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(54) Screw driving gun with a screwbelt-retaining member

(57) A belt-retaining member (34) is disposed in a slider member (33) of a driving gun 3, and includes an engaging finger (34F) with a pointed front end (340) , an enlarged rear end (344) , and upper and lower sliding faces (341, 342) that extend divergently and rearwardly from the pointed front end 340 toward the enlarged rear end (344). The upper and lower sliding faces (341,342) are in frictional contact with a periphery of a retaining notch unit (401) formed in a screw feed belt (40) to permit the periphery of the retaining notch unit (401) in the screw feed belt (40) to overcome friction between the periphery of the retaining notch unit (401) and the upper sliding face (341) for sliding downwardly along the upper sliding face (341) when the screw feed belt (40) is drawn downwardly, and to permit the periphery of the retaining notch unit (401) to overcome friction between the periphery of the retaining notch unit (401) and the lower sliding face (342) for sliding upwardly along the lower sliding face (342) when the screw feed belt (40) is drawn upwardly.

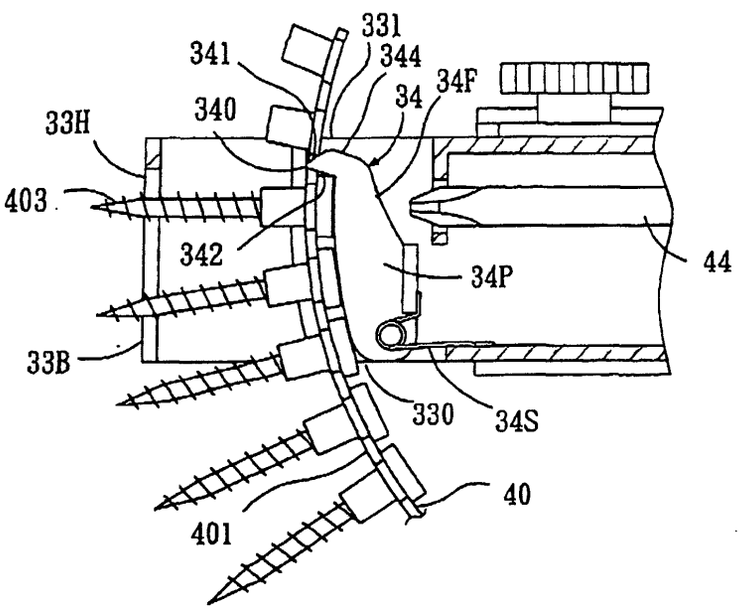


FIG. 6

EP 1 293 299 A2

Description

[0001] The invention relates to a screw driving gun, more particularly to a screw driving gun for use with a screw feed belt.

[0002] Referring to Figures 1 and 3, a conventional screw driving gun 1 is shown to be adapted for use with a screw feed belt 20 that has a belt body 200, a plurality of screws 202 retained on the belt body 200 in such a manner that an individual screw can be released by pressing on a head of the individual screw through the belt body 200, and a plurality of retaining notch units 201 (see Fig. 4) respectively disposed between adjacent ones of the screws 202. The conventional screw driving gun 1 includes a gun housing 2, a tubular barrel 12, a sliding nose piece 13, a screw driving shaft 24, and a belt-retaining member 14.

[0003] As illustrated, the tubular barrel 12 has a peripheral wall 12W with a rear end mounted on the gun housing 2 via a connecting member 11, and an opposite front end. The peripheral wall 12W defines a guiding chamber 120 in a longitudinal direction.

[0004] The screw driving shaft 24 defines an axis, and is disposed in the guiding chamber 120 of the barrel 12. The driving shaft 24 has a driven end, and a driving bit opposite to the driven end.

[0005] A drive unit 25 is disposed in the gun housing 2, and is coupled to the driven end of the screw driving shaft 24 via a chuck assembly (not shown) that is disposed in the connecting member 11 so as to drive the screw driving shaft 24 rotatably.

[0006] The sliding nose piece 13 includes a slidable housing 130 that has a lower opening 131, and a rear portion 13R which is disposed in the barrel 12 so as to permit the sliding nose piece 13 to slide into the barrel 12 in the longitudinal direction. A front portion 13F of the sliding nose piece 13 defines a screw-receiving chamber therein. A belt passage 132 is defined between the front and rear portions 13F,13R of the sliding nose piece 13 in a conventional manner such that the belt passage 132 is in spatial communication with the lower opening 131. The screw-receiving chamber of the sliding nose piece 13 is capable of receiving the lead screw 202 from the screw feed belt 20 when the latter is fed thereinto from the lower opening 131. The front portion 13F of the sliding nose piece 3 further has an abutting end 13B which is adapted to abut against a work piece surface and which is provided with a screw-extension hole in alignment with the guiding chamber 120.

[0007] The belt-retaining member 14 is disposed in the middle portion of the sliding nose piece 13, and includes a spring-loaded pawl arm 14P that is mounted pivotally in the middle portion of the sliding nose piece 13 and that is urged forwardly, and an engaging finger 14F that projects frontwardly from the pawl arm 14P. When the screw feed belt 20 is fed into the screw-receiving chamber of the sliding nose piece 13, the engaging finger 14F is adapted to engage one of the retaining notch unit 201 in the screw feed belt 20 which is disposed above and next to the lead screw 202 in the screw-receiving chamber. The engaging finger 14F has a horizontal upper face 140 that extends parallel to an axis of the screw driving shaft 24, and a lower sliding face 141 that extends inclinedly from the front end of the upper face 140 and that forms an angle with the axis of the screw driving shaft 24. The horizontal upper face 140 and the lower sliding face of the engaging finger 14F are in frictional contact with a periphery that defines the respective one of the retaining notch unit 201 so as to position the screw feed belt 20 in the belt passage 132.

[0008] A disadvantage of the aforesaid conventional screw driving gun 1 resides in that, in case jamming of the screw 202 occurs during the screw driving operation, the screw feed belt 20 is permitted to be drawn only in an upward direction relative to the belt passage 132 of the sliding nose piece 13, thereby limiting removal of the screw feed belt 20 in only one direction. However, it generally occurs that the screw feed belt 20 needs to be pulled downward in case the removal of the screw feed belt 20 in the upward direction is also jammed. The horizontal upper face 140 cannot permit the downward sliding movement of the respective retaining notch unit 201 therealong.

[0009] Therefore, an object of at least the preferred embodiment of this invention is to provide a screw driving gun with a belt-retaining member having a structure capable of overcoming the aforesaid disadvantage that is generally associated with the conventional screw driving gun.

[0010] Generally this object is achieved by providing the screw driving gun with a belt retaining member having a structure to facilitate detachment of the screw feed belt from a slider member in case jamming of screws occurs during the screw driving operation.

[0011] The screw driving gun according to an embodiment of the present invention is adapted for use with a screw feed belt that includes a belt body, a plurality of screws retained on the belt body, and a plurality of retaining notch units respectively disposed between adjacent ones of the screws. The screw driving gun, accordingly, includes a gun housing, a tubular barrel, a screw driving shaft, a drive unit, a hollow slider member, and a belt-retaining member. The tubular barrel has a peripheral wall with a rear end mounted on the gun housing, and an opposite front end. The peripheral wall defines a guiding chamber in a longitudinal direction. The screw driving shaft defines an axis, and is disposed in the guiding chamber of the barrel. The screw driving shaft has a driven end and a driving bit opposite to the driven end. The drive unit is mounted in the gun housing, and is coupled to the driven end of the screw driving shaft so as to drive the screw driving shaft rotatably. The slider member includes a slidable housing that has a lower opening, a rear portion which is coupled slidably to the front end of the barrel so as to permit the slider

member to be slidable relative to the barrel in the longitudinal direction, a front portion which defines a screw-receiving chamber, and a belt passage that is formed between the front and rear portions in such a manner that the belt passage is in spatial communication with the lower opening. The screw-receiving chamber of the slider member is capable of receiving a lead screw from the screw feed belt when the screw feed belt is fed thereinto via the lower opening of the slidable housing. The front portion of the slidable housing further has an abutting end which is adapted to abut against a work piece surface and which is provided with a screw-extension hole in alignment with the shaft-receiving chamber. The belt-retaining member is disposed in the rear portion of the slidable housing, and includes a spring-biased pawl arm which is mounted pivotally in the screw-receiving chamber, and which is urged forwardly toward the abutting end, and an engaging finger which projects frontwardly from the pawl arm and which is adapted to engage one of the retaining notch units in the screw feed belt that is disposed above and next to the lead screw in the screw-receiving chamber. The engaging finger has a pointed front end adapted to be received in the respective one of the retaining notch units in the screw feed belt, an enlarged rear end, and opposing upper and lower sliding faces extending rearwardly and divergently from the pointed front end to the enlarged rear end. The upper and lower sliding faces of the engaging finger incline at angles relative to the axis of the screw driving shaft, and are adapted to be in frictional contact with a periphery defining the respective one of the retaining notch units in the screw feed belt so as to position the screw feed belt in the belt passage and so as to permit the periphery of the respective one of the retaining notch units to overcome friction between the periphery of the respective one of the retaining notch units and the upper sliding face for sliding downwardly along the upper sliding face when the screw feed belt is drawn downwardly from the belt passage, and so as to permit the periphery of the respective one of the retaining notch units to overcome friction between the periphery of the respective one of the retaining notch units and the lower sliding face for sliding upwardly along the lower sliding face when the screw feed belt is drawn upwardly from the belt passage, thereby disengaging the respective one of the retaining notch units in the screw feed belt from the engaging finger. Aspects of the invention are set out in the independent claims. Preferred features are as set out in the dependent claims.

[0012] Preferred features of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is a schematic partly sectional view of a conventional screw driving gun;

Figure 2 is a fragmentary schematic partly sectional view of the conventional screw driving gun;

Figure 3 is a fragmentary schematic partly sectional view of the conventional screw driving gun from which a screw feed belt is removed therefrom;

Figure 4 is a top planar view of the screw feed belt employed in the conventional screw driving gun;

Figure 5 is a fragmentary schematic sectional view of the preferred embodiment of a screw driving gun according to the present invention, illustrating how a screw feed belt is retained by a belt-retaining member disposed in a slider member of the preferred embodiment;

Figure 6 is a fragmentary schematic partly sectional view of the preferred embodiment;

Figure 7 is a fragmentary schematic partly sectional view of the preferred embodiment, from which a screw feed belt is removed therefrom; and

Figure 8 is an exploded, fragmentary perspective view of the preferred embodiment, illustrating how a coupling member is mounted on a gun housing to enclose a chuck assembly therein for holding a screw driving shaft.

[0013] Referring to Figures 5 to 7, the preferred embodiment of a screw driving gun 3 of the present invention is adapted for use with a screw feed belt 40 that includes a belt body 402, a plurality of screws 403 retained securely on the belt body 402 in such a manner that an individual screw 403 can be released from the belt body 402 upon pressing on the screw head through the belt body 402, and a plurality of retaining notch units 401 respectively disposed between adjacent ones of the screws 403. The preferred embodiment, accordingly, includes a gun housing 4, a tubular barrel 32, a hollow slider member 33, a screw driving shaft 44, a drive unit 45, and a belt-retaining member 34.

[0014] As illustrated, the tubular barrel 32 has a peripheral wall 32W with a rear end 321 mounted on the gun housing 4 via a coupling member 31, and an opposite front end 322. The peripheral wall 32W defines a shaft guiding chamber 320 in a longitudinal direction.

[0015] The screw driving shaft 44 is disposed in the guiding chamber 320 of the barrel 32, and defines an axis. The screw driving shaft 44 has a driven end 441 and a driving bit 442 opposite to the driven end 441.

[0016] The drive unit 45, such as a motor, is mounted in the gun housing 4, and is coupled to the driven end 441 of the screw driving shaft 44 via a chuck assembly 311 that is disposed in the coupling member 31 so as to drive the screw driving shaft 44 rotatably. Preferably, the coupling member 31 is coupled to the gun housing 4 by means of groove-and tongue engagement 411,422, as best shown in Figure 8, so as to enclose the chuck assembly 311 therein. Since the feature of the subject invention does not reside in the particular coupling arrangement, a detailed description of the same is omitted herein for the sake of brevity.

[0017] The slider member 33 includes a slidable housing that has a lower opening 330, a rear portion 33R which is coupled slidably to the front end 322 of the bar-

rel 32 so as to permit the slider member 33 to be slidable relative to the barrel 32 in the longitudinal direction, a front portion 33F which defines a screw-receiving chamber, and a belt passage 331 that is formed between the front and rear portions (33R, 33F) and that extends in a transverse direction relative to the longitudinal direction and that is in spatial communication with the lower opening 330. The screw-receiving chamber of the slider member 33 is capable of receiving the lead screw 403 from the screw feed belt 40 when the latter is fed intermittently thereinto via the lower opening 330 of the slidable housing. Since the feature of the subject invention does not reside in the specific structure of the belt feeding mechanism, a detailed description of the same will be omitted herein for the sake of brevity.

[0018] As shown in Figures 5 and 6, the front portion 33F of the slidable housing 33 further has an abutting end 33B which is adapted to abut against a work piece surface (not shown) and which is provided with a screw-extension hole 33H in alignment with the guiding chamber 320 in the barrel 32.

[0019] The belt-retaining member 34 is disposed in the rear portion 33R of the slidable housing 33, and includes a pawl arm 34P having a lower end which is mounted pivotally in the screw-receiving chamber and which is urged forwardly toward the abutting end 33B by a spring unit 34S, and an engaging finger 34F which projects frontwardly from a top end of the pawl arm 34P and which is adapted to engage one of the retaining notch units 401 in the screw feed belt 40 which is disposed above and next to the lead screw 403 in the screw-receiving chamber. The engaging finger 34F has a pointed front end 340 adapted to be received in the respective one of the retaining notch units 401, an enlarged rear end 344, and upper and lower sliding faces 341,342 which extend rearwardly and divergently from the pointed front end 340 to the enlarged rear end 344. The upper and lower sliding faces 341,342 of the engaging finger 34F incline at angles relative to the axis of the screw driving shaft 44 and are adapted to be in frictional contact with a periphery defining the respective one of the retaining notch units 401 so as to position the screw feed belt 40 in the belt passage 331 of the slidable housing 33. In case jamming of the screws occurs during the screw driving operation, the screw feed belt 40 can be drawn downwardly from the belt passage 331 of the slidable housing 32 so as to permit the periphery of the respective one of the retaining notch unit 401 to overcome friction between the periphery of the respective one of the retaining notch unit 401 and the upper sliding face 341 for sliding downwardly along the upper sliding face 341 by applying a downward pulling force, thereby disengaging the respective one of the retaining notch unit 401 in the screw feed belt 40 from the engaging finger 34F. The screw feed belt 40 can also be drawn upwardly from the belt passage 331 of the slider member 33 so as to permit the periphery of the respective one of the retaining notch units 401 to overcome friction between the periphery of the respective one of the retaining notch units 401 and the lower sliding face 342 for sliding upwardly along the lower sliding face 342, thereby disengaging the respective one of the retaining notch units 401 in the screw feed belt 40 from the engaging finger 34F.

[0020] While the present invention has been described in its preferred embodiments, it is to be understood that the words which have been used are words of description rather than limitation and that changes may be made to the invention without departing from its scope as defined by the appended claims.

[0021] Each feature disclosed in this specification (which term includes the claims) and/or shown in the drawings may be incorporated in the invention independently of other disclosed and/or illustrated features.

[0022] The text of the abstract filed herewith is repeated here as part of the specification.

[0023] A belt-retaining member (34) is disposed in a slider member (33) of a driving gun 3, and includes an engaging finger (34F) with a pointed front end (340), an enlarged rear end (344), and upper and lower sliding faces (341, 342) that extend divergently and rearwardly from the pointed front end 340 toward the enlarged rear end (344). The upper and lower sliding faces (341,342) are in frictional contact with a periphery of a retaining notch unit (401) formed in a screw feed belt (40) to permit the periphery of the retaining notch unit (401) in the screw feed belt (40) to overcome friction between the periphery of the retaining notch unit (401) and the upper sliding face (341) for sliding downwardly along the upper sliding face (341) when the screw feed belt (40) is drawn downwardly, and to permit the periphery of the retaining notch unit (401) to overcome friction between the periphery of the retaining notch unit (401) and the lower sliding face (342) for sliding upwardly along the lower sliding face (342) when the screw feed belt (40) is drawn upwardly.

Claims

1. A screw driving gun adapted for use with a screw feed belt carrying a plurality of screws and being formed with a plurality of engageable formations, the screw driving gun comprising a feeding mechanism having a feeding element for engaging the engageable formation for feeding the screw feed belt in a first direction, wherein the feeding element is formed such as to permit the screw feed belt to be advanced and retracted relative to the feeding element respectively in the first direction and in a second direction opposite the first direction against friction between the feeding element and the engageable formation.

2. A screw driving gun according to Claim 1, wherein the feeding element is pointed in section.

3. A screw driving gun according to Claim 1 or Claim 2, wherein the feeding element comprises two surfaces for engaging the engageable formation which are both inclined with respect to a plane perpendicular to the first direction.

4. A screw driving gun according to Claim 3, wherein the inclined surfaces act as ramps up which the engageable formation can slide to reverse said relative movement.

5. A screw driving gun according to any preceding claim, wherein the feeding mechanism comprises a pawl lever.

6. A screw driving gun according to Claim 5, wherein the pawl lever is biassed towards the screw feed belt.

7. A screw driving gun according to any preceding claim, in combination with a said screw feed belt.

8. A combination according to Claim 6, wherein each engageable formation comprises at least one notch.

9. A screw driving gun (3) adapted for use with a screw feed belt (40) that includes a belt body (402), a plurality of screws 403 retained on the belt body (402) in such a manner that an individual screw (403) can be released upon pressing on a head of the individual screw, and a plurality of retaining notch units (401) respectively disposed between adjacent ones of the screws, the screw driving gun 3 **characterized by**:

a gun housing (4);
a tubular barrel (32) having a peripheral wall (32W) with a rear end 321 mounted on the gun housing (4), and an opposite front end (322), the peripheral wall (32W) defining a guiding chamber (320) in a longitudinal direction;
a screw driving shaft (44) defining an axis, disposed in the guiding chamber (320) of the barrel (32), and having a driven end (441) and a driving bit (442) opposite to the driven end (441);
a drive unit (45) mounted in the gun housing (4) and coupled to said driven end (441) of the screw driving shaft (44) so as to drive the screw driving shaft (44) rotatably;
a hollow slider member (33) including a slidable housing that has a lower opening (330), a rear portion 33R which is coupled slidably to the front end 322 of the barrel (32) so as to permit the slider member (33) to be slidable relative to the barrel (32) in the longitudinal direction, a front portion (33F) defining a screw-receiving chamber, and a belt passage 331 that is formed between the front and rear portions (33F, 33R) and that extends in a transverse direction relative to the longitudinal direction and that is in spatial communication with the lower opening (330), the screw-receiving chamber of the slider member (33) being capable of receiving a lead screw (403) from the screw feed belt (40) when the screw feed belt (40) is fed thereinto via the lower opening (330) of the slidable housing, the front portion (33F) of the slidable housing further having an abutting end (33B) which is adapted to abut against a work piece surface and which is provided with a screw-extension hole (33H) in alignment with the guiding chamber (320); and
a belt-retaining member (34) disposed in the rear portion (33R) of the slidable housing (33), and including a spring-biased pawl arm (34P) mounted pivotally in the screw-receiving chamber and urged forwardly toward the abutting end (33B), and an engaging finger (34F) projecting frontwardly from the pawl arm (34P) and adapted to engage one of the retaining notch units (401) in the screw feed belt (40) which is disposed above and next to the lead screw in the screw-receiving ohamber, the engaging finger (34F) having a pointed front end (340) adapted to be received in the respective one of the retaining notch units (401), an enlarged rear end (344), and opposing upper and lower sliding faces (341,342) extending rearwardly and divergently from the pointed front end (340) toward the enlarged rear end (344), the upper and lower sliding faces (341, 342) inclining at angles relative to the axis of the screw driving shaft (44) and being adapted to be in frictional contact with a periphery defining the respective one of the retaining notch units (401) so as to position the screw feed belt (40) in the belt passage (331) and so as to permit the periphery of the respective one of the retaining notch units (401) to overcome friction between the periphery of the respective one of the retaining notch unit (401) and the upper sliding face (341) for sliding downwardly along the upper sliding face (341) when the screw feed belt (40) is drawn downwardly from the belt passage (331), and so as to permit the periphery of the respective one of the retaining notch units (401) to overcome friction between the periphery of the respective one of the retaining notch units (401) and the lower sliding face (342) for sliding upwardly along the lower sliding face (342) when the screw feed belt (40) is drawn upwardly from the belt passage (331), thereby disengaging the respective one of the retaining notch units (401) in the screw feed belt (40) from the engaging finger 34F.

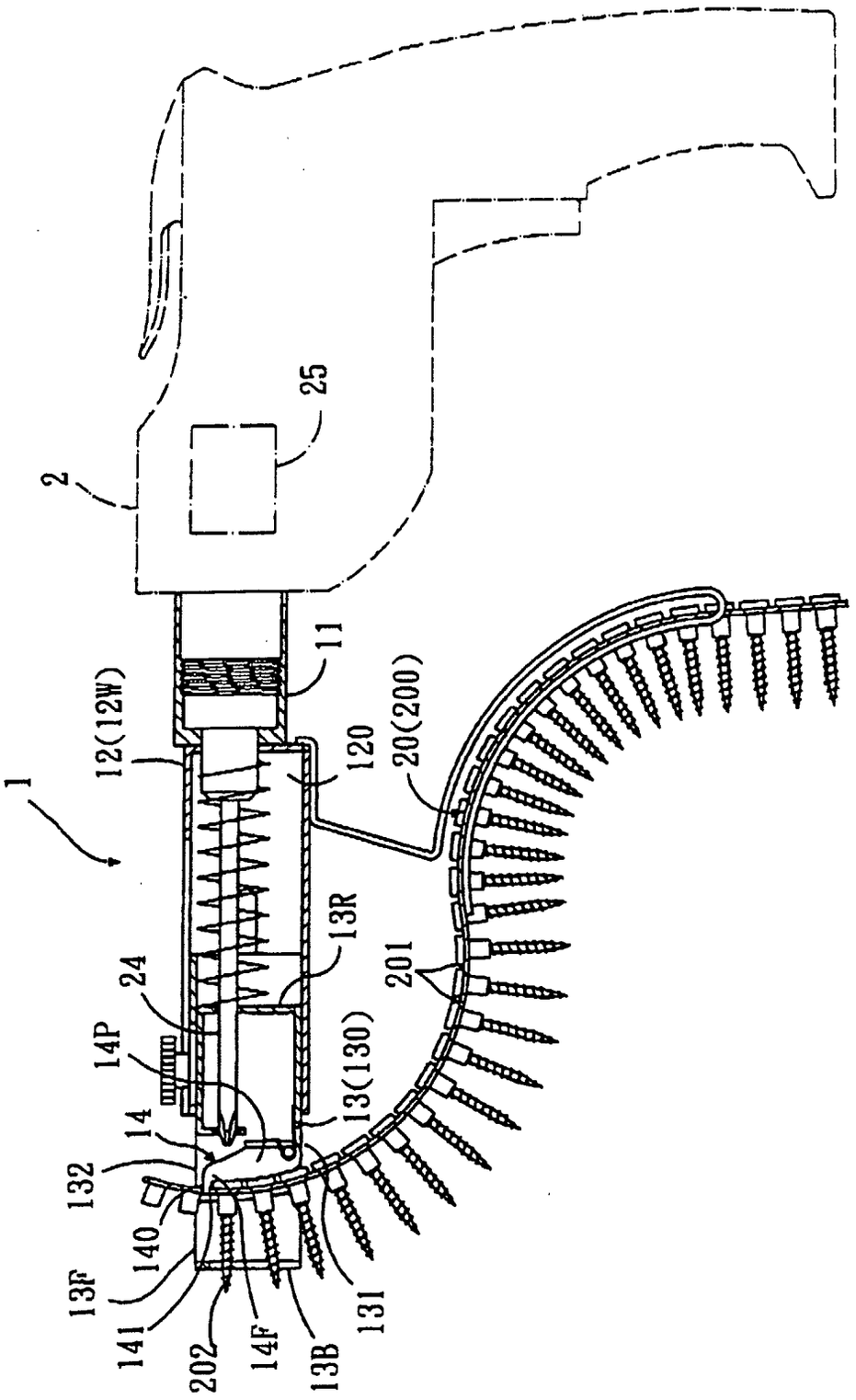


FIG. 1
PRIOR ART

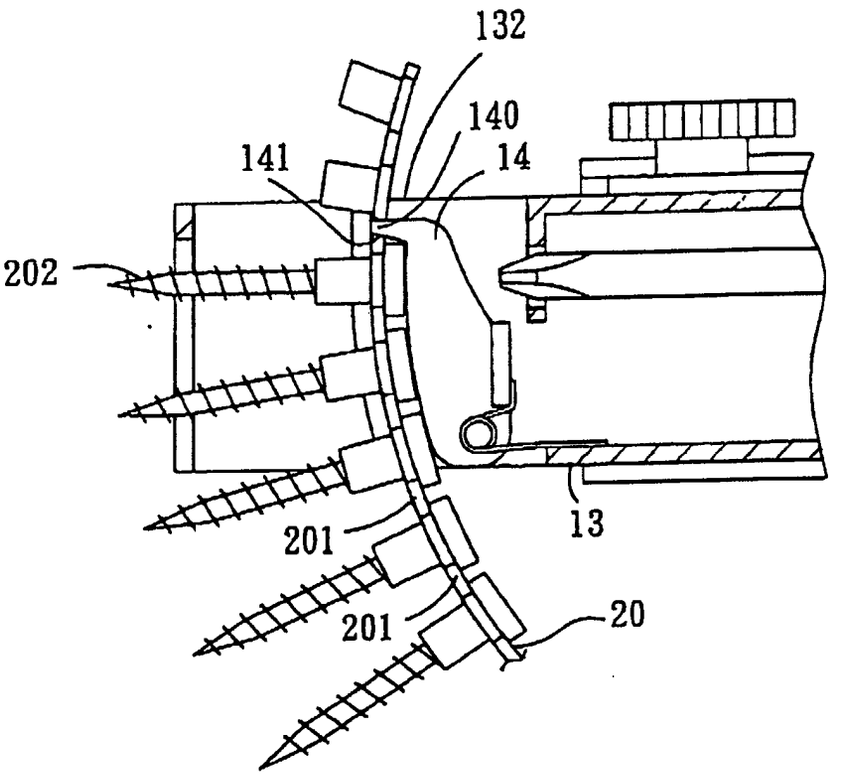


FIG. 2
PRIOR ART

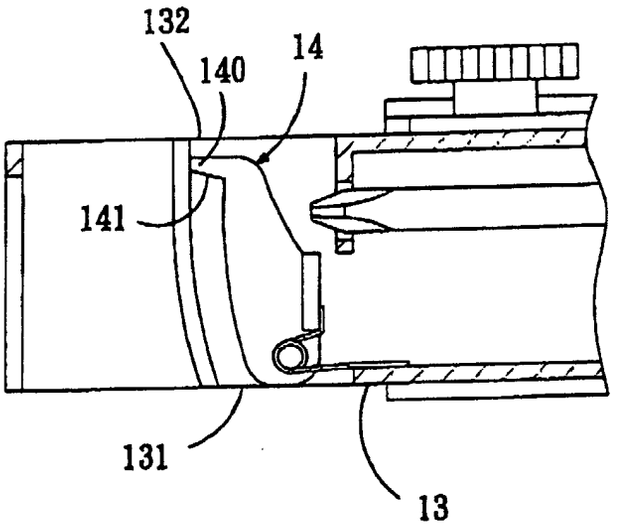


FIG. 3
PRIOR ART

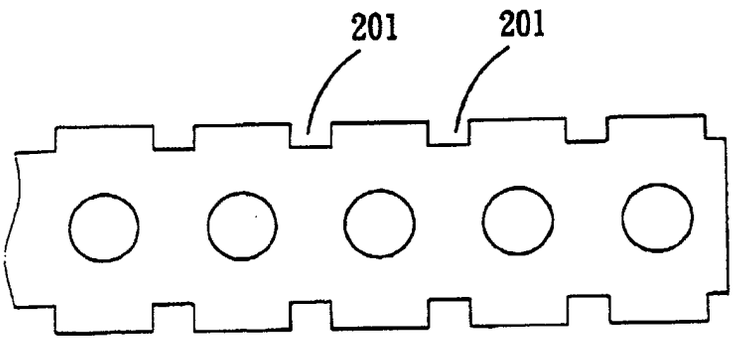


FIG. 4
PRIOR ART

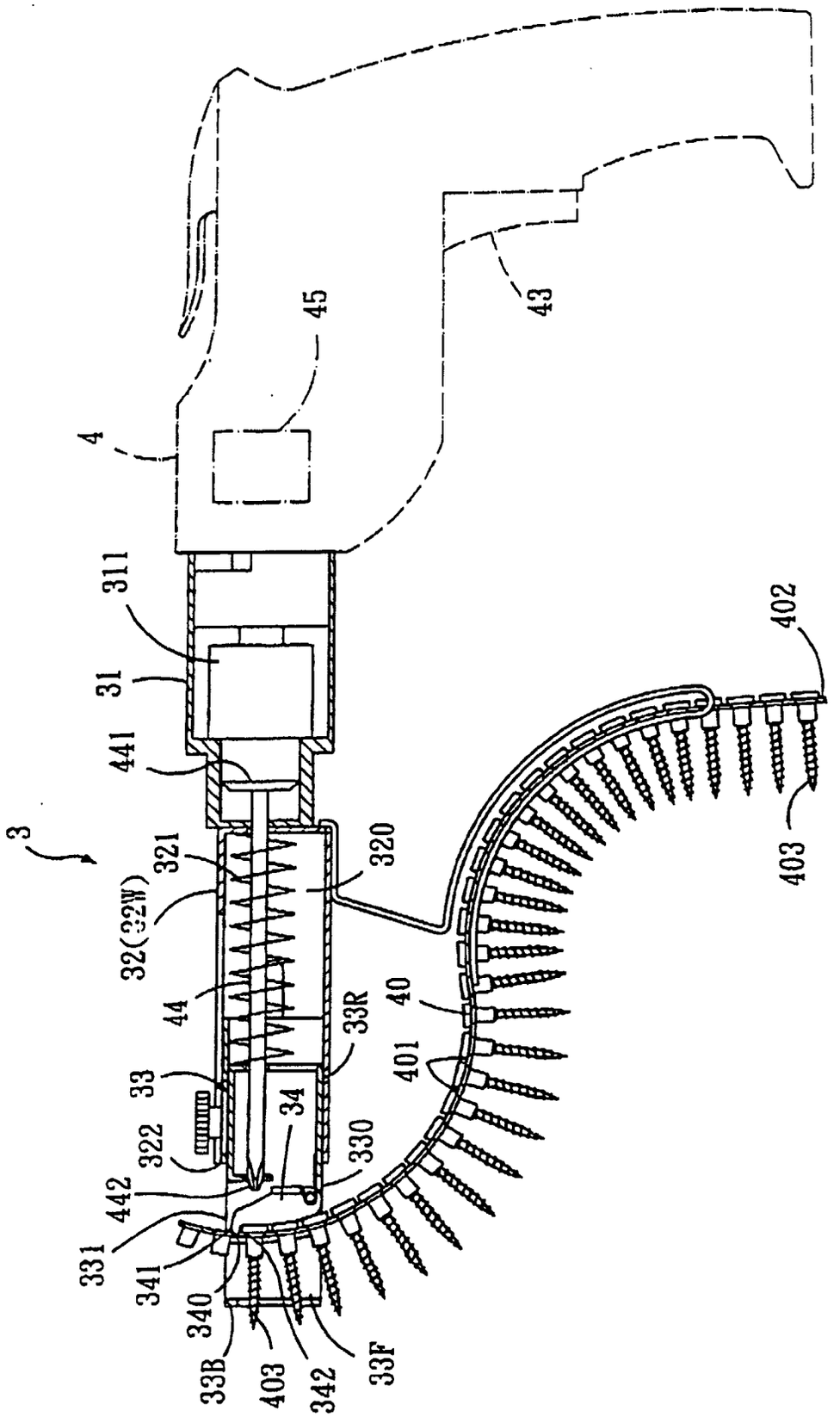
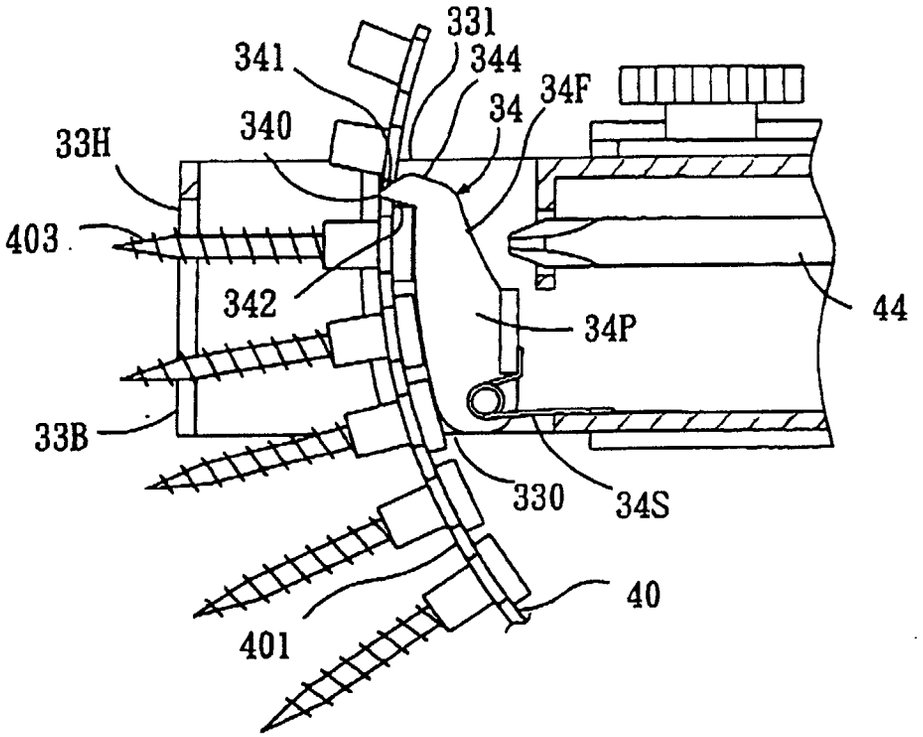

4
45
43
311
31
441
3
321
32(32W)
44
33
322
442
331
341
340
33B
403
342
33F
320
33R
34
330
40
401
402
403

FIG. 5


331
341
344
34F
34
340
33H
403
342
34P
44
33B
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34S
40
401

FIG. 6

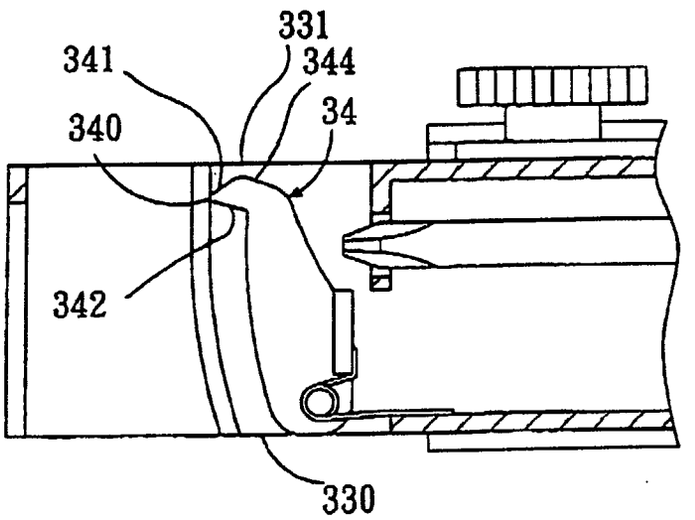
331
341
344
34
340
342
330

FIG. 7

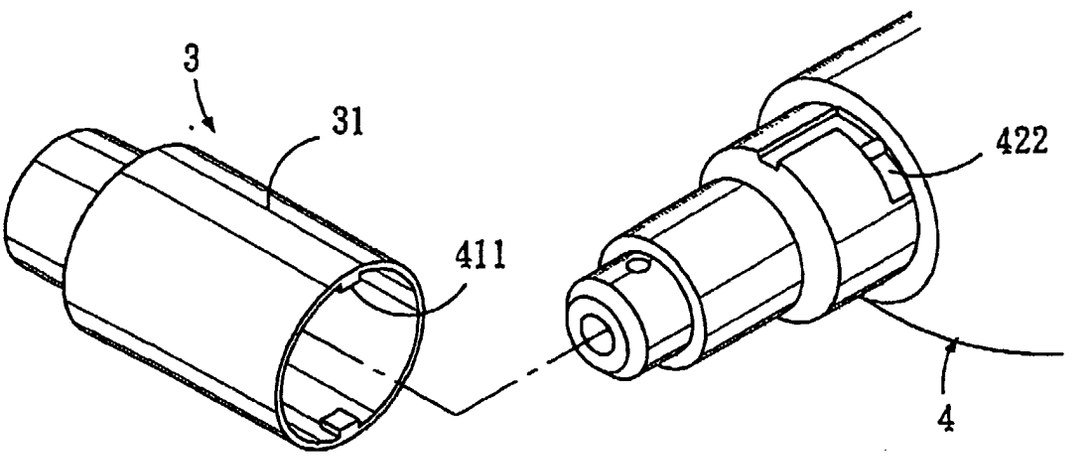

FIG. 8