the sliding plane P of movable shutter 20 is preferably substantially orthogonal to the midplane of the outer casing 6, i.e. to the lying plane of main duct 7 and of secondary duct 8, and is furthermore inclined with respect to the longitudinal axis A of main duct 7 by an angle β preferably lower than 75° and preferably, though not necessarily, ranging between 35° and 45°.

[0059] Preferably, the inclination angle β of the sliding plane P of movable shutter 20 with respect to the longitudinal axis A of main duct 7 is lower than or equal to the inclination angle α of the longitudinal axis B of secondary duct 8 with respect to the longitudinal axis A of main duct 7.

[0060] With reference to Figure 3, when it is in the first operating position, the movable shutter 20 therefore forms an extension of the upper wall of secondary duct 8, which is preferably inclined by some degrees with respect to the longitudinal axis B of secondary duct 8, so as to more effectively deflect the screws 100 coming out of secondary duct 8 towards the lower portion of main duct 7.

[0061] With reference to Figures 1, 2, 3 and 4, in the example shown, in particular, the movable shutter 20 preferably consists of an oblong plate or blade substantially rectangular in shape, which is preferably made of metal material and is inserted in axially sliding manner inside a slit that is preferably made in the outer casing 6, or rather in the central block 10, immediately above the bifurcation of the two diverging branches of the Y.

[0062] In addition, the oblong plate is preferably arranged astride the midplane of the outer casing 6, i.e. astride the lying plane of the longitudinal axes A and B, and preferably extends substantially skimming the branch of the outer casing 6 housing the secondary duct 8.

[0063] With reference to Figure 2, on the other hand, the moving device 21 is preferably accommodated between the two diverging branches of the V- or Y-shaped outer casing 6 that respectively house the main duct 7 and the secondary duct 8.

[0064] More in detail, the moving device 21 preferably comprises: a double-acting pneumatic cylinder 22 which is firmly fixed on the branch of the outer casing 6 housing the secondary duct 8, with the movable stem 23 arranged parallel and integral to an axial end of the movable shutter 20; and optionally also an electro-pneumatic control unit (not shown) which is adapted to control the pressurized air flowing into the two chambers of the pneumatic cylinder 22, so as to be able, on command, to axially move the movable stem 23 and the movable shutter 20 integral thereto.

[0065] Preferably, the electro-pneumatic control unit is moreover adapted to synchronize the movements of the movable shutter 20 with the movements of the screw bit 3.

[0066] With reference to Figures 2, 3 and 4, the screw-stop device 18, on the other hand, is adapted to stop each single screw 100 descending along the lower portion of main duct 7, arranging it with the tip of the screw facing the open end 7a of main duct 7 and with the head of the screw facing the screw bit 3, and is preferably located on the straight tubular segment 11 close to the junction with the central block 10.

[0067] Preferably, the screw-stop device 18 additionally comprises: at least one and preferably a plurality of radially movable latches 25 which lie on a same reference plane substantially perpendicular to the longitudinal axis A of straight tubular segment 11, are arranged inside the

axial cavity of straight tubular segment 11 spaced apart around the longitudinal axis A of the segment, and are finally inserted in axially sliding manner inside a series of radial seats that are formed in the lateral wall of the straight tubular segment 11; and an elastic member 26 which is adapted to elastically keep the crown of latches 19 in a locking position (see Figure 3) in which all latches 25 slightly project into the straight tubular segment 11 so as to prevent the passage of the head of the screw 100.

[0068] More in detail, the latches 25 preferably are at least three in number (four in the example shown) and are preferably angularly equally spaced around the longitudinal axis A of the straight tubular segment 11. Preferably, the latches 25 moreover have a spherical shape, and are preferably finally inserted in axially slidable manner inside a series of radial through holes that are made in the lateral wall of the straight tubular segment 11, equally angularly spaced around the longitudinal axis A of the segment.

[0069] Preferably, the movable latches 25 furthermore have a diameter that is such as to project out of the lateral wall of the straight tubular segment 11, on opposite sides of the same wall.

[0070] On the other hand, the elastic member 26 preferably consists of an elastic annular body preferably made of elastomeric material, which is fitted on the straight tubular segment 11, substantially coplanar to the crown of latches 25, so as to surround the crown of latches 25 and be able to elastically push all the latches 19 towards the centre of the straight tubular segment 11.

[0071] More in detail, in the example shown the screw-stop device 18 preferably comprises two crowns of movable latches 25 arranged along the straight tubular segment 11, one above the other; and two elastic members 26 each adapted to elastically keep a respective crown of movable latches 25 in the locking position.

[0072] Finally, with reference to Figures 1 and 2, the autofeed automatic screwdriver 1 is preferably moreover provided with an in-feed pipe 30 preferably of flexible type, which is adapted to connect the mouth of the secondary duct 8 to a screw feeding apparatus (not shown in the figures) which, in turn, is capable of automatically feeding a succession of screws 100 at inlet of the secondary duct 8 of the bit-holding head 2 via the in-feed pipe 30.

[0073] The screw feeding apparatus is a machinery already widely known in the field of autofeed automatic screwdrivers, and therefore won't be further described.

[0074] General operation of autofeed automatic screwdriver 1 is easily inferable from the description above, and therefore does not require further explanations.

[0075] As regards, on the other hand, the bit-holding head 2, the movable shutter 20 moves in guillotine-like manner inside the outer casing 6, so as to obliquely extend, when the screw bit 3 is in the upper portion of main duct 7, inside the main duct 7 at the joining/connecting point with the secondary duct 8, thus to deflect/direct each screw 100 coming out of secondary duct 8 towards the lower portion 7 of main duct 7, with the tip turned towards the open end 7a of the same main duct 7.

[0076] The advantages connected to the particular structure of the bit-holding head 2 are remarkable.

[0077] The automatic movement of movable shutter 20 prevents the screw bit 3 from being subjected to wear.

[0078] Furthermore, the autofeed automatic screwdriver 1 is more compact than the ones currently known and, in addition, does not have movable parts that, during operation, can change the outer shape of the nose or oblong lower section of the automatic screwdriver 1.

[0079] In addition, experimental tests have shown that the movable shutter 20, by forming an extension of the upper wall of secondary duct 8, allows to more effectively deflect/direct the screws 100 towards the lower portion of main duct 7.

[0080] Finally the guillotine-like movement of the plate-like movable shutter 20 along a plane inclined with respect to the longitudinal axis B of secondary duct 8 prevents the screws 100 coming out of secondary duct 8 from autonomously moving the movable shutter 20.

[0081] It is finally clear that changes and variations can be made to the autofeed automatic screwdriver 1 described above without thereby departing from the scope of protection of the invention.

Claims

1. An autofeed automatic screwdriver (1) comprising: a bit-holding head (2) that houses inside a rotatable screw bit (3) and is adapted to receive at inlet a succession of screws (100) that are arranged in sequence in front of the screw bit (3); and a motor assembly (4) which is adapted to drive into rotation the screw bit (3) about its longitudinal axis;
the bit-holding head (2) comprising: an outer casing (6) internally provided with a substantially straight, main duct (7) open at the bottom and which accommodates said screw bit (3) inside an upper portion of the duct, and a substantially straight, secondary duct (8) that branches off obliquely from the main duct (7) and is dimensioned so as to convey a succession of screws (100) into the main duct (7), below the screw bit (3); and a deflector assembly (17) which is located substantially at the joining/ connecting point between the main duct (7) and the secondary duct (8), and is adapted to channel the screws (100) coming out from the secondary duct (8) towards the lower portion of the main duct (7);
the autofeed automatic screwdriver (1) being **characterized in that** said deflector assembly (17) comprises: a movable shutter (20) which is inserted in axially slidable manner in the outer casing (6) so that it can move in a guillotine-like manner on a sliding plane (P) inclined with respect to the longitudinal axis (A) of the main duct (7), between a first operating position in which the movable shutter (20) obliquely

intersects the main duct (7), at the joining/connecting point with the secondary duct (8), and a second operating position in which the movable shutter (20) does not protrude inside the main duct (7); and a moving device (21) adapted to place the movable shutter (20) alternately in the first or in the second operating position.

2. Automatic screwdriver according to Claim 1, **characterized in that** the movable shutter (20) has a plate-like structure.

3. Automatic screwdriver according to Claim 1 or 2, **characterized in that** the sliding plane (P) of the movable shutter (20) is substantially orthogonal to the laying plane of the main (7) and secondary (8) ducts.

4. Automatic screwdriver according to Claim 1, 2 or 3, **characterized in that** the longitudinal axis (B) of the secondary duct (8) is inclined with respect to the longitudinal axis (A) of the main duct (7) by an angle (α) of less than 75°; and/or that the sliding plane (P) of the movable shutter (20) is inclined with respect to the longitudinal axis (A) of the main duct (7) by an angle (β) of less than 75°.

5. Automatic screwdriver according to any one of the preceding claims, **characterized in that** the inclination angle (β) of the sliding plane (P) of the movable shutter (20) with respect to the longitudinal axis (A) of the main duct (7) is lower or equal to the inclination angle (α) of the longitudinal axis (B) of the secondary duct (8) with respect to the longitudinal axis (A) of the main duct (7).

6. Automatic screwdriver according to any one of the preceding claims, **characterized in that** the movable shutter (20), when placed in the first operating position, is adapted to form an extension of the upper wall of the secondary duct (8) that obliquely crosses the main duct (7) .

7. Automatic screwdriver according to Claim 6, **characterized in that** the movable shutter (20), when placed in the first operating position, is adapted to form an extension of the upper wall of the secondary duct (8) which completely crosses the main duct (7) up to reach the lateral wall of the main duct (7) on the opposite side of the mouth of the secondary duct (8).

8. Automatic screwdriver according to Claim 6 or 7, **characterized in that** said extension of the upper wall of the secondary duct (8) is inclined with respect to the longitudinal axis (B) of the secondary duct (8).

9. Automatic screwdriver according to any one of the preceding claims, **characterized in that** the outer casing (6) is substantially V- or Y- shaped.

10. Automatic screwdriver according to Claim 9, **characterized in that** the moving device (21) is accommodated between the two diverging branches of the V- or Y- shaped outer casing (6) that respectively house the main duct (7) and the secondary duct (8).

11. Automatic screwdriver according to any one of the preceding claims, **characterized in that** the moving device (21) is an electrically- or pneumatically- operated, linear actuator.

12. Automatic screwdriver according to any one of the preceding claims, **characterized in that** the bit-holding head (2) furthermore comprises a bit-holding rod (14) which extends coaxial to the longitudinal axis (A) of the main duct (7), is inserted in axially slidable and angularly rotatable manner in the outer casing (6) so as to partly protrude inside the upper portion of the main duct (7), and is finally integral with the screw bit (3); said bit-holding rod (14) being mechanically connected to the motor assembly (4) so as to be driven into rotation about its longitudinal axis.

13. Automatic screwdriver according to claim 12, **characterized in that** the bit-holding head (2) furthermore comprises a contrast spring (15) which is interposed between the outer casing (6) and the bit-holding rod (14), and is adapted to elastically counteract the advancing/ descent of the bit-holding rod (14) within the main duct (7), towards the open end (7a) of the same main duct (7).

14. Automatic screwdriver according to any one of the preceding claims, **characterized in that** the bit-holding head (2) furthermore comprises a screw-stop device (18) which is arranged along the lower portion of the main duct (7), downstream of the joining/connecting point with the secondary duct (8), and is adapted to stop each screw (100) which descends along the main duct (7) towards the open end (7a) .

15. Automatic screwdriver according to any one of the preceding claims, **characterized in that** the motor assembly (4) is adapted to move axially the screw bit (3) within the bit-holding head (2), so as to bring the screw bit (3) in abutment against the head of the screw (100) and then push the screw (100) along the main duct (7), towards the open end (7a).

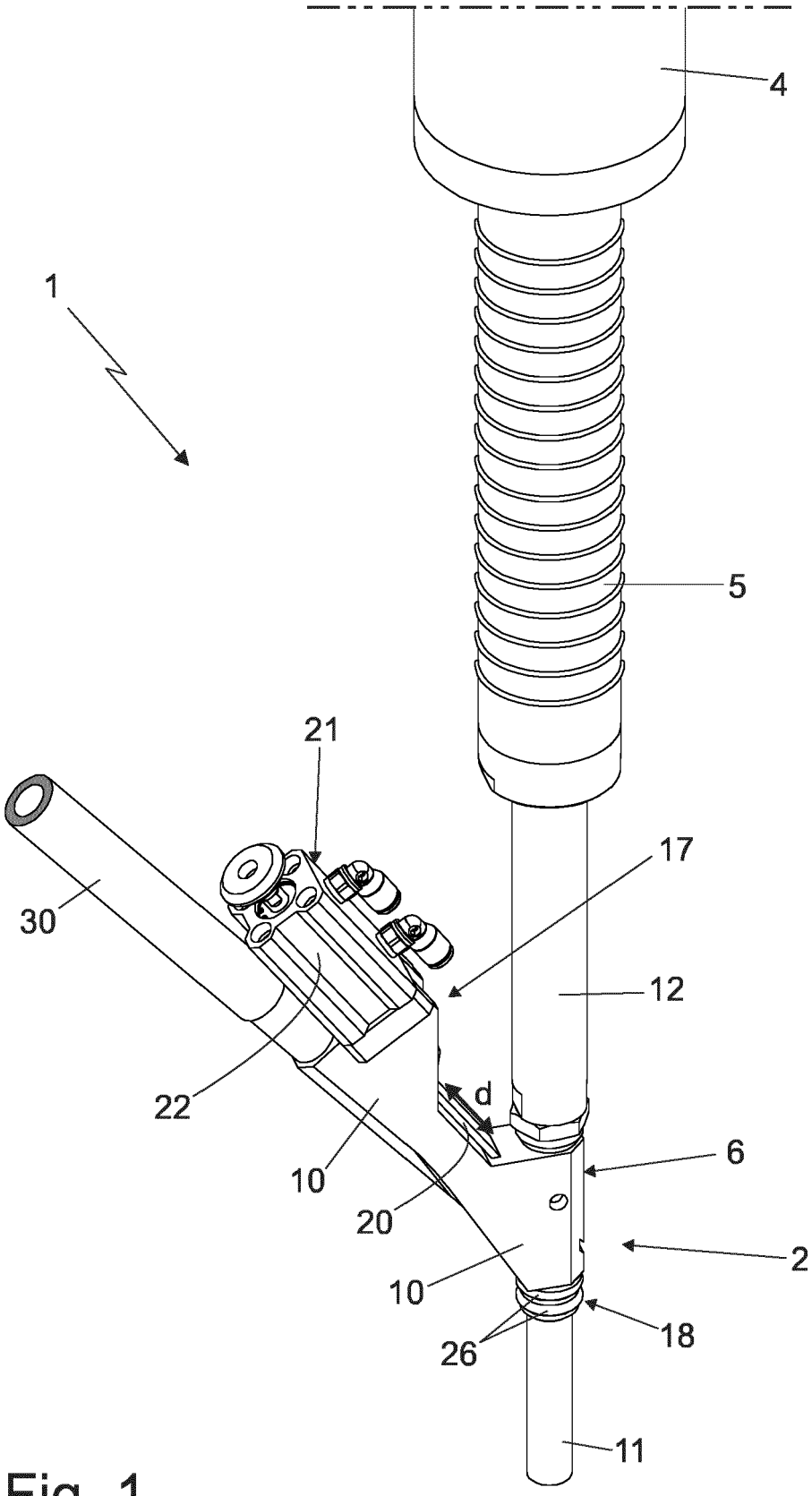

Fig. 1

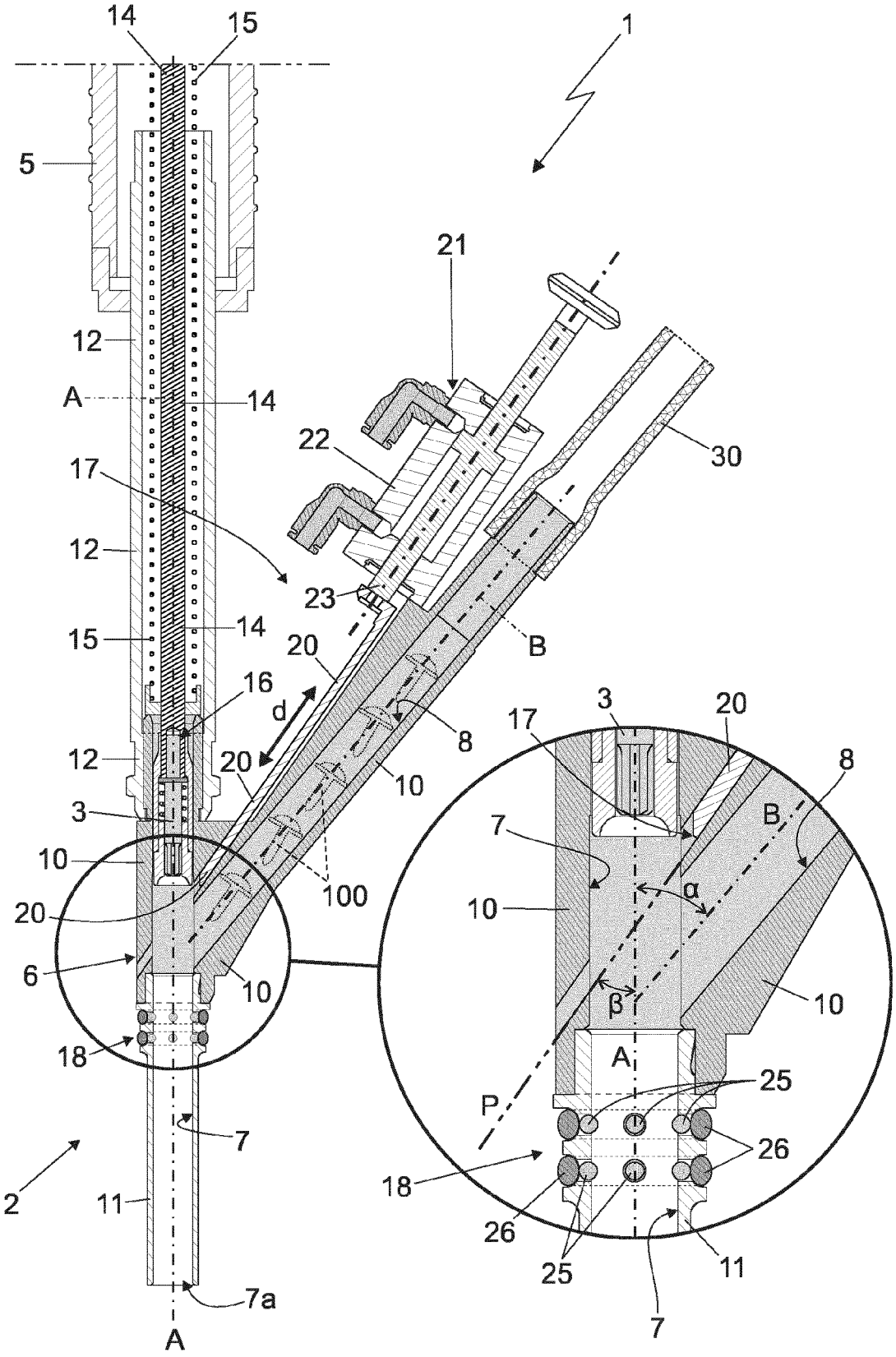
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Fig. 2

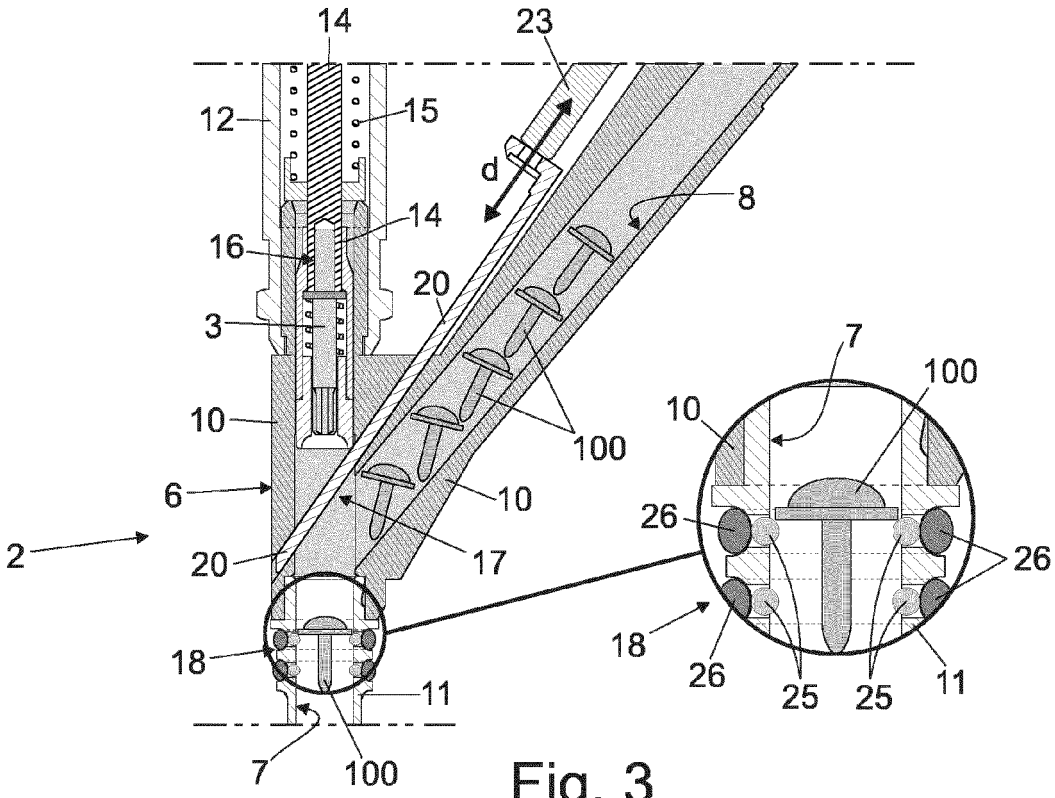
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Fig. 3

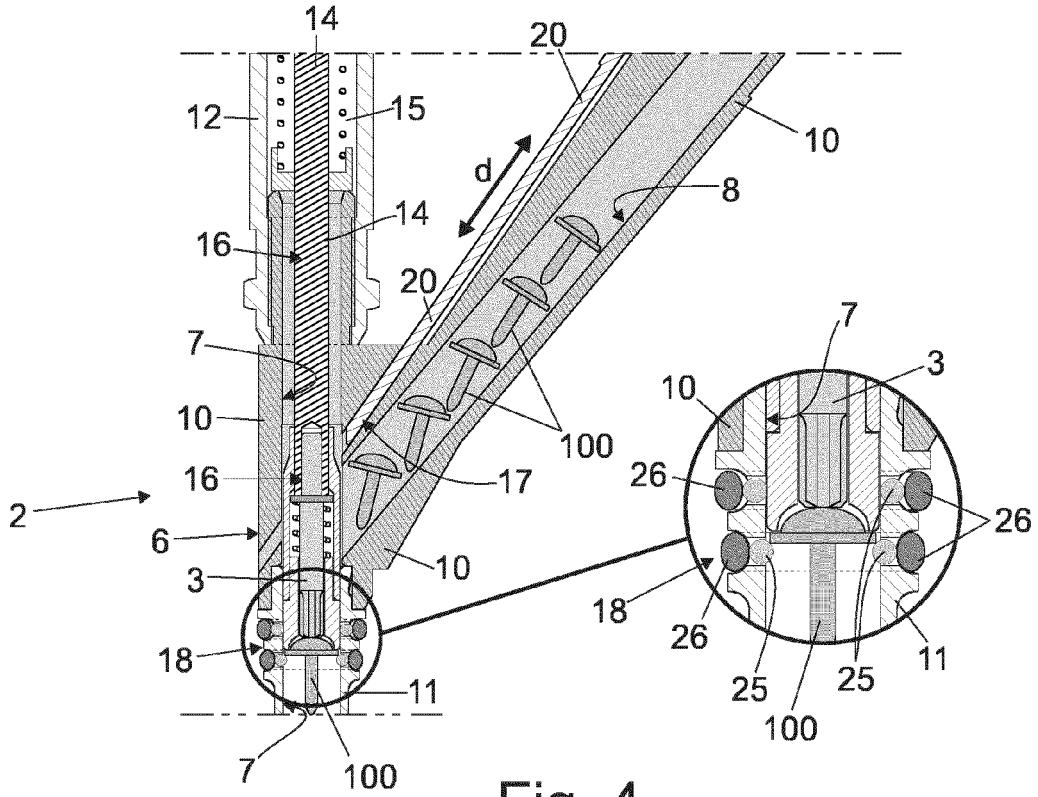
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Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 17 21 0661

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B25B
E04D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	3 May 2018	Pothmann, Johannes

CATEGORY OF CITED DOCUMENTS

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