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(54) **Screw apparatus for screwing a roofing**

(57) A screw driving machine 1 is designed for screwing down roofing material 3 on a building's roof, in which washers are placed under the screw heads.

The screw driving machine 1 has a frame 13 on which there is a movable carrier 15 for washers. This carrier 15 can be moved along a horizontal first guide 17 situated on the frame, and is provided with a stop against which a washer 21 can be positioned. There is also a washer holder 27 on the carrier 15 in which there is a stack 29 of washers.

The screw driving machine 1, furthermore, has a screwing device 31 that can be moved along a second guide 33, situated vertically on the frame 13. Moreover, there is a means of placing 35 attached to the frame 13, for taking a washer from the washer holder 27 and placing it on the carrier 15.

The means of placing 35 is a means of gripping 39, for gripping a washer, and an additional means of moving 41, in order to move the means of gripping. This means of gripping 39 is an electromagnet, which is fastened to the piston's free end.

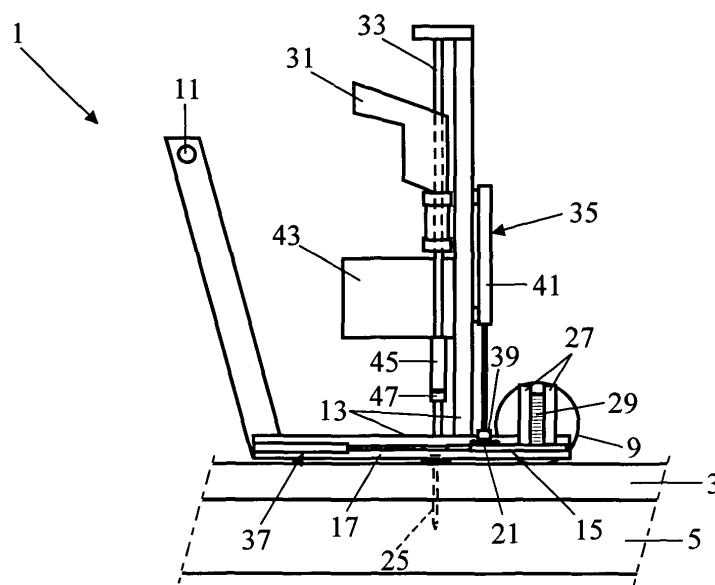


FIG. 3

Description

BACKGROUND OF THE INVENTION:

Field of the invention

[0001] The invention relates to a screw driving machine for screwing down roofing material on a roof of a building, comprising a screwing device, a washer holder for washers, a moveable carrier for a washer that is to be screwed down, a means of placing for taking a washer from the washer holder and placing it on the carrier, a screw feeding device, and a means of moving for moving the carrier between a first position under the screwing device and a second position under the means of placing.

[0002] The washers are provided with a hole and are placed under the screw heads in order to distribute the force and to prevent the screws from damaging the roofing material. Such screw driving machines are usually provided with wheels with which they can be moved over the building's roof.

Prior art

[0003] Such a screw driving machine is known from the American patent US 6.064.189. With the known screw driving machine the washers are stacked and a washer is slid out each time from under the stack by a movable carrier. The carrier brings the washer over an opening in the bottom of the screw driving machine, after which the washer falls through the opening onto the roofing material. Then a screw is inserted in a hole situated in the washer, after which the roofing material is screwed down by means of a screwing device. The washers should be flat, because otherwise they will be held back by the washers lying above and it will not be possible to slide them from the stack.

Summary of the invention

[0004] An objective of the invention is to provide a screw driving machine of the type described in the preamble in which washers of all shapes can be used. To this end, the screw driving machine according to the invention is characterized in that the means of placing comprises a means of gripping for gripping a washer, as well as an additional means of moving for moving the means of gripping. Because the washers are not slid from a stack, but are gripped one by one from the stack by the means of gripping, it is possible for them to be any shape desired. The washers can, for example, be corrugated.

[0005] An embodiment of the screw driving machine according to the invention is characterized in that the washer holder is attached to the carrier. Because of this, the washer holder can be moved between a position under the means of gripping and a position at a distance

from it, as a result of which the means of gripping only has to move in a vertical direction. Preferably, the means of moving can move mainly in a horizontal direction and the additional means of moving can move mainly in a vertical direction.

[0006] Furthermore, the screw driving machine comprises a frame, which is provided with a mainly horizontal first guide, along which the carrier can be moved, and a mainly vertical second guide, along which the screwing device can be moved.

[0007] A further embodiment of the screw driving machine according to the invention is characterized in that the means of gripping comprises a magnet, preferably, an electromagnet. By means of a magnet a washer can be gripped in a simple way. If the magnet is executed as an electromagnet, the washer can also simply be released again. Instead of or in combination with the magnet, the means of gripping may also comprise suction cups, as a result of which washers made of a material not attracted by a magnet can also be used. The disadvantage with this, however, is that the screw driving machine in that case must have a means of producing a vacuum.

[0008] Preferably, the additional means of moving is also a cylinder with a piston which can move in it. In this embodiment, the means of gripping is preferably attached to the piston's free end.

Brief description of the drawings

[0009] The invention will be elucidated more fully below on the basis of drawings in which an embodiment of the screw driving machine according to the invention is shown. In these drawings:

Figure 1 shows a front view of an embodiment of the screw driving machine according to the invention; Figure 2 shows a view from above of the screw driving machine shown in figure 1; Figure 3 shows a side view of the screw driving machine shown in figure 1; and Figure 4 shows a side view of the screw driving machine shown in figure 1 during a different stage of the screwing process.

Detailed description of the drawings

[0010] In figures 1, 2 and 3 an embodiment of the screw driving machine according to the invention is shown in a front view, a view from above and a side view respectively. The screw driving machine 1 is designed for screwing down roofing material 3 on a building's roof. The roofing material 3 is screwed down at the tops 7 of a corrugated roofing sheet 5, in which washers are placed under the screw heads.

[0011] The screw driving machine 1 is provided with wheels 9 and is moved manually over the roofing material 3 while driving the screws. To this end, the screw

driving machine 1 is provided with a handgrip 11. The wheels 9 are attached to a frame 13 on which there is a movable carrier 15 for washers. This carrier 15 can be moved along a horizontal first guide 17 situated on the frame, and is provided with a stop 19 against which a washer 21 can be positioned (see figure 2). There is a slot 23 in the carrier 15 (see figure 2) through which a screw 25 is inserted during the process. There is also a washer holder 27 on the carrier 15. This washer holder is made up of four vertical strips between which a stack 29 of washers is situated.

[0012] The screw driving machine 1, furthermore, has a screwing device 31 that can be moved along a second guide 33, situated vertically on the frame 13. Moreover, there is a means of placing 35 attached to the frame 13, for taking a washer from the washer holder 27 and placing it on the carrier 15. In order to move the carrier 15, the screw driving machine 1 is provided with a means of moving 37 that is a cylinder with a movable piston in it. The carrier 15 can be moved between a first position, in which the washer lying on the carrier is situated under the screwing device, see figure 3, and a second position, in which the washer lying on the carrier is situated under the means of placing, see figure 4.

[0013] The means of placing 35 is a means of gripping 39, for gripping a washer, and an additional means of moving 41, in order to move the means of gripping. This additional means of moving 41 is also a cylinder with a movable piston in it and the means of gripping 39 in this embodiment is an electromagnet, which is attached to the piston's free end.

[0014] Furthermore, the screw driving machine 1 has a screw feeding device 43. This has a generally known double ratchet mechanism (not visible in the figures) in order to move two discs, provided with teeth, gradually one tooth at a time. These discs take a strip along with them on which the screws are fastened. The screw feeding device 43, furthermore, has a screw guide 45, which guides the screws to a position under a screw head of the screwing device 31. When the discs are revolved the screws are released from the strip one by one in the known way and fall into the screw guide 45. There is a clamping device 47 under in the screw guide 45 that clamps the screw.

[0015] In figures 3 and 4 the screw driving machine is shown during different stages of the screwing process. In the first position of the carrier 15 shown in figure 3, a washer is gripped by the electromagnet 39. The carrier 15 is then moved to a second position shown in figure 4. In this position the washer 21 is placed on the carrier 15 against the stop 19. The carrier 15 is then moved again to the first position, see figure 3. A screw 25 is now inserted in a washer 21 by the screwing device 31 and partially screwed into the roofing material 3. Here, the clamp 47 releases the screw 25. At the same time the next washer is taken from the stack 29. The carrier 15 is then moved again to the second position, see figure 4. Here, the washer 21 is stopped by the screw 25

and the carrier 15 slides out from under the washer. The screw 25 can now be screwed further into the roofing material 3, and the next washer is laid on the carrier 15.

[0016] Moreover, the screw driving machine can be equipped with sensors (not shown in the figures) in order to be able to detect the tops 7 of the roofing sheets 5.

[0017] Although in the above the invention is explained on the basis of the drawings, it should be noted that the invention is in no way limited to the embodiment shown in the drawings. The invention also extends to all embodiments deviating from the embodiment shown in the drawings within the context defined by the claims.

15 Claims

1. Screw driving machine for screwing down roofing material on a building's roof, comprising a screwing device, a washer holder for washers, a movable carrier for a washer that is to be screwed down, a means of placing for taking a washer from the washer holder and placing it on the carrier, a screw feeding device and a means of moving for moving the carrier between a first position under the screwing device and a second position under the means of placing, **characterized in that** the means of placing comprises a means of gripping for gripping a washer, as well as an additional means of moving for moving the means of gripping.
2. Screw driving machine according to claim 1, **characterized in that** the washer holder is attached to the carrier.
3. Screw driving machine according to claim 1 or 2, **characterized in that** the means of moving can be moved mainly in a horizontal direction and the additional means of moving can be moved mainly in a vertical direction.
4. Screw driving machine according to claim 1, 2 or 3, **characterized in that** the screw driving machine comprises a frame provided with a mainly horizontal first guide, along which the carrier can be moved, and a mainly vertical second guide, along which the screwing device can be moved.
5. Screw driving machine according to one of the preceding claims **characterized in that** the means of gripping comprises a magnet, preferably an electromagnet.
6. Screw driving machine according to one of the preceding claims, **characterized in that** the additional means of moving is a cylinder with a movable piston in it, in which the means of gripping is attached to the piston's free end.

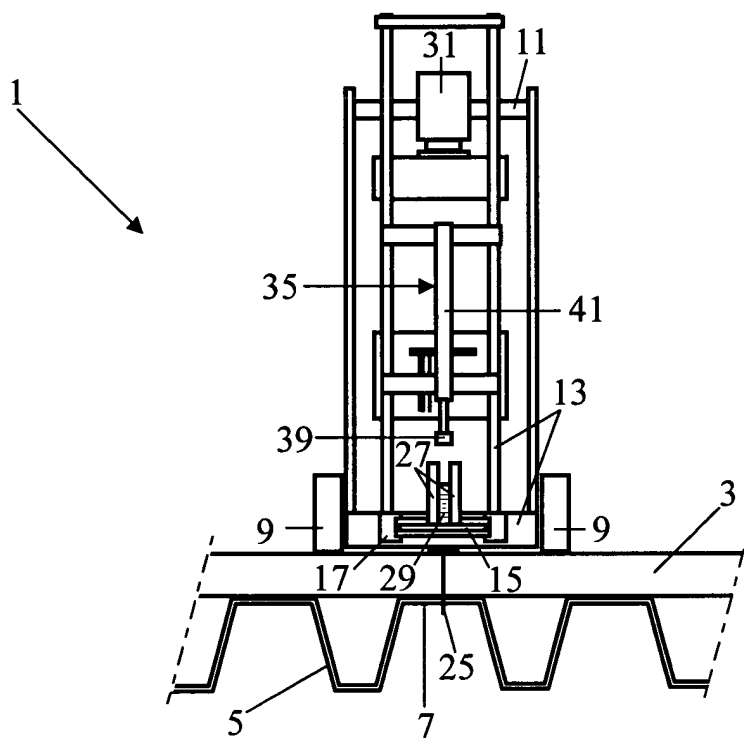


FIG. 1

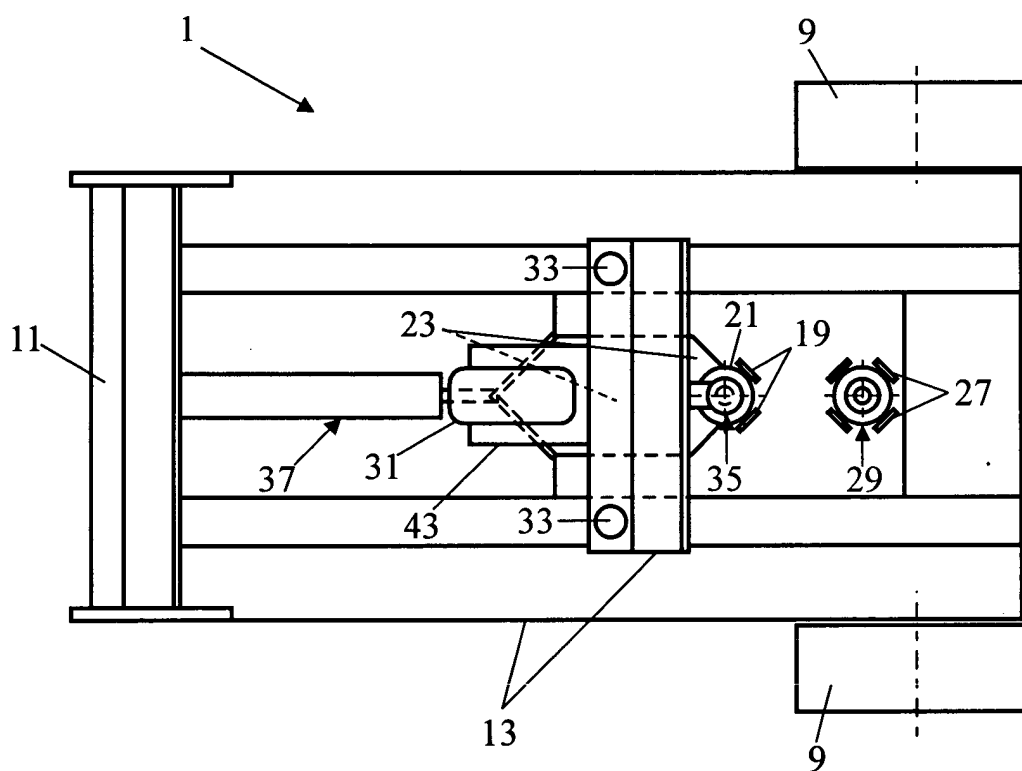


FIG. 2

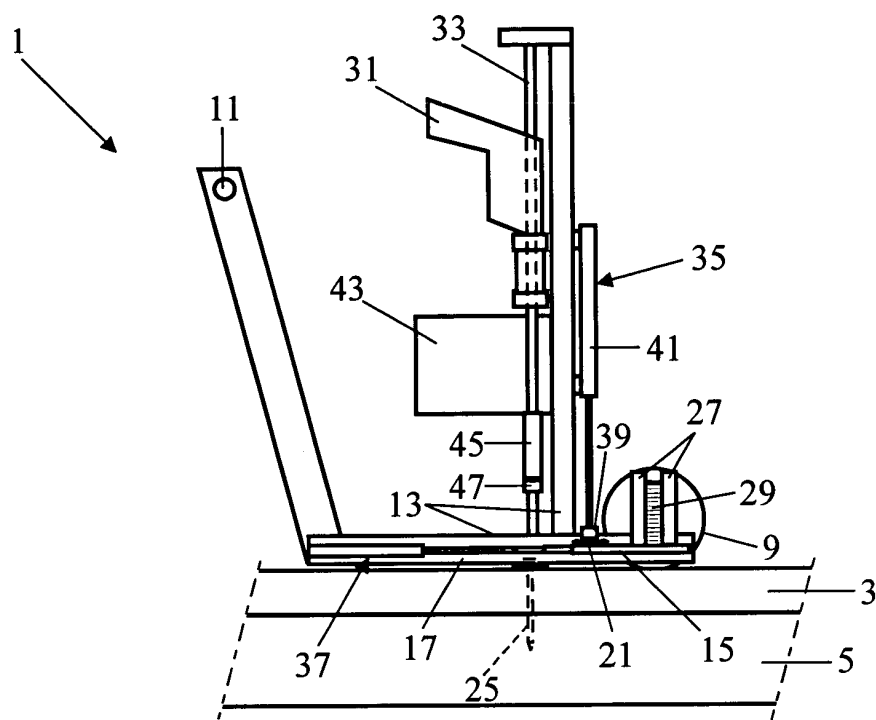


FIG. 3

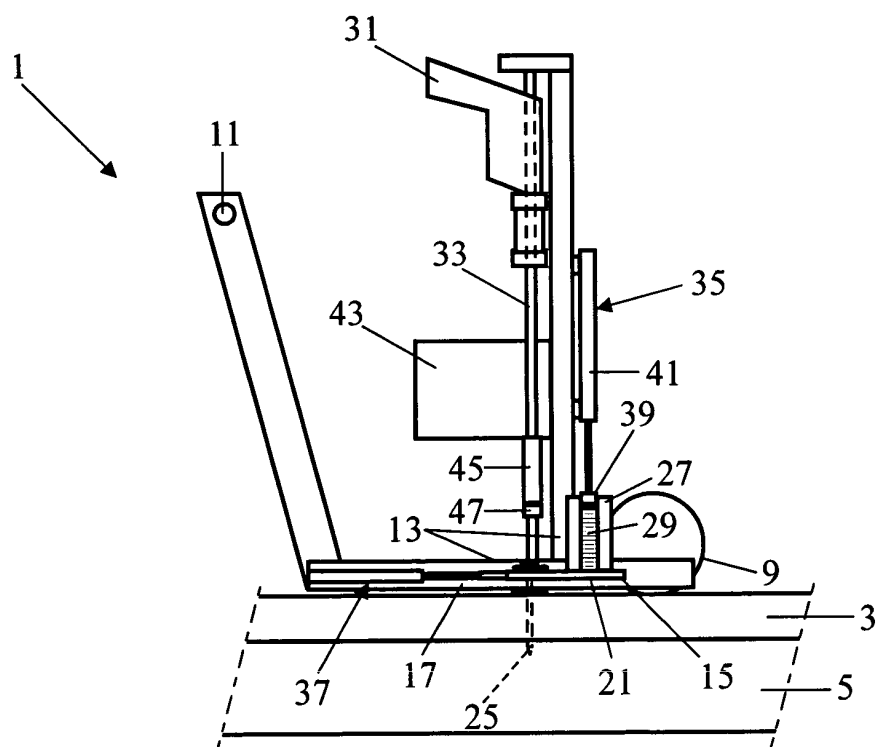


FIG. 4