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(54) **HANDHELD DEVICE, METHOD AND ATTACHMENT DEVICE**

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(58) **Field of Classification Search**
CPC B05C 17/0116; B05C 17/0052; B05C 11/1021; B05C 11/1023; B05C 17/0103
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,942,736 B2 * 9/2005 Chinander B05C 17/0103 118/692
7,048,964 B2 * 5/2006 McGlinchy E06B 3/24 427/284

(Continued)

FOREIGN PATENT DOCUMENTS

CN 108745806 11/2018
DE 10 2009 045 891 4/2011

(Continued)

OTHER PUBLICATIONS

Examination Report issued in corresponding German Patent Application No. 10 2020 205 308.1, Nov. 16, 2020, 8 pages.

(Continued)

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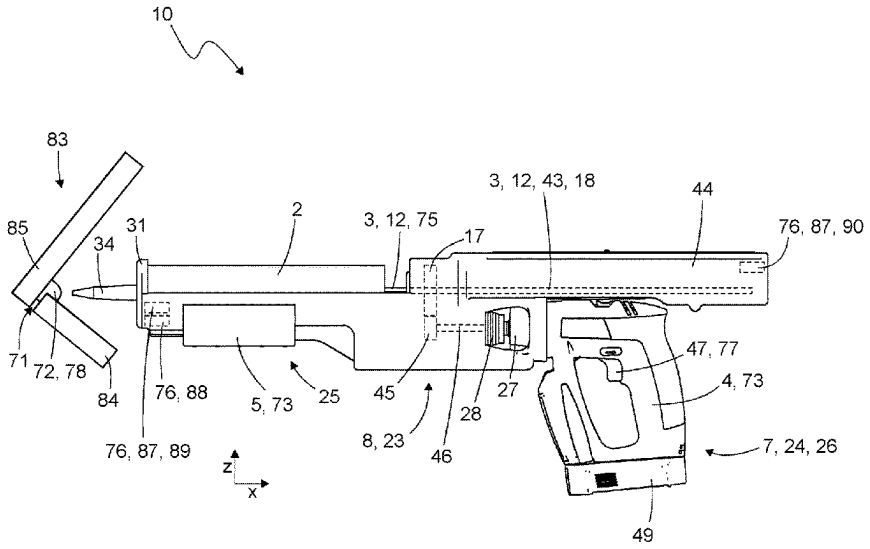
(57) **ABSTRACT**

A handheld device, in particular a cartridge press and/or tubular bag press, for dispensing filling material into a joint, including: a handle assembly for manually gripping the handheld device and for moving the handheld device along a joint path, a dispensing device for dispensing the filling material into the joint, and a sensor device which is designed to detect an influencing quantity. The influencing quantity influences the body geometry of a filling material body formed by the filling material dispensed into the joint, in which the handheld device is adapted to adjust a dispensing rate (r) at which the dispensing device dispenses the filling material based on the detected influence quantity.

18 Claims, 5 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

8,400,503	B2 *	3/2013	Linnenkohl	G01N 21/88 348/130
8,568,121	B2 *	10/2013	Khoshnevis	B28B 3/20 425/63
9,359,122	B2 *	6/2016	Schmid	G01F 11/029
9,475,231	B2 *	10/2016	Conrad	F16L 13/116
10,894,272	B2 *	1/2021	Turner	H04W 4/80
2005/0048206	A1	3/2005	Chinander et al.	
2011/0151042	A1	6/2011	Strobel-Schmidt et al.	
2014/0252025	A1	9/2014	Schmid et al.	
2015/0091292	A1	4/2015	Conrad et al.	
2020/0001320	A1	1/2020	Turner et al.	

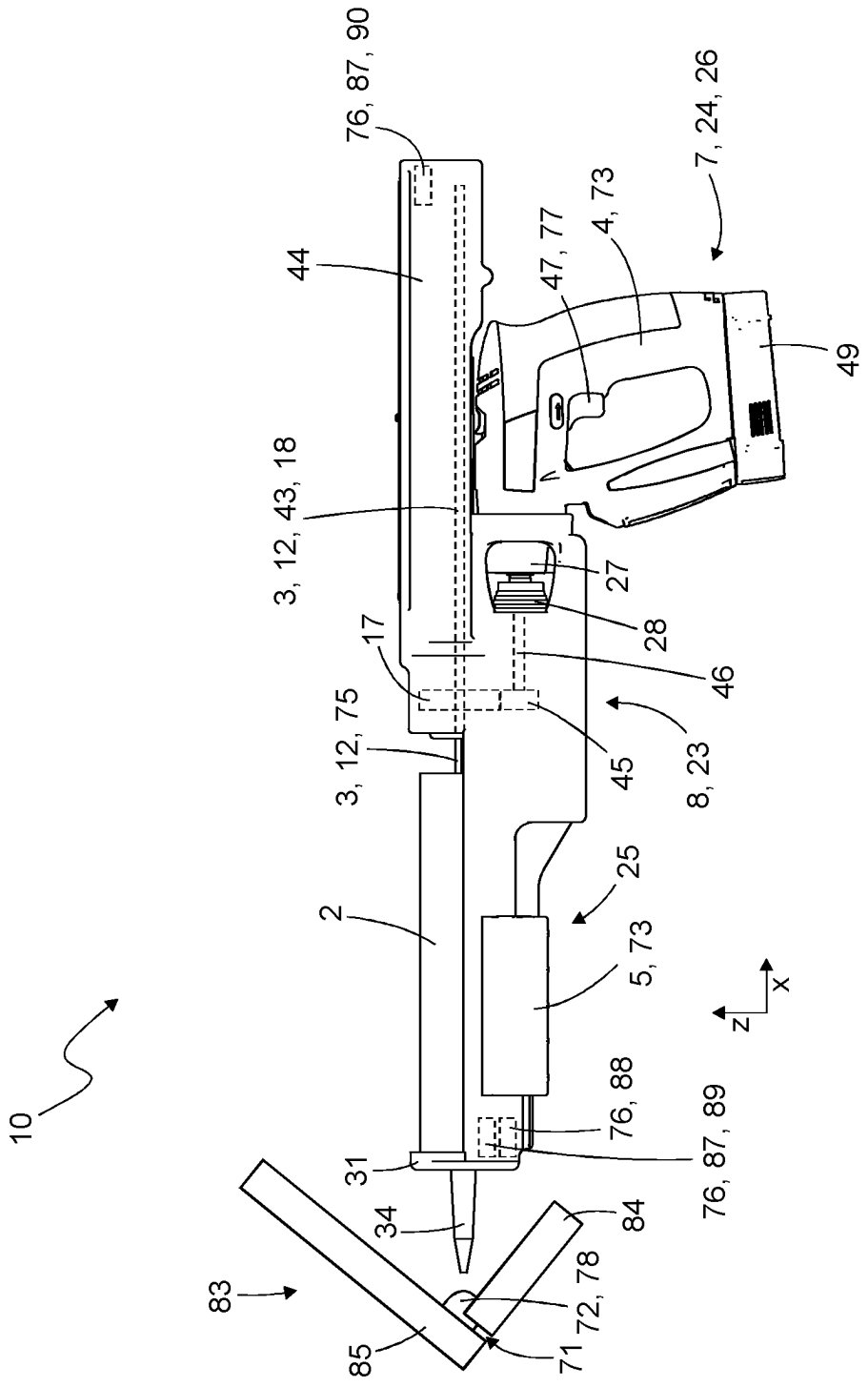
FOREIGN PATENT DOCUMENTS

DE	10 2011 081 137	2/2013
WO	03/006178	1/2003
WO	2013/104362	7/2013

OTHER PUBLICATIONS

International Search Report issued in International Application No. PCT/EP2021/052535, May 21, 2021, 6 pages w/translation.
Written Opinion issued in International Application No. PCT/EP2021/052535, May 21, 2021, 8 pages.

* cited by examiner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z

Fig. 1

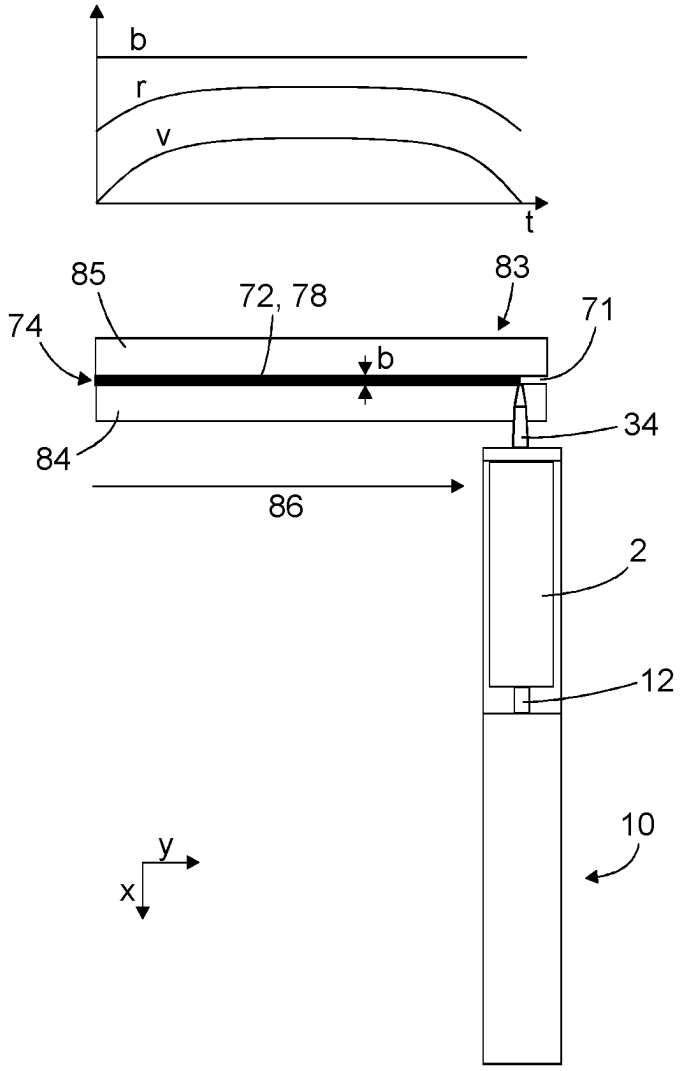
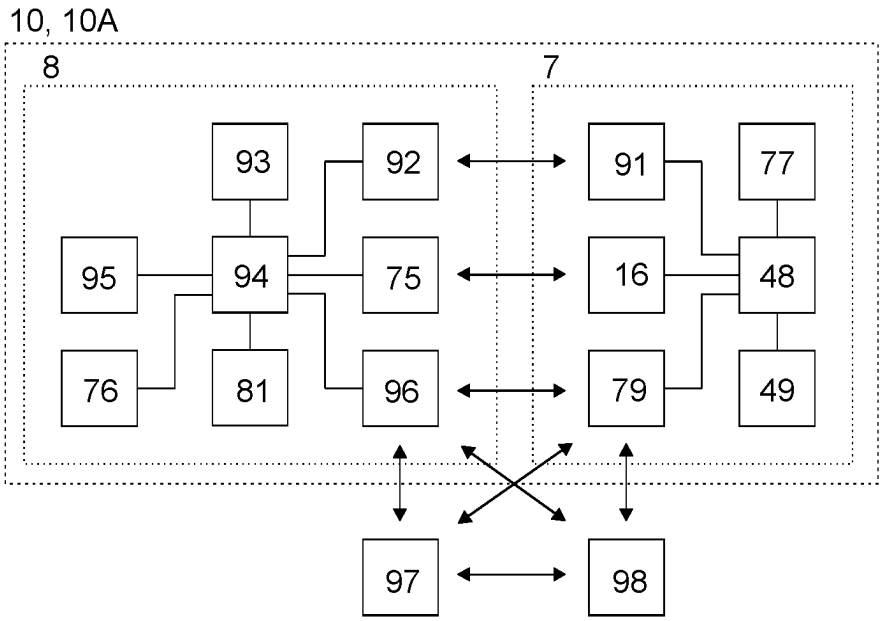


Fig. 2


10, 10A
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49
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98

Fig. 3

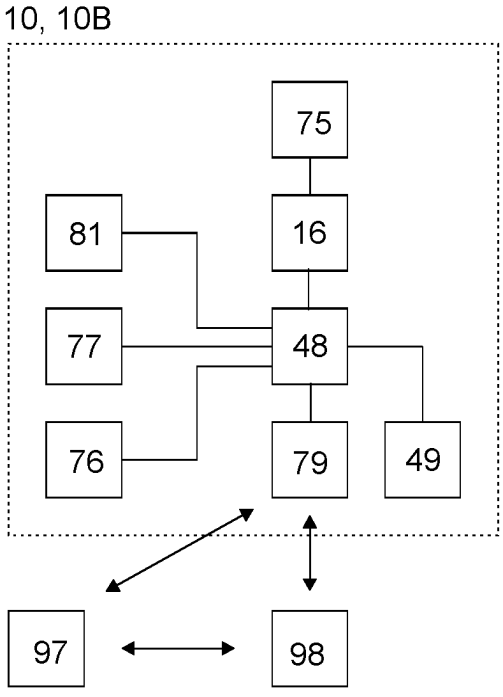
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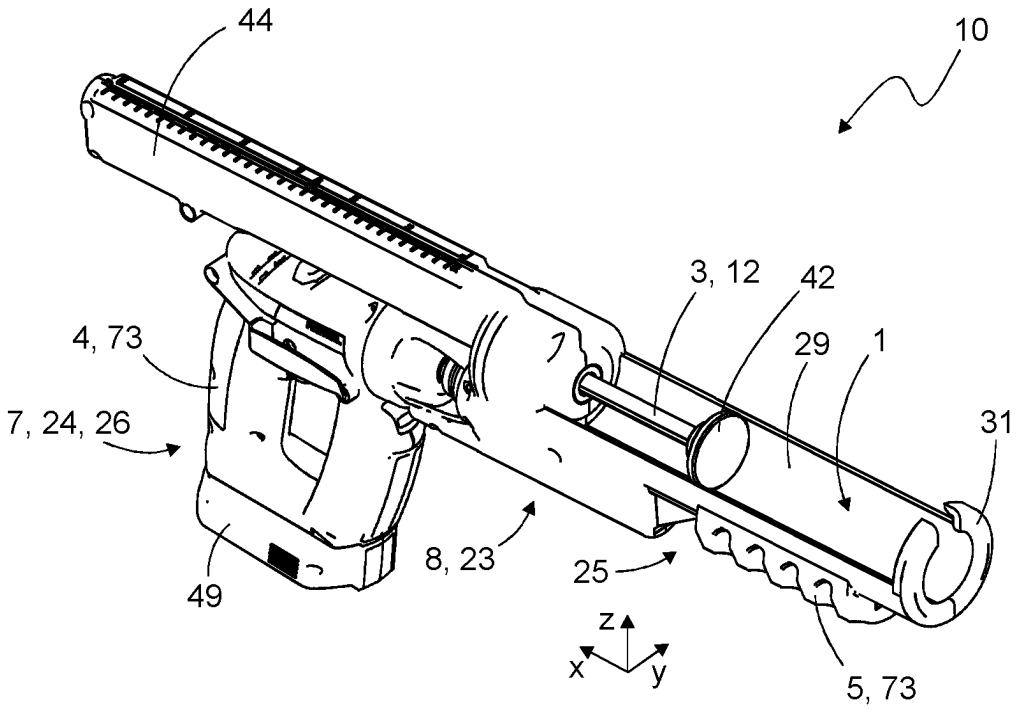
Fig. 4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y
5, 73

Fig. 5

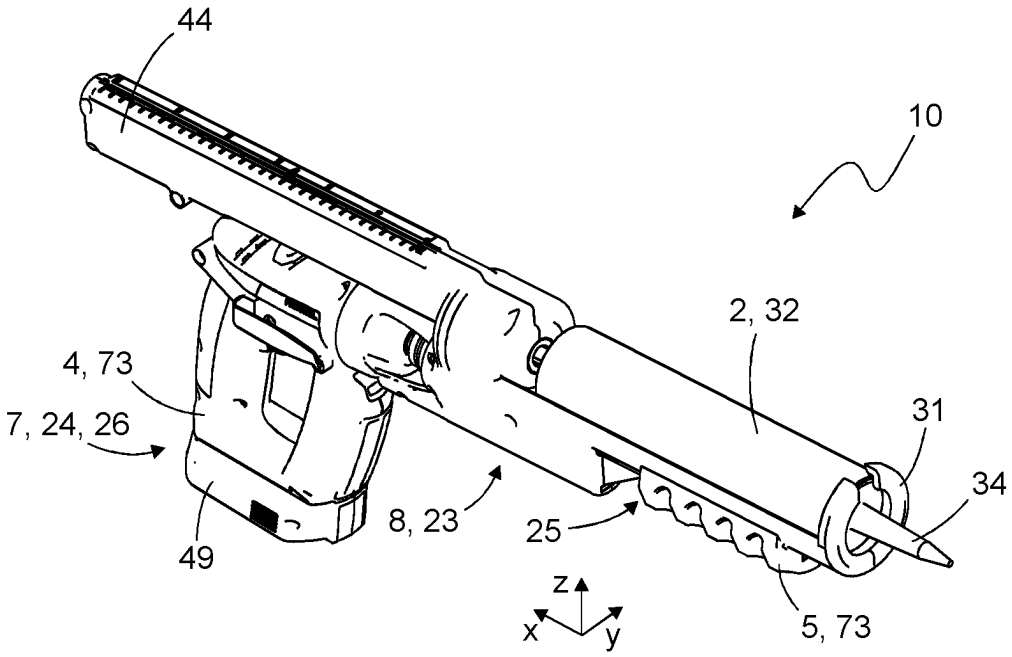
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Fig. 6

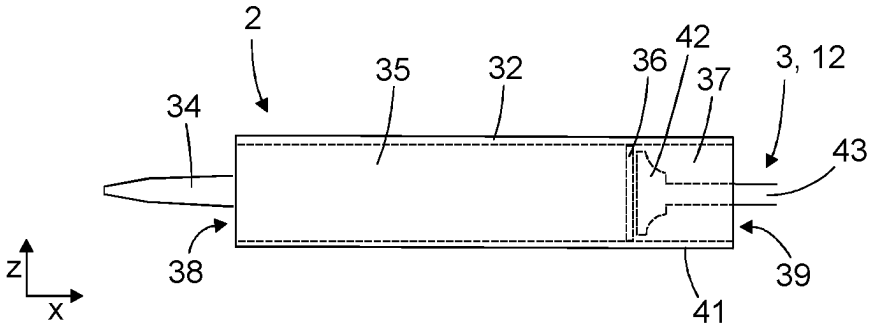

Fig. 7

HANDHELD DEVICE, METHOD AND ATTACHMENT DEVICE

The invention relates to a handheld device for dispensing filling material into a joint. The handheld device is designed, for example, as a cartridge press and/or a tubular bag press. The filling material is, for example, joint sealant, in particular silicone or acrylic. The handheld device comprises a handle assembly for manually gripping the handheld device and moving the handheld device along a joint path. The handheld device further comprises a dispensing device for dispensing the filling material into the joint.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a handheld device which makes it easier for the user to achieve, when dispensing the filling material into the joint, a desired body geometry, for example a body geometry which is as uniform as possible, of the filling material body formed by the dispensed filling material. The filling material body has, for example, an elongated, in particular string-shaped body geometry and should expediently have a constant width along the length of the filling material body.

The object is solved by a handheld device according to claim **1**. The handheld device comprises a sensor device adapted to detect an influencing quantity influencing the body geometry of the filling material body formed by the filling material dispensed into the joint. The influence quantity is, for example, a handheld device speed at which the handheld device is moved, or relates to a joint geometry of the joint. The handheld device speed may also be referred to as pulling speed. The handheld device is adapted to adjust a dispensing rate at which the dispensing device dispenses the filling material, based on the detected influence quantity. The dispensing rate is the amount of filling material that is dispensed per unit of time.

In this way, the handheld device can compensate for one or more interfering influencing quantities, such as a varying handheld device speed and/or a varying joint geometry, and thus prevent these one or more influencing quantities from affecting the body geometry of the filling material body in an undesirable manner.

If, for example, the user guides the handheld device along the joint path at a varying—i.e. not constant—handheld device speed when dispensing the filling material, this results in a conventional handheld device dispensing more filling material (per unit length of the joint path) at joint sections where the handheld device speed is lower than at joint sections where the handheld device speed is higher. The result is a filling material body with a non-uniform body geometry.

According to a preferred embodiment, the handheld device described can be used to detect the handheld device speed and to adjust the dispensing rate of the filling material to the detected handheld device speed. For example, at a higher detected handheld speed, the handheld device dispenses the filling material at a higher dispensing rate than at a lower detected handheld speed. In this way, the influence of the varying handheld speed on the body geometry can be compensated and it becomes possible, for example, to achieve a uniform body geometry (despite a varying handheld speed).

If, for example, the joint geometry, in particular the joint width, varies along the joint path, this can, with a conventional handheld device, have the result that at joint sections where the joint width is smaller (and therefore less filling material is required for filling and/or covering the joint) too much filling material for the given joint width is dispensed, and, at joint sections where the joint width is larger (and therefore more filling material is required for filling and/or covering the joint), too little filling material for the given joint width is dispensed. This results in uneven filling and/or covering of the joint along the joint path.

According to a preferred embodiment, the joint geometry, in particular the joint width, can be detected by means of the described handheld device and the dispensing rate of the filling material can be adapted to the detected joint width. For example, the handheld device outputs the filling material at a higher dispensing rate when the joint width is greater than when the joint width is smaller. In this way, the influence of the varying joint width on the body geometry, in particular the filling and/or covering of the joint, can be compensated for and it becomes possible, for example, to achieve a uniform filling and/or covering of the joint (despite a varying joint width).

Advantageous further developments are defined in the subclaims.

The invention further relates to a method for dispensing filling material into a joint with a handheld device, in particular a cartridge press and/or a tubular bag press, comprising the steps of: Moving the handheld device along the joint path, dispensing the filling material into the joint, detecting an influence quantity influencing a body geometry of a filling material body formed by the filling material dispensed into the joint, and adjusting the dispensing rate at which the filling material is dispensed, based on the detected influence quantity.

The method is expediently carried out by means of the described handheld device and/or is designed in accordance with a described further development of the handheld device.

The invention further relates to an attachment device for detachable attachment to a driver device to form a handheld device for dispensing filling material into a joint, comprising: a dispensing device for dispensing the filling material into the joint, the dispensing device being drivable by the drive device, and a sensor device adapted to detect an influence quantity influencing a body geometry of a filling material body formed by the filling material dispensed into the joint, wherein the attachment device is adapted to provide a control signal to the drive device based on the detected influence quantity to control the drive of the dispensing device to adjust the dispensing rate at which the dispensing device dispenses the filling material.

BRIEF DESCRIPTION OF THE DRAWINGS

Further exemplary details as well as exemplary embodiments are explained below with reference to the figures. Thereby shows

FIG. **1** a side view of a handheld device and a processing area,

FIG. **2** a top view of a handheld device guided along a joint, together with a diagram showing a handheld device speed and dispensing rate,

FIG. **3** a block diagram of a handheld device with a first composition,

FIG. **4** a block diagram of a handheld device with a second composition,

FIG. **5** a perspective view of the handheld device without inserted filling material container,

FIG. **6** a perspective view of the handheld device with inserted filling material container, and

FIG. 7 a sectional view of a filling material container in which a pressing element is inserted.

DETAILED DESCRIPTION OF THE INVENTION

In the following explanations, reference is made to the spatial directions "x-direction", "y-direction" and "z-direction" which are orthogonal to each other. The x-direction and the y-direction are horizontal directions, and the z-direction is a vertical direction (in a horizontal use position of the handheld device **10**).

FIG. **1** shows the handheld device **10** together with a processing area **83**. The processing area **83** comprises a joint **71**. Exemplarily, the processing area **83** includes a first area portion **84** and a second area portion **85** and the joint **71** is located between the two area portions **84**, **85**. For example, the area portions **84**, **85** are building materials, such as tiles. For example, the first area portion **84**, is a tile, a panel, a door frame, a window frame, or a molding. The second area portion **85** is, for example, another tile or a wall. The joint **71** between the area portions **84**, **85** may also be referred to as a gap or cavity.

The handheld device **10** is exemplarily designed as a cartridge press and/or as a tubular bag press. The handheld device **10** may also be referred to as a filling material container press. The handheld device **10** is used to dispense filling material **72** into the joint **71**. The filling material **72** is, for example, silicone or acrylic. The filling material **72** is expediently held in a filling material container **2**, for example a cartridge or a tubular bag, and dispensed from the filling material container **2** into the joint **71** by means of the handheld device **10**.

The handheld device **10** includes a handle assembly **73** for manually gripping the handheld device **10** and moving the handheld device **10** along a joint path **74** (shown in FIG. **2**). The handheld device **10** can be carried manually by the user and moved and positioned freely in space manually. The handheld device **10** is not fixed or suspended anywhere. The joint path **74** is the path of the joint **71** in the longitudinal direction of the joint **71**. Exemplarily, the joint path **74** runs in the y-direction—i.e. perpendicular to the drawing plane of FIG. **1**.

The handheld device **10** further comprises a dispensing device **75** for dispensing the filling material **72** into the joint **71**. Exemplarily, the dispensing device **75** comprises a pressing device **3** for pressing the filling material container **2** to cause dispensing of filling material **72** contained in the filling material container **2**. The filling material **72** is dispensed into the joint **71** via a dispensing element **34**, for example an applicator tip.

The handheld device **10** further comprises a sensor device **76** configured to detect an influence quantity that influences a body geometry of a filling material body **78**. The filling material body **78** is formed by the filling material **72** dispensed into the joint **71**. The filling material body **78** may also be referred to as a bead. Preferably, the influencing quantity is the handheld device speed v and/or concerns the joint geometry.

The handheld device **10** is adapted to adjust a dispensing rate r, at which the dispensing device **75** dispenses the filling material **72**, based on the detected influence quantity. The dispensing rate r is the amount of filling material **72** that is output from the handheld device **10** per unit time.

For example, the handheld device **10** has a pressing element **12** for pressing the filling material container **2** to cause the filling material **72** to be dispensed from the filling material container **2**. In particular, the handheld device **10** is adapted to adjust the dispensing rate r by adjusting the speed of the pressing element **12**. For example, the handheld device **10** has an electric drive **16** (see FIG. **3** or **4**) for driving the pressing element **12** and is adapted to adjust the speed of the electric drive **16**, for example by adjusting the current supplied to the electric drive **16**, based on the influence quantity to adjust the dispensing rate r.

Expediently, the handheld device **10** is configured to continuously detect the influence quantity and continuously adjust the dispensing rate r based on the influence quantity. For example, the handheld device **10** continuously detects the current handheld device speed and/or the current joint geometry and continuously adjusts the current dispensing rate r to the current handheld device speed and/or the current joint geometry.

Preferably, the handheld device **10** is configured to adapt the dispensing rate r on the basis of the detected influence quantity in such a way that the filling material body **78** formed by the filling material **72** dispensed into the joint **71** has a predetermined body geometry, in particular a predetermined width b, preferably a constant width b. For example, a specification information is stored in the handheld device **10**, which specifies a body geometry, in particular a width, of the filling material body **78**. The handheld device **10** is configured to adjust the dispensing rate r on the basis of the detected influence quantity and the specification information in such a way that the body geometry of the filling material body **78** corresponds to the specification information.

The handheld device **10** is expediently configured to adjust the dispensing rate r on the basis of the influencing quantity in such a way that the dispensing device **75** dispenses a predetermined, in particular constant, amount of filling material per unit length of the joint path **74**. For example, a specification information is stored in the handheld device **10**, which specifies a filling material amount per unit length. The handheld device **10** is configured to adjust the dispensing rate r on the basis of the detected influence quantity and the specification information in such a way that the filling material amount per unit length corresponds to the specification information.

According to a preferred embodiment, the influence quantity comprises the handheld device speed v at which the handheld device **10** is moved. The handheld device **10** is configured to detect the handheld device speed v as the influence quantity and to adjust the dispensing rate r based on the handheld device speed v.

In particular, the handheld device speed v is the speed of the handheld device **10** relative to the joint path **74**. Expediently, the handheld device **10** comprises a dispensing element **34**, in particular an applicator tip, for dispensing the filling material **72** into the joint **71**. In particular, the handheld device speed v is the speed of the dispensing element **34** relative to the joint path **74**.

In particular, the handheld device **10** is configured to adjust the dispensing rate r on the basis of the detected handheld device speed v so that the filling material body **78** has a predetermined body geometry, in particular a predetermined width b, preferably a constant width b, in particular along the joint path **74**.

FIG. **2** shows a corresponding adjustment of the dispensing rate r. In FIG. **5**, the user performs a handheld device movement **86** with the handheld device **10**, in which the handheld device **10** is guided along the joint path **74**, in particular with the dispensing element **34**. FIG. **5** shows the time curves of the handheld device speed v, the dispensing

rate r and the width b of the filling material body **78**. The width b is the width of the filling material body **78** orthogonal to the longitudinal direction of the joint path **74**. The width b is in particular the width of that part of the filling material body **78** which lies above the joint **71** or covers the joint **71**.

Preferably, the handheld device **10** is configured to increase the dispensing rate r of the filling material **72** in response to an increasing detected handheld device speed v. Expediently, the handheld device **10** is further configured to reduce the dispensing rate r of the filling material **72** in response to a decreasing detected handheld device speed v.

Expediently, the handheld device **10** is configured to provide the dispensing rate r in proportion to the detected handheld device speed v and/or with a monotonic, in particular strictly monotonic, dependence on the handheld device speed v.

Thus, the handheld device **10** dispenses the filling material at a higher dispensing rate r at a first detected handheld device speed v than at a second detected handheld device speed v that is lower than the first detected handheld device speed v.

Expediently, the handheld device **10** is configured to adjust the dispensing rate r on the basis of the handheld device speed v in such a way that the dispensing device **75** dispenses, along the joint path **74**, a predetermined, in particular constant, amount of filling material per unit length of the joint path **74**.

According to a further embodiment, the influence quantity relates to the joint geometry. The handheld device **10** is configured to detect the joint geometry, in particular a joint width, as the influence quantity and to adjust the dispensing rate r on the basis of the detected joint geometry, in particular the joint width. The joint width is in particular the width of the joint **71** orthogonal to the direction of the joint path **74**.

Preferably, the handheld device **10** is configured to adjust the dispensing rate r on the basis of the detected joint geometry in such a way that the filling material body **78** has a predetermined body geometry, in particular a predetermined width b, preferably a constant width b. The width b is the width of the filling material body **78** orthogonal to the longitudinal direction of the joint path **74**. The width b is in particular the width of that part of the filling material body **78** which lies above the joint **71** or covers the joint **71**.

Preferably, the handheld device **10** is configured to increase the dispensing rate r of the filling material **72** in response to an increasing detected joint width. Expediently, the handheld device **10** is configured to reduce the dispensing rate r of the filling material **72** in response to a decreasing detected joint width. Expediently, the handheld device **10** is configured to provide the dispensing rate r in proportion to the detected joint width and/or with a monotonic, in particular strictly monotonic, dependence on the joint width.

Thus, the handheld device **10** dispenses the filling material at a higher dispensing rate r for a first detected joint width than for a second detected joint width that is lower than the first detected joint width.

According to a particularly preferred embodiment, the handheld device **10** is configured to take into account both the handheld device speed v and the joint geometry, in particular the joint width, as the influence quantity. The handheld device **10** thus adjusts the dispensing rate r simultaneously on the basis of the handheld device speed v and on the basis of the joint geometry, in particular on the basis of the joint width. The dependency between the dispensing rate r and the handheld device speed v and the dependency between the dispensing rate r and the joint geometry is preferably as described above.

The sensor device **76**, by means of which the handheld device **10** detects the influence quantity—i.e. in particular the handheld device speed v and/or the joint geometry—will be discussed in more detail below.

Preferably, the sensor device **76** for detecting the influence quantity comprises an accelerometer, an odometry unit, a laser unit, an image sensor, a LIDAR unit, a RADAR unit, and/or a touch sensor.

Preferably, the sensor device **76** comprises a first sensor unit **87** by means of which the handheld device speed v is detected. The first sensor unit **87** is designed, for example, to detect the acceleration of the handheld device **10**. The handheld device **10** is configured to calculate the handheld device speed v based on the detected acceleration, in particular by integrating the detected acceleration. The first sensor unit **87** expediently comprises a first sensor element **89**, which is configured, for example, as an acceleration sensor. The first sensor element **89** is expediently arranged at a front end—that is, at that end at which the dispensing element **34** is located—of the handheld device **10**, in particular of a horizontal section **23** of the handheld device **10**. In a purely exemplary manner, the first sensor unit **87** further comprises a second sensor element **90**, which is configured, for example, as an acceleration sensor. The second sensor element **90** is expediently arranged at a rear end—that is, at that end which faces away from the dispensing element **34**—of the handheld device **10**, in particular of the horizontal section **23** of the handheld device **10**.

According to an alternative embodiment, the first sensor unit **87**, in particular the first sensor element **89**, is designed as an image sensor. Preferably, the handheld device **10** is configured to record a plurality of sequential images with the first sensor unit **87** and to calculate the handheld device speed v based on the plurality of recorded images. Preferably, the handheld device **10** is further configured to detect the joint geometry, in particular the joint width, based on the plurality of captured images, for example using an image processing algorithm. Thus, the first sensor unit **87** can suitably be used both to detect the handheld device speed v and to detect the joint geometry, in particular the joint width.

The first sensor unit **87** can thus, for detecting the handheld device speed, have one or two acceleration sensors (to improve accuracy), an odometry unit (to perform an odometric method), a laser unit (for a laser measurement), and/or an image sensor (for example, an optical camera for an image evaluation). Expediently, the first sensor unit **87** may also comprise a combination of said units.

Optionally, the sensor device **76** further comprises a second sensor unit **88** by means of which the joint geometry is detected (in particular in the case in which the joint geometry is not detected by the first sensor unit **87**). Preferably, the second sensor unit **88** is designed as an image sensor. Suitably, the handheld device **10** is designed to capture a plurality of sequential images with the second sensor unit **88** and to detect the joint geometry, in particular the joint width, on the basis of the plurality of captured images, for example using an image processing algorithm.

Thus, the second sensor unit **88** may in particular comprise an image sensor (for example, an optical camera for image evaluation), a laser unit (for example, a line laser), a LIDAR unit, a RADAR unit, and/or a touch sensor (for sensory touch gauges) for detecting the joint geometry. More expediently, the second sensor unit **88** may also comprise a combination of said units.

Referring now to FIG. **3**, a preferred first composition **10**A of the handheld device **10** will be discussed below.

According to the first composition **10**A, the handheld device **10** comprises a drive device **7** and an attachment device **8** attached to the drive device **7**. The attachment device **8** is removably attached to the drive device **7**.

The attachment device **8** comprises the dispensing device **75** and the drive device **7** is used to drive the dispensing device **75**. For example, the drive device **7** comprises the electric drive **16**, which is coupled to the dispensing device **75** via a mechanical interface. In particular, the electric drive **16** comprises an electric motor with a gear stage.

The drive device **7** further comprises a communication device **79** for communication, in particular for data transmission, with an attachment device communication device **96** of the attachment device **8**. Expediently, the attachment device **8** transmits a communication signal to the communication device **79** via the attachment device communication device **96**, which communication signal maps the influence quantity and/or comprises a control signal. The communication may be contact-based, for example via plug contacts or sliding contacts, or wireless, for example via Bluetooth or WLAN.

The drive device **7** optionally further comprises an energy interface **91** coupled to an attachment device energy interface **92**, preferably wireless or wired. Via the energy interface **91** and the attachment device energy interface **92**, an energy transmission between the drive device **7** and the attachment device **8** is expediently performed. The energy transmission is preferably an inductive energy transmission.

The drive device **7** further comprises an operating device **77**. Via the operating device **77**, the user can expediently start and/or stop the dispensing of filling material **72**. Furthermore, the operating device **77** can be used to enter the specification information.

The drive device **7** further comprises an energy storage device **49**, for example a rechargeable battery and/or a battery, which is used to supply energy to the handheld device **10**, in particular to the electric drive **16**.

The drive device **7** further comprises a control unit **48** comprising, for example, at least one microcontroller. The control unit **48** is communicatively connected to the operating device **77**, the energy interface **91**, the electric drive **16**, the communication device **79** and/or the energy storage device **49**. The control unit **48** is configured, for example, to control the electric drive **16** based on the communication signal from the attachment device **8** to adjust the dispensing rate r according to the influence quantity.

The attachment device **8** optionally comprises an attachment device energy storage device **93**, in particular an accumulator and/or a battery, for (in particular additional) energy supply of the attachment device **8**.

The attachment device **8** further comprises an attachment device operating device **95** through which the user can enter, for example, the specification information.

The attachment device **8** further comprises the sensor device **76** for detecting the influence quantity.

The attachment device **8** further comprises a display unit **81** for displaying status information and/or specification information concerning the dispensing of the filling material **72**. The status information indicates, for example, how much filling material **72** is present in the filling material container **2** and/or how much filling material **72** has already been dispensed. In particular, the display unit **81** comprises a scale and/or a graphical display. The status information may comprise one or more operating parameters, for example a cartridge fill level, a consumption quantity and/or applied and/or remaining running meters.

The attachment device **8** further comprises an attachment device control unit **94** comprising, for example, at least one microcontroller. The attachment device control unit **94** is communicatively connected to the attachment device energy interface **92**, the attachment device energy storage device **93**, the attachment device operating device **95**, the sensor device **76**, the display unit **81**, the attachment device communication device **96**, and/or the dispensing device **75**. In particular, the attachment device control unit **94** is adapted to calculate the communication signal, in particular the control signal, on the basis of the detected influence quantity and to output it to the attachment device communication device **96** for transmission to the drive device **7**.

The attachment device **8** may expediently be provided alone, i.e. without the drive device **7**. The attachment device **8** is for detachably attaching to the drive device **7** to form the handheld device **10** for dispensing the filling material **72** into the joint **71**. The attachment device **8** comprises the dispensing device **75** drivable by the drive device **7** for dispensing the filling material **72** into the joint **71**, and the sensor device **76** adapted to detect an influence quantity affecting a body geometry of a filling material body **78** formed by the filling material **72** dispense into the joint **71**. The attachment device **8** is adapted to provide, based on the detected influence quantity, the control signal to the drive device **7** to control the drive of the dispensing device **75** to adjust the dispensing rate r at which the dispensing device **75** dispenses the filling material.

Expediently, the communication device **79** and/or the attachment device communication device **96** is designed to communicate with an external device **97** and/or a cloud server **98**, for example, to receive the specification information. The communication is preferably wired or wireless, in particular via Bluetooth or WLAN. The external device **97** is, for example, an Internet-of-Things device, a cell phone, a computer, or a tablet.

FIG. **4** shows a second possible composition **10**B of the handheld device **10**. According to the second composition **10**B, the handheld device **10** is designed as an integrated device. In particular, according to the second composition **10**B, the handheld device **10** does not comprise a removable attachment device. According to the second composition **10**B, the handheld device **10** comprises the dispensing device **75**, the electric drive **16**, the control unit **48**, the display unit **81**, the operating device **77**, the sensor device **76**, the communication device **79**, and/or the energy storage device **49**. Expediently, said units of the composition **10**B are formed as explained above (or below). Expediently, said units of the composition **10**B are arranged in a common housing. For example, according to the second composition **10**B, the electric drive **16**, the dispensing device **75** and/or the sensor device **76** are arranged in a common housing. Said units of the composition **10**B are expediently interconnected by wire. The control unit **48** is expediently wire-connected to the sensor device **76**, and is preferably configured to control the electric drive **16** on the basis of the influence quantity detected with the sensor device **76**, in order to adjust the dispensing rate r.

In the following, the specification information will be discussed in more detail. The specification information specifies, for example, the desired body geometry, in particular the desired width, of the filling material body to be achieved by adjusting the dispensing rate r. Furthermore, the specification information may specify a desired amount of filling material per unit length to be achieved by adjusting

the dispensing rate r. The specification information can also specify whether only the handheld device speed v, only the joint geometry or both the handheld device speed v and the joint geometry are to be taken into account as influence quantity. The specification information can be expediently entered into the handheld device **10** via the operating device **77** or the attachment device operating device **95**. Further, the specification information may be received from the handheld device **10** via the communication device **79** or the attachment device communication device **96**, for example, from the external device **97** and/or the cloud server **98**. The handheld device **10** is adapted to take the specification information into account when adjusting the dispensing rate r.

According to a preferred embodiment, the handheld device **10** is configured to record the consumption of filling material as filling material consumption information. Preferably, the handheld device **10** is configured to store the filling material consumption information in association with an identifier of a filling material container **2**. Expediently, several different filling material containers **2** are used (successively and/or alternately) with the handheld device **10**, each filling material container **2** having a different identifier. The handheld device **10** expediently records for each filling material container **2** its own filling material consumption information in association with the respective identifier. Expediently, the handheld device **10** is adapted to store the filling material consumption information in association with location information concerning the location where the consumption takes place. The handheld device **10** is adapted to display the filling material consumption information on the display unit **81** (for example, together with the identifier and/or the location information) and/or is adapted to transmit the filling material consumption information to the external device **97** and/or the cloud server **98** (for example, together with the identifier and/or the location information). Based on the filling material consumption information, for example, a billing of the consumed filling material can be performed.

According to another preferred embodiment, the handheld device **10** is configured to provide a cutting opening information, wherein the cutting opening information represents a recommendation to the user for a cutting of an applicator tip of the handheld device **10** to be performed by the user. The cutting opening information is displayed, for example, via the display unit **81**. Expediently, the handheld device **10** is adapted to generate the cutting opening information based on the specification information and/or to adjust the dispensing rate r in consideration of the cutting opening information.

In particular, the handheld device **10** is designed as an intelligent cartridge press which always produces a constant previously defined body geometry independently of the pulling speed (i.e. the handheld device speed v), and optionally independently of the gap geometry (i.e. the joint geometry). Expediently, the relative handheld device speed v of the applicator tip to the substrate, for example the processing area **83**, is directly measured or calculated by one or more sensors of the sensor device **76**, and from this the dispensing rate r required for a constant line density or constant body geometry is continuously calculated and set.

Before starting work, the user sets the desired standard joint dimension manually, for example via the specification information, and cuts the applicator tip accordingly. If necessary, the applicator tip can be cut to size in a defined manner using an auxiliary tool. In addition, the cutting opening for optimum material output can be output as a recommendation note via the display unit **81**. The user positions the applicator tip at the gap geometry (i.e. the joint **71**), starts the handheld device **10**, in particular the electric drive **16**, and pulls the handheld device **10** at any desired pulling speed (i.e. the handheld device speed v) along the joint path **74**. In doing so, the handheld device **10** always applies the correct amount of filling material by adjusting the dispensing rate r. To complete the creation of the filling material body, the handheld device **10** is stopped by the user. The user then shapes and smoothes the filling material body.

Further exemplary features of the handheld device **10** will be discussed below:

The handheld device **10** comprises a receptacle **1** (see FIG. **5**) for a filling material container **2**. The filling material container **2** is exemplarily designed as a cartridge. Alternatively, the filling material container can be designed as a tubular bag.

FIGS. **1** and **6** show the handheld device **10** with a filling material container **2** inserted in the receptacle **1**. Here, the handheld device **10** includes the filling material container **2**. The handheld device **10** can also be provided without the filling material container **2** inserted (cf. FIG. **5**).

The basic shape of the handheld device **10** comprises a horizontal section **23** and a vertical section **24**. The horizontal section **23** is elongated and oriented with its longitudinal axis parallel to the x-direction. The vertical section **24** is attached to the bottom of the horizontal section **23** and, starting from the horizontal section **23**, extends downwardly, in particular vertically downwardly. Exemplarily, the basic shape of the handheld device **10** comprises the horizontal section **23** and the vertical section **24**. Exemplarily, the handheld device **10** has a T-shaped basic shape.

The horizontal section **23** includes the receptacle **1**, the dispensing device **75**, and/or optionally a stabilizing handle **5** of the handle assembly **73**. The vertical section **24** includes a carrying handle **4** of the handle assembly **73**.

In an exemplary embodiment, the handheld device **10** comprises a shaft section **25**. In an exemplary embodiment, the shaft section **25** is elongated and oriented with its longitudinal axis parallel to the x-direction. The shaft section **25** is part of the horizontal section **23**; expediently, the shaft section **25** is the front longitudinal section of the horizontal section **23**. The shaft section **25** comprises the receptacle **1**, which is arranged in particular on the upper side of the shaft section **25**. On the shaft section **25**, in particular on the underside of the shaft section **25**, the stabilizing handle **5** is expediently arranged.

In an exemplary embodiment, the handheld device **10** includes a drive section **26**. In an exemplary embodiment, the drive section **26** is provided by the vertical section **24**. In particular, the drive section **26** is configured to provide the drive of the dispensing device **75**. The drive section **26** comprises the electric drive **16**, in particular an electric motor, for driving the dispensing device **75**.

Exemplarily, the handheld device **10** comprises a drive device **7** for a screwing and/or drilling power tool. The drive device **7** is expediently the drive section **26**. The drive device **7** can be used in particular as a screwdriving and/or drilling power tool, for example as a cordless screwdriver. The drive device **7** is expediently detachable from the handheld device **10**, and (in particular after attachment of a tool, for example a drill or a screwdriver blade) usable for screwing and/or drilling. The drive device **7** is comprises the carrying handle **4**.

The handheld device **10** comprises the attachment device **8**. The attachment device **8** expediently comprises the shaft section **25**. Exemplarily, the attachment device **8** is the

horizontal section **23**. The attachment device **8** is attached, in particular detachably attached, to the drive section **26**, in particular the drive device **7**. The attachment device **8** comprises the stabilizing handle **5**. The attachment device **8** is expediently configured as a cartridge press attachment device. The attachment device **8** can also be designed as a tubular bag press attachment device.

The drive section **26**, in particular the drive device **7**, comprises a drive interface **27** for providing a drive rotary motion, which is generated in particular by means of the electric drive **16**. The attachment device **8** comprises a receiving interface **28** for receiving the input rotary motion provided at the drive interface **27**. The attachment device **8** is connected with the receiving interface **28** to the drive interface **27** of the drive section **26**.

Preferably, the attachment device **8** is rotatable relative to the drive device **7** about an axis of rotation aligned parallel to the longitudinal direction of the handheld device **10**. Exemplarily, the handheld device **10** comprises a pivot bearing by means of which the attachment device **8** is mounted on the drive device **7** so as to be rotatable about the axis of rotation **9**. Expediently, the attachment device **8** can be rotated by means of the pivot bearing in an angular range of at least 100 degrees, in particular at least 140 degrees, relative to the drive device **7**.

The receptacle **1** is designed to receive the filling material container **2**. The receiving base **29** of the receptacle **1** is shaped in particular to correspond to the shape of the filling material container **2**. Exemplarily, the filling material container **2** has a cylindrical, in particular circular-cylindrical, shape. The receiving base **29** defines a cylindrical segment-shaped receptacle recess which corresponds to the cylindrical shape of the filling material container **2** and into which the cylindrical filling material container **2** can be inserted. In particular, the receptacle **1** is groove-shaped. Exemplarily, the receptacle **1** is designed as a half-shell, in particular as a half-shell open towards the top. The receptacle **1** can also be referred to as an open receptacle **1**.

FIG. **7** shows an exemplary embodiment of the filling material container **2**. The filling material container **2** comprises the container body **32**, which is shaped in particular cylindrically, preferably circular-cylindrically. Exemplarily, the container body **32** is hollow cylindrical in shape. The longitudinal axis of the container body **32** is aligned parallel to the x-direction. The container body **32** has a front end face **38** and a rear end face **39**, each of which is suitably oriented perpendicular to the x-direction. The rear end face **39** is suitably configured to be open in the x-direction, so that a receiving space **37** (for receiving a pressing element **12**) is accessible via the rear end face **39**. The receiving space **37** is bounded in the radial direction by a rear hollow cylindrical body section **41** of the container body **32**. Furthermore, the receiving space **37** is bounded in the negative x-direction by a particularly disc-shaped pressing section **36**. In the positive x-direction, the receiving space **37** is open. The receiving space **37** is in particular cylindrical.

The filling material container **2** is preferably designed as a cartridge, in particular as a joint sealant cartridge, for example as a silicone cartridge or acrylic cartridge. The filling material container **2** comprises a filling material chamber **35** arranged in the container body **32**, in which the filling material **72** to be dispensed is located. The filling material **72** is in particular joint sealant, for example silicone or acrylic.

The filling material container **2** comprises a dispensing element **34**, which is designed in particular as an applicator tip and is expediently aligned with its longitudinal axis parallel to the x-direction. The dispensing element **34** is arranged at the front end face **38**. The filling material container **2** further comprises the pressing section **36** which, when pressed, reduces the filling material chamber **35** so that the filling material **72** is dispensed from the filling material container **2** by the dispensing element **34**. The pressing section **36** is disposed at the rear end face **39** and/or is accessible through the rear end face **39**.

In particular, the pressing section **36** is movable in the (negative) x-direction to effect the dispensing of the filling material. The negative x-direction shall also be referred to as the forward direction, and the positive x-direction shall be referred to as the reverse direction. Exemplarily, the pressing section **36** is disc-shaped. The pressing section **36** is inserted into the hollow cylindrical container body **32** and is movable in the x-direction relative to the hollow cylindrical container body **32** to reduce the filling material chamber **35**. The pressing section **36** may also be referred to as a piston member or a base, in particular a cartridge base. On the side of the pressing section **36** facing away from the filling material chamber **35**, there is the receiving space **37** for receiving the pressing element **12** of the pressing device **3**.

The dispensing device **75** expediently comprises the filling material container **2**. The dispensing device **75** further comprises the pressing device **3** for pressing the filling material container **2** to cause dispensing of filling material **72** contained in the filling material container **2**. Expediently, the pressing device **3** further serves to lock the filling material container **2** in the receptacle **1** so that the filling material container **2** cannot be removed from the receptacle **1**.

The pressing device **3** comprises a pressing element **12**, by means of which the pressing section **36** can be pressed (in negative x-direction) in order to cause the filling material **72** to be dispensed from the filling material chamber **35**. The pressing element **12** further serves to support the filling material container **2** (inserted into the receptacle **1** and applied against a front stop structure **31**) in (positive) x-direction and/or radial direction (in particular z-direction and/or y-direction) and to thus lock the filling material container **2** in the receptacle **1**; i.e., in particular to fix it in the receptacle **1** in such a way that the filling material container **2** cannot be removed from the receptacle **1**.

The pressing element **12** comprises, by way of example, a pressing head **42** which can be inserted into the receiving space **37** and/or can be placed directly against the pressing section **36**. The pressing head **42** is exemplarily designed as a press plunger and has in particular a disk-shaped end section. In the (positive) x-direction, a rod section **43** adjoins the pressing head **42**. The rod section **43** is designed in particular as a spindle **18** and expediently has a thread, in particular an external thread. The rod section **43** is aligned with its longitudinal axis parallel to the x-direction.

The horizontal section **23** of the handheld device **10** may also be referred to as the pressing section. The horizontal section **23** comprises the shaft section **25** already explained above. The horizontal section **23** further comprises a rear longitudinal section **44** adjoining the shaft section in (positive) x-direction. Exemplarily, the rear longitudinal section **44** extends in (positive) x-direction behind the drive section **26**, in particular behind the carrying handle **4**. The rear longitudinal section **44** serves in particular to receive the rod section **43** of the pressing element **12**.

The pressing device **3** further comprises a drive mechanism for driving the pressing element **12**. The drive mechanism serves to drive the pressing element **12** in the forward direction, so as to cause the filling material **72** to be

dispensed from the filling material container **2**. In particular, the drive mechanism is configured to convert the rotational drive motion provided by the drive section **26**, in particular the electric drive **16**, into a linear motion of the pressing element **12**. The linear movement is in particular a forward movement, expediently in the (negative) x-direction.

The drive mechanism includes a drive element **17** which is coupled to the pressing element **12** and which is used to drive the pressing element **12**. The drive element **17** is capable of being set in an output rotational motion based on the input rotational motion (provided by the drive section **26**), and is adapted to set the pressing element **12** in the linear motion based on the output rotational motion. Exemplarily, the drive element **17** has teeth on its outer periphery. Furthermore, the drive element **17** has a central aperture on which an internal thread is provided. The drive element **17** may also be referred to as a spindle nut, a gear, or a spindle nut gear. The spindle **18** of the pressing element **12** extends through the central aperture. The spindle **18** has its external thread in engagement with the internal thread of the drive element **17**, so that the spindle **18** is set in linear motion when the drive element **17** rotates.

The drive mechanism further comprises a coupling gear **45** through which the drive element **17** is coupled to the drive section **26**. The coupling gear **45** engages the teeth of the drive element **17**. Exemplarily, the coupling gear **45** has a smaller diameter than the drive element **17**. Exemplarily, the coupling gear **45** is arranged below the drive element **17** in the z-direction. The coupling gear **45** is non-rotatably coupled to an output shaft **46** of the receiving interface **28**. Exemplarily, the coupling gear **45** is arranged coaxially with the output shaft **46**. The output shaft **46** is oriented parallel to the x-direction. The output shaft **46** is coupled to the drive section **26**, in particular via the receiving interface **28** to the drive interface **27**, and is set into the output rotational movement by the input rotational movement provided by the drive section **26**. The output rotary motion is transmitted to the drive element **17** via the coupling gear **45**.

The handheld device **10** comprises an operating device **77**. The operating device **77** comprises an operating element **47**, by means of which the drive of the pressing element **12** can be controlled—and thereby the dispensing of the filling material **72** from the filling material container **2**. In particular, the operating element **47** can be used to start and/or stop the dispensing of the filling material **72**. In particular, the operating element **47** is designed as a button, expediently as a trigger button or pistol trigger. The operating element **47** is arranged on the carrying handle **4**, in particular at the upper end of the carrying handle **4**. The operating element **47** is operable by the first hand of the user, in a state in which the user grips the carrying handle **4** with the first hand. The operating element **47** is communicatively coupled to a control unit **48**, via which the electric drive **16** is controlled.

The handheld device **10** includes the carrying handle **4**. The carrying handle **4** allows the handheld device **10** to be carried and guided by a first hand of a user to position the handheld device **10** at a desired position when dispensing the filling material **72**.

The carrying handle **4** is exemplarily part of the vertical section **24**, in particular of the drive section **26**. The carrying handle **4** is exemplarily designed as a pistol grip. The longitudinal axis of the carrying handle **4** is oriented vertically, in particular in the z-direction or in the x-z-direction. The carrying handle **4** is grippable about its longitudinal axis. The carrying handle **4** is arranged in the rear region of the handheld device **10**. The carrying handle **4** is preferably at least 8 cm long (in the direction of its longitudinal axis).

The handheld device **10** further comprises a stabilizing handle **5**. The stabilizing handle **5** allows the handheld device **10** to be gripped by a second hand of the user and stabilized during dispensing of the filling material **72**, in particular while the user is gripping the carrying handle **4** with his first hand. The stabilizing handle **5** is exemplarily arranged further forward (i.e. further in negative x-direction) than the carrying handle **4**.

The invention claimed is:

1. A handheld device for dispensing filling material into a joint, comprising:

a handle assembly for manually gripping the handheld device and moving the handheld device along a joint path,

a dispensing device for dispensing the filling material into the joint, and

a sensor device adapted to detect an influence quantity influencing a body geometry of a filling material body formed by the filling material dispensed into the joint,

wherein the handheld device is configured to adjust, based on the detected influence quantity, a dispensing rate at which the dispensing device dispenses the filling material,

the handheld device further comprising an operating device for inputting specification information and/or a communication device for receiving the specification information, wherein the handheld device is configured to take the specification information into account when adjusting the dispensing rate.

2. The handheld device of claim **1**, wherein the influence quantity comprises a handheld device speed at which the handheld device is moved.

3. The handheld device according to claim **2**, wherein the handheld device comprises a dispensing element for dispensing the filling material into the joint, and the handheld device speed is the speed of the dispensing element relative to the joint path.

4. The handheld device according to claim **1**, wherein the influencing quantity concerns a joint geometry.

5. The handheld device according to claim **1**, wherein the handheld device is configured to adapt the dispensing rate on the basis of the detected influence quantity in such a way that the filling material body formed by the filling material dispensed into the joint has a predetermined body geometry.

6. The handheld device according to claim **1**, wherein the handheld device is configured to adapt the dispensing rate on the basis of the influencing quantity in such a way that the dispensing device outputs a predetermined quantity of filling material per unit length of the joint path along the joint path.

7. The handheld device according to claim **1**, wherein the handheld device is adapted to increase the dispensing rate of the filling material in response to an increasing detected handheld device speed and/or to reduce the dispensing rate of the filling material in response to a decreasing detected handheld device speed.

8. The handheld device according to claim **1**, wherein the sensor device for detecting the influence quantity comprises an acceleration sensor, an odometry unit, a laser unit, an image sensor, a LIDAR unit, a RADAR unit, and/or a touch sensor.

9. The handheld device according to claim **1**, comprising a drive device and a detachable attachment device attached to the drive device, wherein the attachment device comprises the dispensing device and the drive device is for driving the dispensing device.

10. The handheld device according to claim 1, wherein the handheld device is a cartridge press and/or a tubular bag press.

11. The handheld device according to claim 3, wherein the dispensing element is an applicator tip.

12. The handheld device according to claim 5, wherein the handheld device is configured to adapt the dispensing rate on the basis of the detected influence quantity in such a way that the filling material body formed by the filling material dispensed into the joint has a predetermined width.

13. The handheld device according to claim 5, wherein the handheld device is configured to adapt the dispensing rate on the basis of the detected influence quantity in such a way that the filling material body formed by the filling material dispensed into the joint has a constant width.

14. A handheld device for dispensing filling material into a joint, comprising:

a handle assembly for manually gripping the handheld device and moving the handheld device along a joint path,

a dispensing device for dispensing the filling material into the joint, and

a sensor device adapted to detect an influence quantity influencing a body geometry of a filling material body formed by the filling material dispensed into the joint,

wherein the handheld device is configured to adjust, based on the detected influence quantity, a dispensing rate at which the dispensing device dispenses the filling material,

the handheld device further comprising a display unit for displaying status information and/or specification information concerning the dispensing of the filling material.

15. A handheld device for dispensing filling material into a joint, comprising:

a handle assembly for manually gripping the handheld device and moving the handheld device along a joint path,

a dispensing device for dispensing the filling material into the joint, and

a sensor device adapted to detect an influence quantity influencing a body geometry of a filling material body formed by the filling material dispensed into the joint,

wherein the handheld device is configured to adjust, based on the detected influence quantity, a dispensing rate at which the dispensing device dispenses the filling material, and

wherein the handheld device is adapted to record a consumption of filling material as filling material consumption information.

16. The handheld device according to claim 15, wherein the handheld device is adapted to store the filling material consumption information in association with an identifier of a filling material container.

17. The handheld device according to claim 15, wherein the handheld device is adapted to store the filling material consumption information in association with location information concerning the location where the consumption occurs.

18. The handheld device according to claim 1, wherein the handheld device is adapted to provide cutting opening information, the cutting opening information representing a recommendation to the user for a cutting of an applicator tip of the handheld device to be performed by the user.

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