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Viviroli

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(54) **CABLE PROCESSING MACHINE WITH SEPARATE CABLE STORAGE MEANS**

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H01B 13/00 (2006.01)
H01R 43/052 (2006.01)

(52) **U.S. Cl.**
CPC ***H01B 13/0003*** (2013.01); ***H01B 13/0036*** (2013.01); ***H01R 43/052*** (2013.01)

(58) **Field of Classification Search**
CPC H01B 13/0003; H01B 13/0036; Y10S 198/95; B65G 47/52; B65G 47/57; B65G 13/10
See application file for complete search history.

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(57) **ABSTRACT**

A cable processing machine has a processing region for processing cables, an operating region for operation of the machine by an operator, a conveying device that conveys batches of cables processed in the processing region from the processing region to the operating region, a cable storage device having a receiving portion accessible from the processing region for receiving individual cables processed in the processing region and a removal portion accessible from the operating region for safe removal of the individual cables by the operator, as well as a feed device that feeds the cables processed in the processing region either to the conveying device or to the receiving portion.

17 Claims, 11 Drawing Sheets

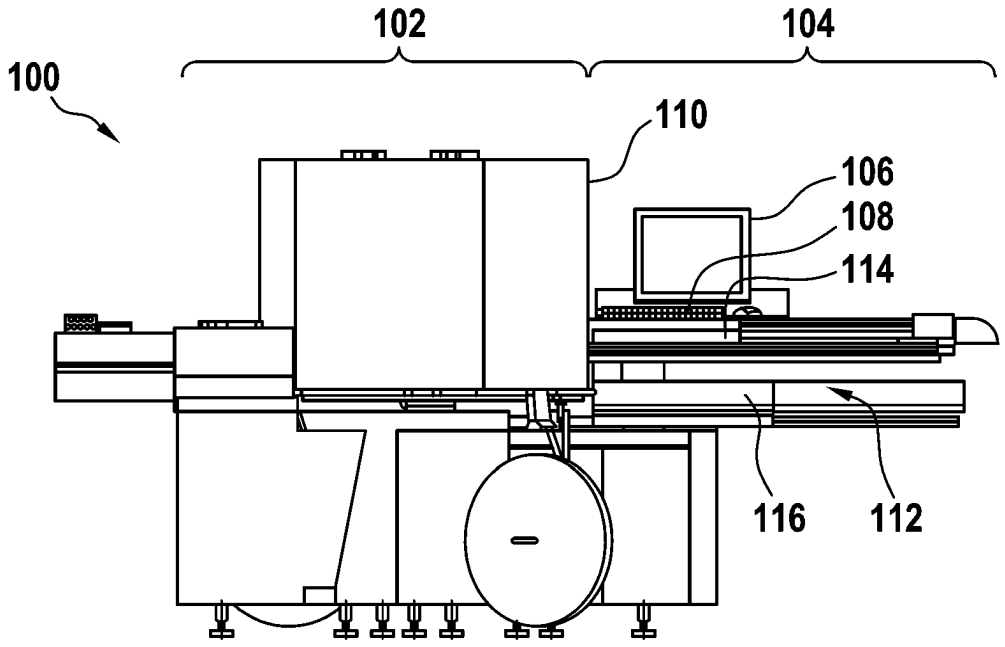

Fig. 1

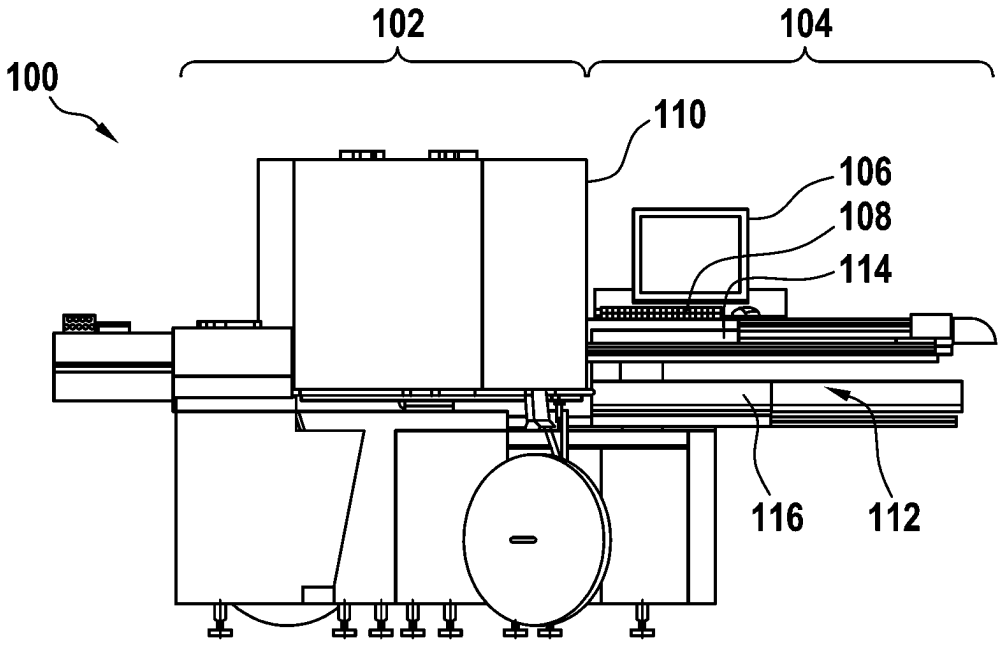
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Fig. 2

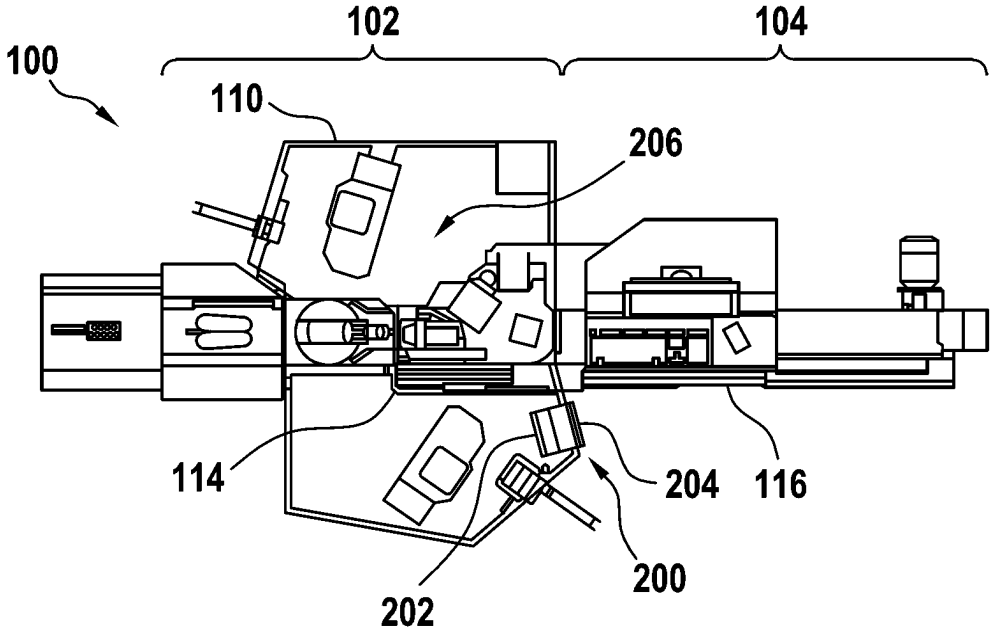
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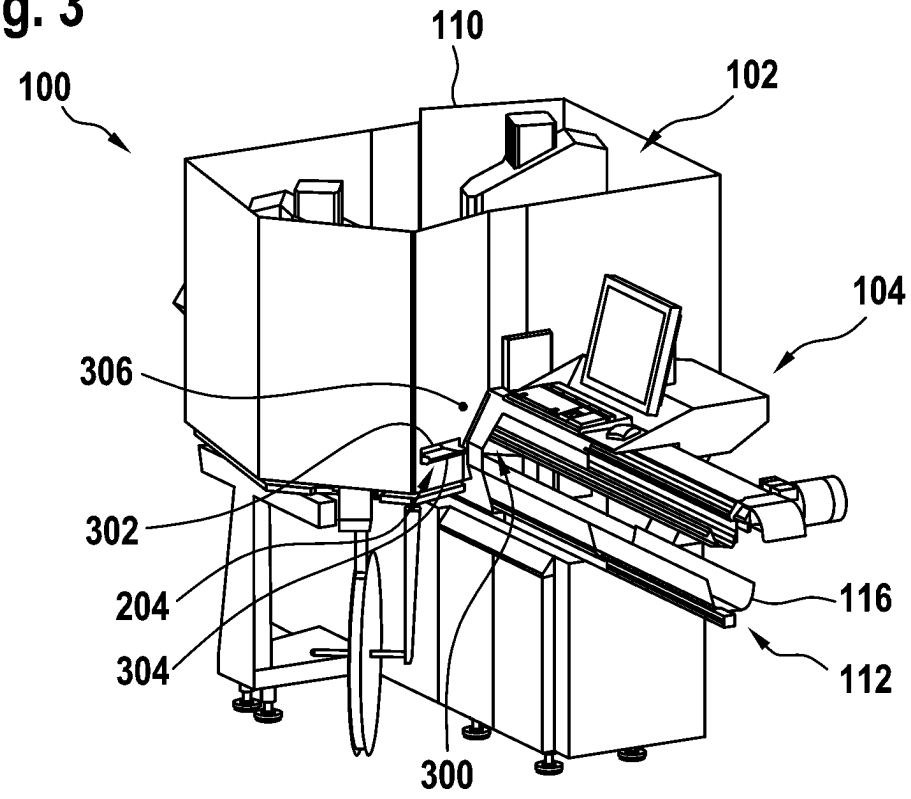
Fig. 3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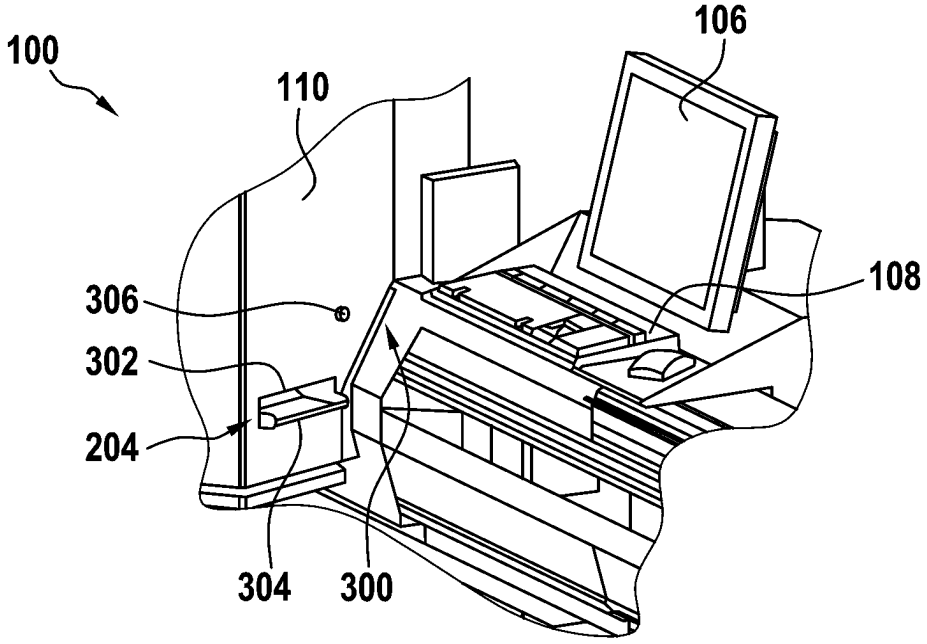
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Fig. 5

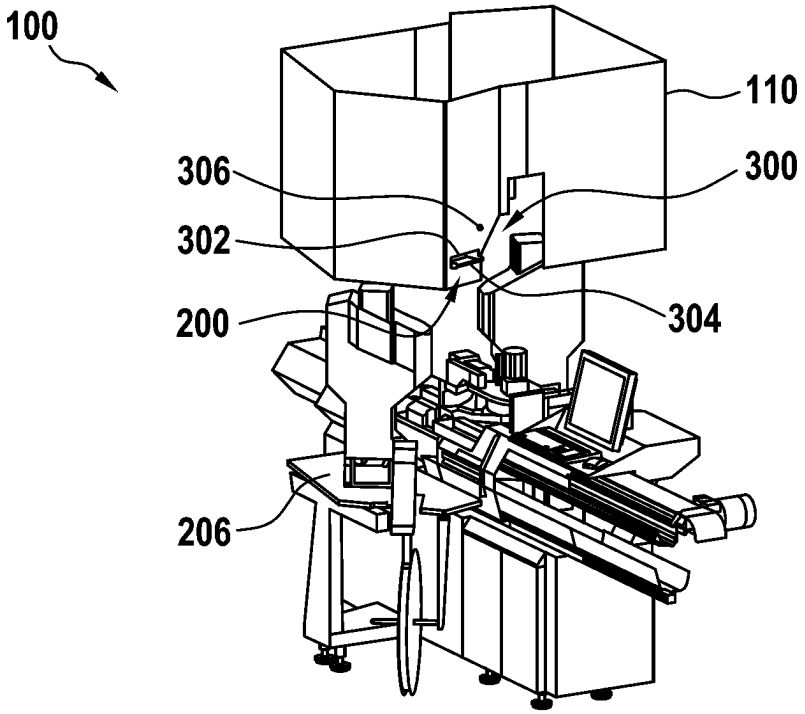


Fig. 6

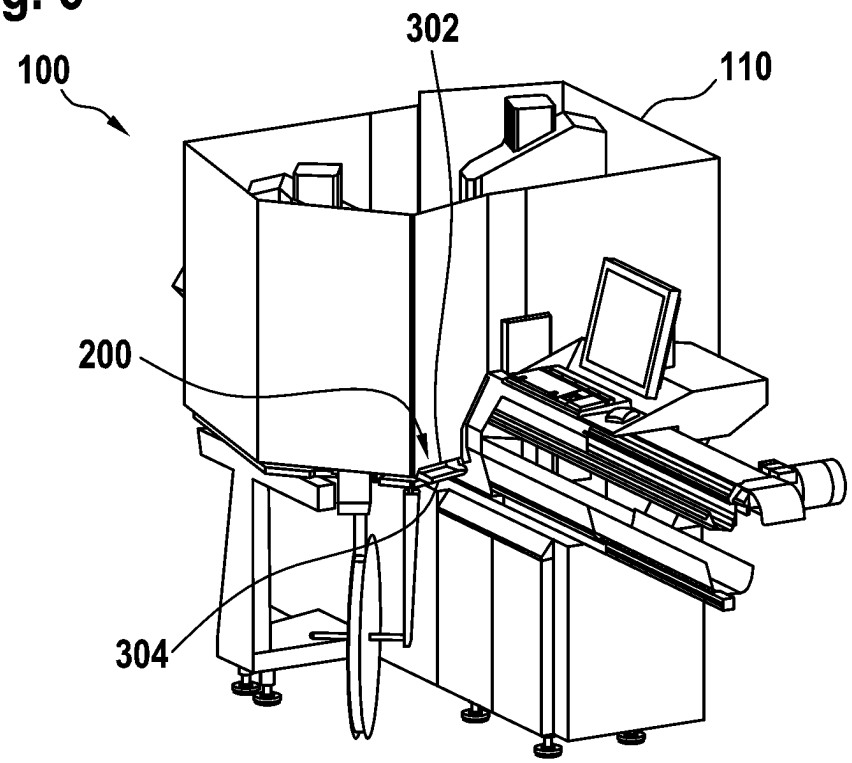


Fig. 7

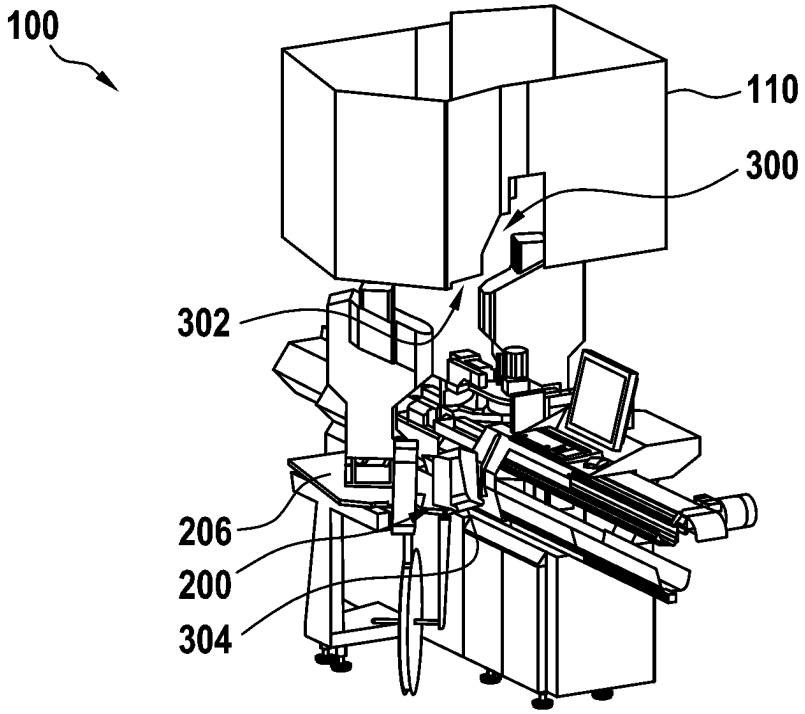
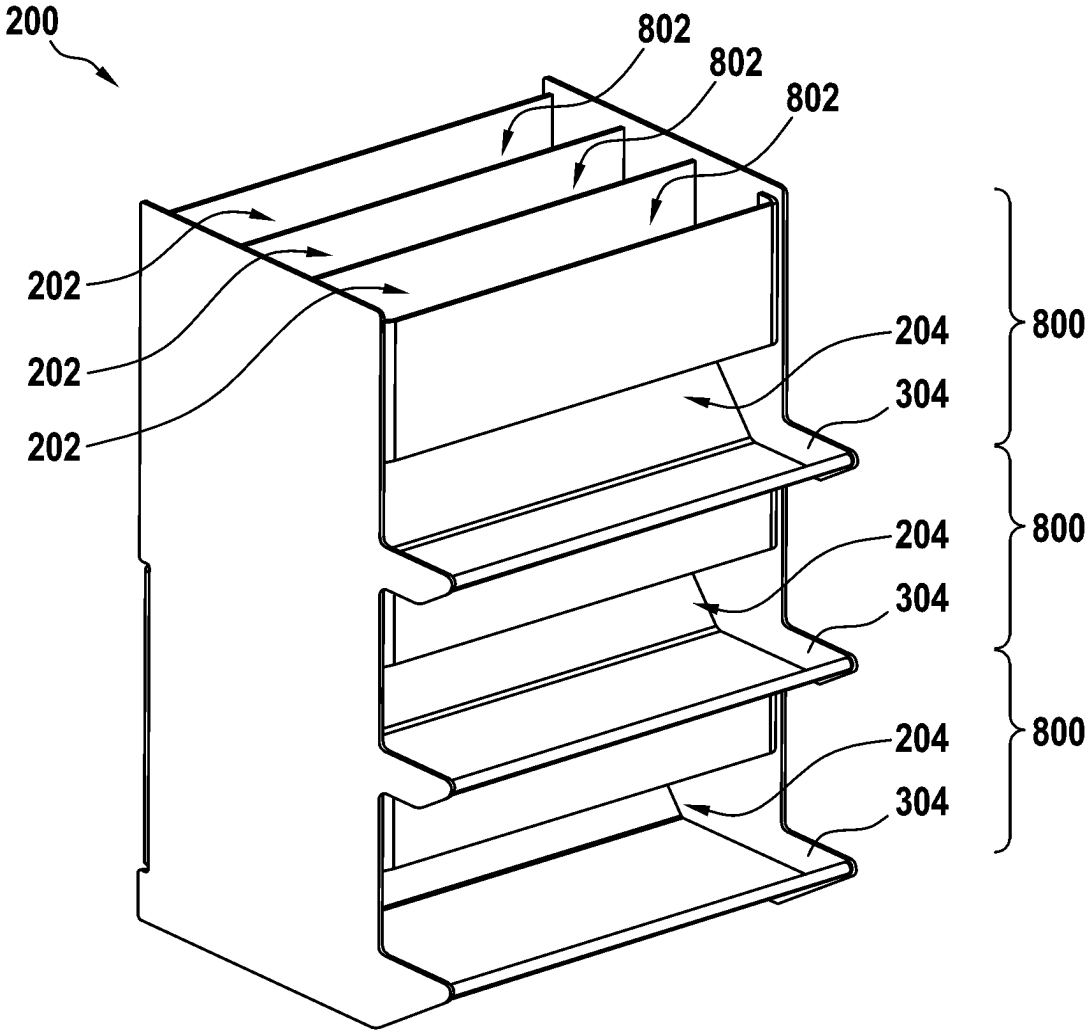


Fig. 8



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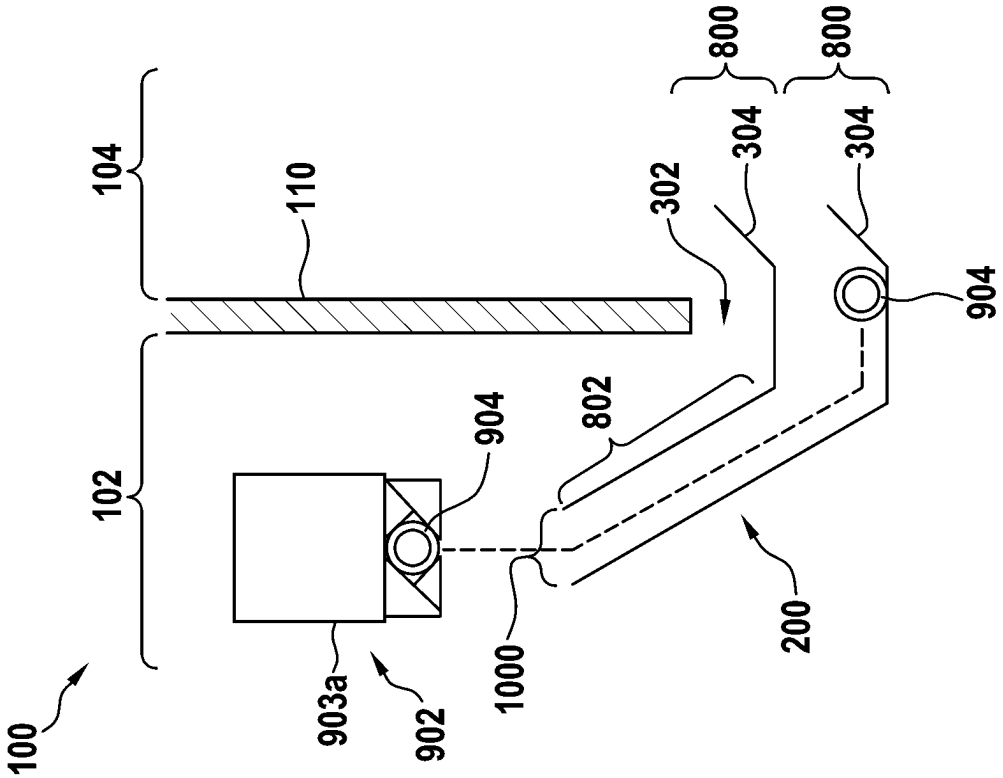
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Fig. 9

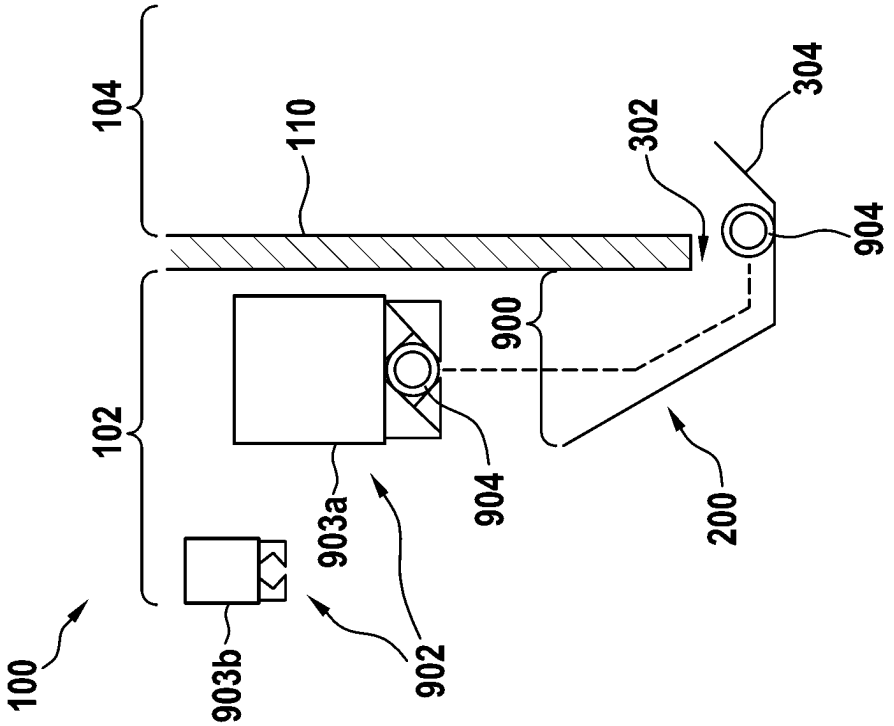
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Fig. 12

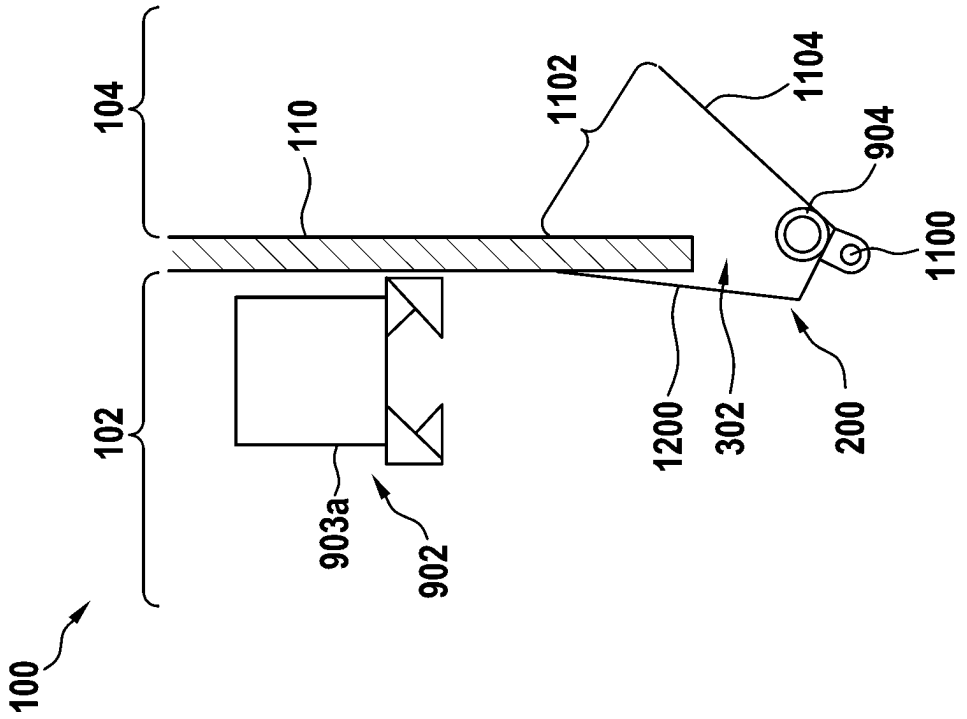
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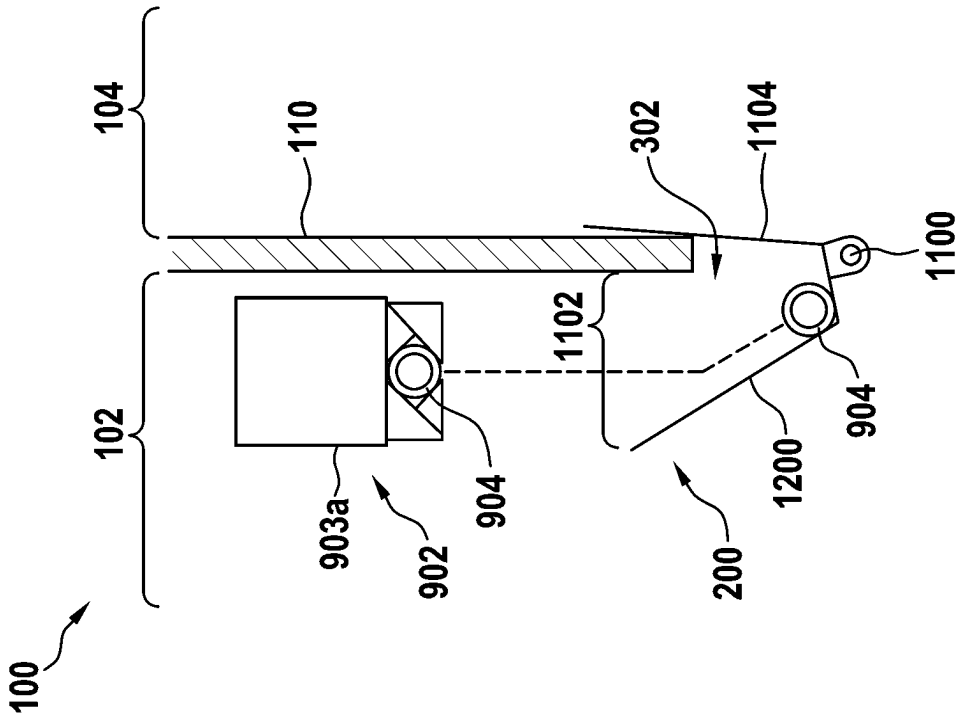
Fig. 11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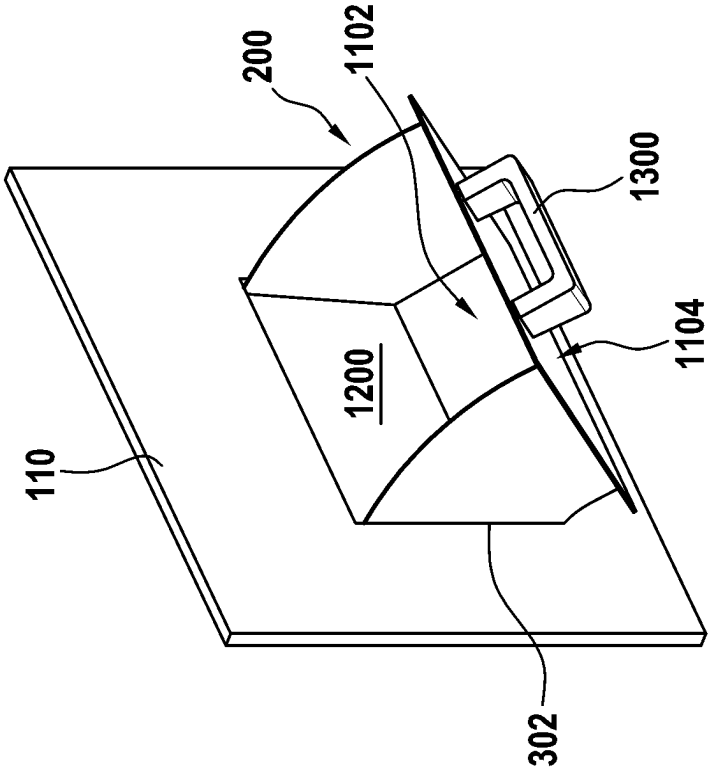
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Fig. 14

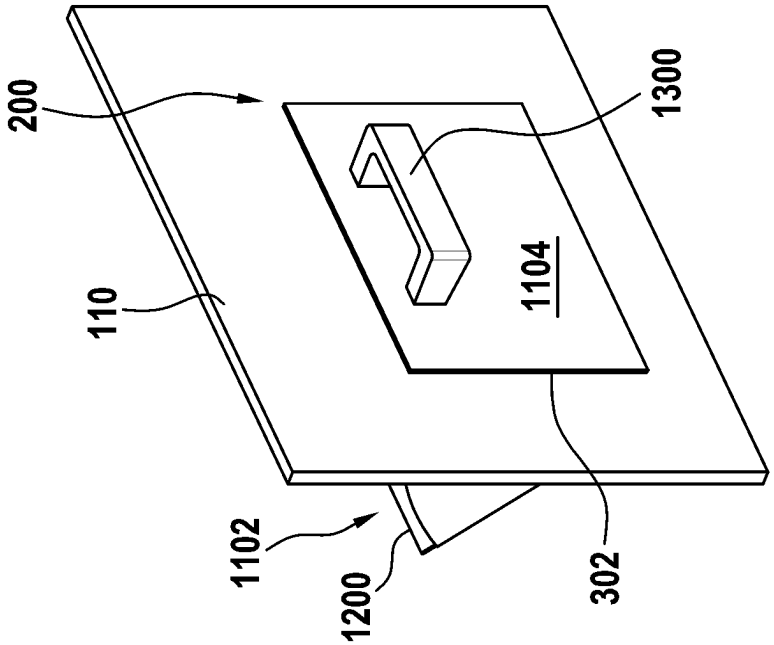
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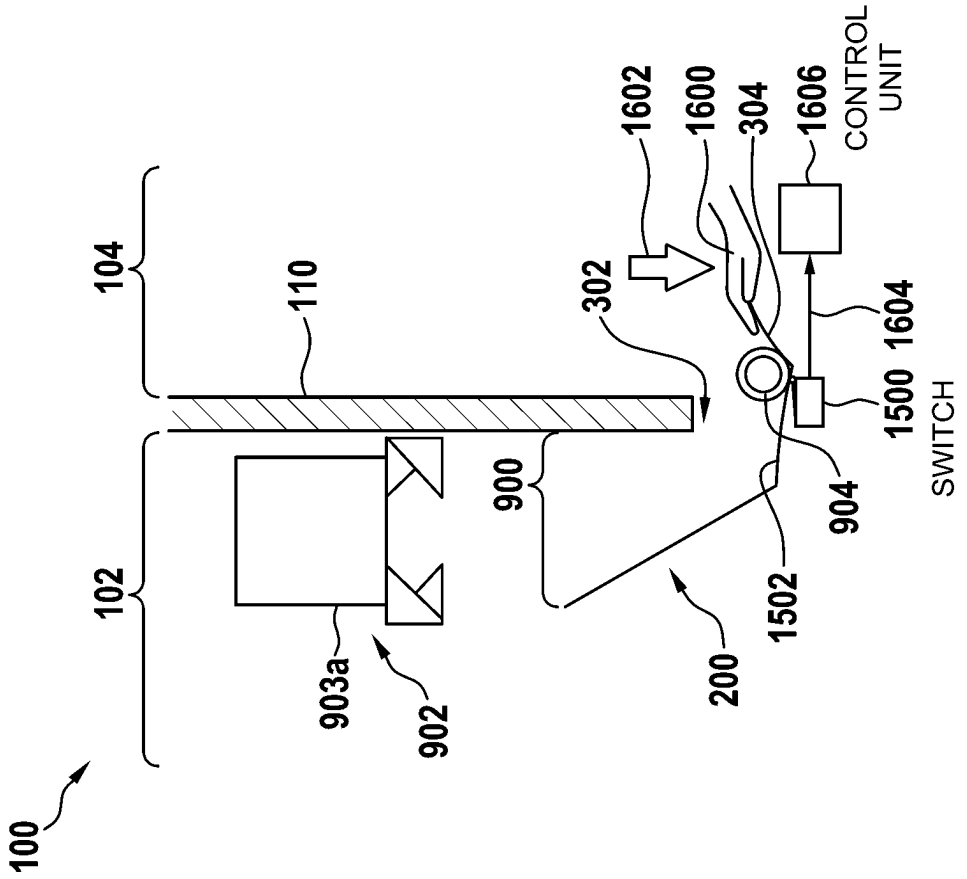
Fig. 13

Fig. 16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1606
CONTROL UNIT
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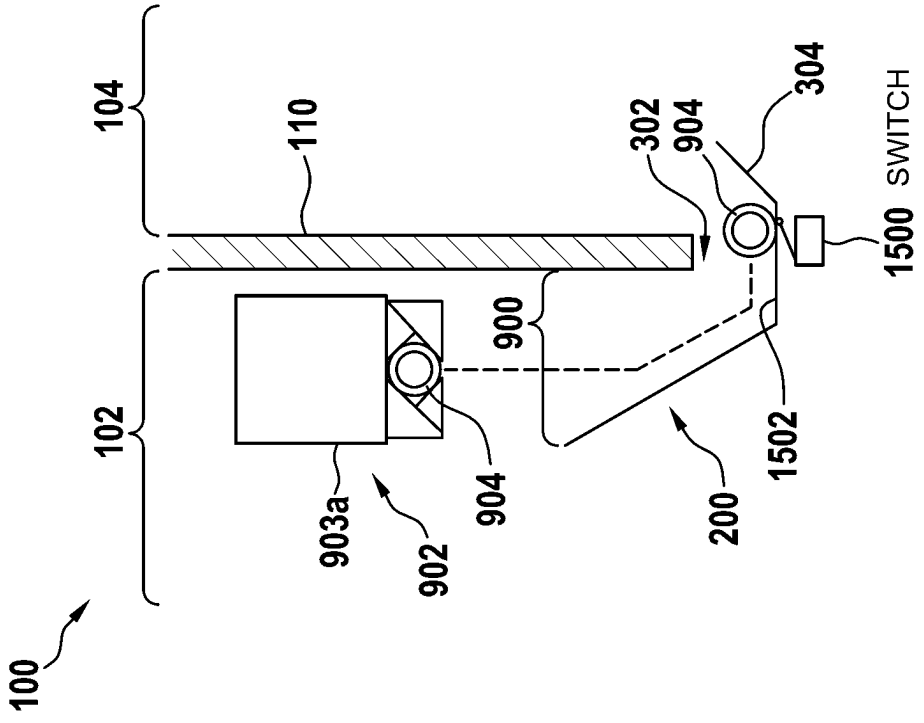
SWITCH

Fig. 15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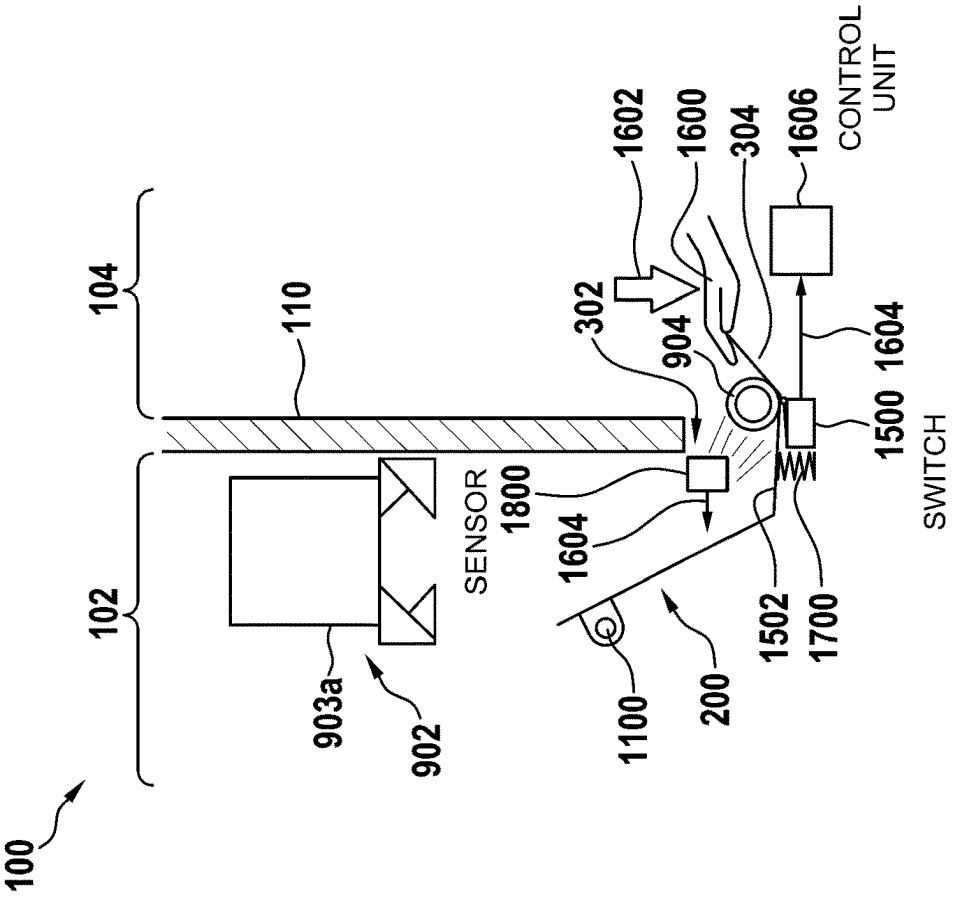
SWITCH

Fig. 18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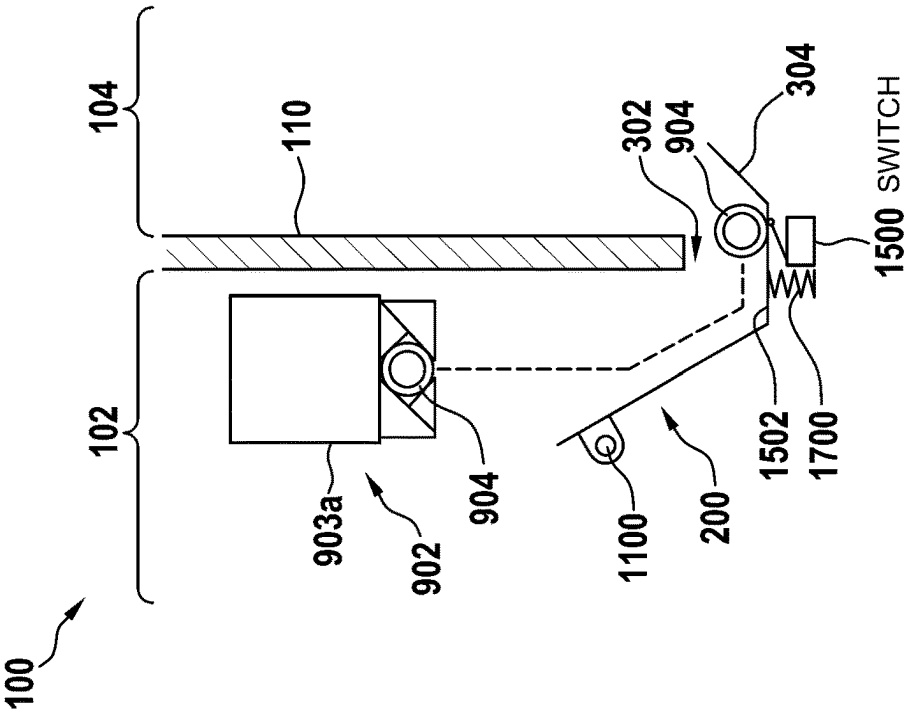
SWITCH

Fig. 17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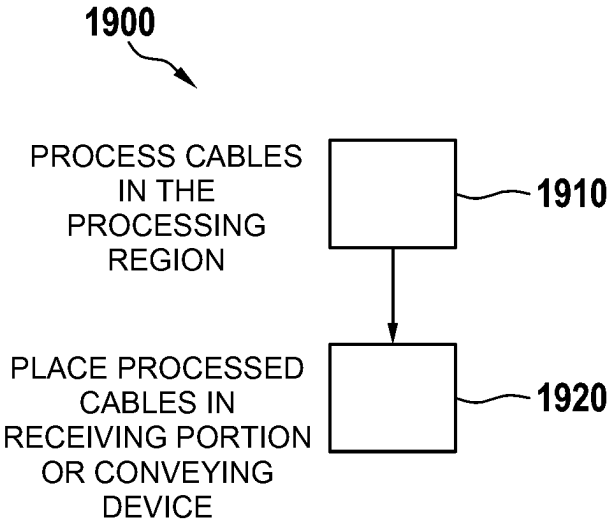
SWITCH

Fig. 19


1900
PROCESS CABLES IN THE PROCESSING REGION
1910
PLACE PROCESSED CABLES IN RECEIVING PORTION OR CONVEYING DEVICE
1920

CABLE PROCESSING MACHINE WITH SEPARATE CABLE STORAGE MEANS

FIELD

The present invention relates to a cable processing machine for processing cables and to a method for operating such a cable processing machine.

BACKGROUND

Cable processing machines can produce batches of cables, i.e. a certain number of cables of the same cable type, fully automatically. The finished cables are usually removed by hand by an operator, for example from a removal tray which is specially provided for removal and into which the cables are automatically thrown and transported to the operator as soon as a batch has been completed.

Before cable production can be started on such a cable processing machine, one or more training cables or cable samples are usually produced first for quality purposes and for parameterizing a processing process, and these cables are checked by the operator. Transporting the finished cable samples to the operator by means of the removal tray can take a few seconds at a time. If a plurality of cable samples are to be produced one after the other, the time required to prepare the cable processing machine can increase significantly simply on account of the transport of the cable samples to the operator.

Usually, all cables produced by the cable processing machine, regardless of whether they are cables from a batch, a random sample or individual training cables, are placed in the same removal tray. This is automatically moved, for example, to a safe operating region of the cable processing machine at certain times, for example every time a batch has been completed, and the operator can then remove the cables. It may therefore be the case that different types of cables mix with one another in the removal tray. The cables must then be sorted by hand by the operator. This is time-consuming, partly because the operator has to wait until a batch has been completed to access the cables, and partly because it is prone to errors.

SUMMARY

It is thus an object of the invention to improve the removal of cables from a cable processing machine.

This object is achieved by a cable processing machine and a method according to the following description.

A first aspect of the invention relates to a cable processing machine for processing cables. The cable processing machine comprises a processing region for processing the cables, an operating region for operation of the cable processing machine by an operator, a conveying device which is designed to convey batches of cables processed by the cable processing machine from the processing region to the operating region, a cable storage means comprising a receiving portion accessible from the processing region for receiving individual cables processed by the cable processing machine and a removal portion accessible from the operating region for safe removal of the individual cables by the operator, as well as a feed device which is designed to feed the cables processed by the cable processing machine either to the conveying device or to the receiving portion.

With the option of storing individual cables such as short training or sample cables or other short cables, e.g. cable waste or faulty cables, in a separate cable storage means, quality controls can be carried out in less time and with less susceptibility to errors than if the cables are discharged from the cable processing machine only in production batches.

In particular, during a production operation of the cable processing machine, for example a machine for attaching contacts to cable ends by means of crimping, the individual cables can be removed separately from the cables of a production batch for inspection. In addition to saving time, this has the advantage that random samples can be checked immediately without prior manual sorting. This means that it is possible to intervene early if the random sample is poor. This also avoids training or sample cables mixing with a random sample and thus limiting the informative value of the random sample.

The processing region can comprise a region of the cable processing machine that is potentially hazardous to the operator and that should not be accessible to the operator at least during operation of the cable processing machine. Tools that are required for processing the cables and means for transporting the cables, such as conveyor belts or cable grippers, can be arranged in the processing region. By contrast, an operating region can be understood to mean a region of the cable processing machine in or from which the operator can safely operate the cable processing machine. A human-machine interface for controlling the cable processing machine, for example in the form of a screen and an input device such as a keyboard or a mouse, can also be arranged in the operating region.

The conveying device can, for example, comprise a conveyor belt, a movable or tiltable tray or a gripping system for moving the cables, or a combination of at least two of the examples mentioned. For example, the conveying device can comprise two batch trays connected in series, which allow for uninterrupted production of a plurality of batches one after the other.

A cable storage means can be understood to mean a container or a storage area for storing cables, for example. It is possible for the cable storage means to be movably arranged in the cable processing machine. Alternatively, the cable storage means can be fixed in the cable processing machine. The receiving portion can open into the removal portion so that cables that are placed in the receiving portion can get into the removal portion, for example by the effect of gravity, and can be removed in the operating region separately from the respective cables of a production batch. For example, the receiving portion can comprise a chute or a duct for guiding the cables into the removal portion. The removal portion can comprise a collecting container, a tray or a channel for removing the cables, for example.

The removal portion can be designed, for example, in such a way that the operator cannot reach into the potentially hazardous region of the cable processing machine or cannot reach into the processing region at all with his hand or individual fingers when removing the cables. For this purpose, the removal portion can be appropriately narrowed or closed by a suitable mechanism toward the processing region, for example, when the operator removes the cables.

It is possible for the removal portion to extend at least partially within the processing region, provided that it is ensured that the operator can safely remove the cables from the removal portion.

Additionally or alternatively, the cable processing machine can comprise a protective wall or protective cover which separates the processing region and the operating region around the cable storage means in such a way that inadvertent reaching into the processing region is prevented or at least made more difficult.

The feed device can comprise a combination of two feed devices that are movable independently of one another, for example, one for moving cables to the conveying device and another for moving cables to the cable storage means. This may be a combination of two cable grippers or of a conveyor belt and a cable gripper. Alternatively, the feed device can be formed by a pivotable cable gripper or a pivotable conveyor belt. The cable gripper or the conveyor belt can be pivoted back and forth between the conveying device and the cable storage means. However, any other desired embodiments of the feed device are also possible. It is conceivable, for example, for the feed device to comprise one or more movable or tiltable trays for receiving the cables, similarly to the conveying device.

A second aspect of the invention relates to a method for operating a cable processing machine as described above and below. The method comprises the following steps: processing a cable in the processing region and moving the cable processed in the processing region by means of the feed device either to the conveying device in order to form a batch of cables and convey it from the processing region to the operating region, or to the receiving portion of the cable storage means in order to provide the cable separately from the batch in the operating region.

Features of the cable processing machine, as it is described above and below, can also be features of the method and vice versa.

Possible features and advantages of embodiments of the invention may be considered, inter alia and without limiting the invention, to be dependent upon the concepts and findings described below.

According to one embodiment, the cable storage means is designed to prevent the operator, when removing the cables, from reaching into a region of the cable processing machine that is potentially hazardous to the operator.

For example, the cable storage means can be designed to prevent the operator from reaching into the processing region at all. For this purpose, the cable storage means can be curved or narrowed accordingly. Additionally or alternatively, the removal portion can be closed toward the processing region, for example by a flap or the like that is movable in only one direction. This can prevent the operator from injuring himself when removing the cables, for example by accidentally coming into contact with moving parts of the cable processing machine located in the processing region.

According to one embodiment, the cable processing machine further comprises a protective wall which at least partially surrounds the processing region during operation of the cable processing machine in order to prevent the operator from reaching into the processing region. The protective wall has a first passage and a second passage. The conveying device is designed to convey the batches through the first passage, while the removal portion is formed on the second passage.

For example, the protective wall can close off the processing region all around during the operation of the cable processing machine. In addition, the protective wall can cover the processing region at the top. The protective wall can be removed for maintenance or repair purposes or moved into a position in which the processing region is freely accessible, for example. The first passage and the second passage can be arranged adjacent to one another, for example, such that the operator has access from the same location both to the cables in the cable storage means and to the batches brought out by the conveying device.

According to one embodiment, the cable storage means is designed as a container with a container opening. The container is arranged in the second passage such that it is movable between a receiving position and a removal position. The container opening is accessible from the processing region in the receiving position and from the operating region in the removal position.

In other words, the container opening can be arranged at least partially in the processing region in the receiving position in order to form the receiving portion, and can be arranged at least partially in the operating region in the removal position in order to form the removal portion.

For example, the cable storage means can be designed as a drawer or a compartment that can be tilted about a pivot point. The cable storage means can be open at the top. The container opening can be the only opening in the cable storage means, for example. It is possible that the container opening is located completely in the processing region in the receiving position. In combination with the protective wall which separates the processing region from the operating region, the operator can thus be prevented from reaching into the container opening while cables are being conveyed into the cable storage means.

According to one embodiment, the second passage is closed in the receiving position by a wall surface of the container.

This can prevent the operator from reaching into the processing region through the second passage while the cable storage means is being loaded with cables. For example, the second passage can be closed by a front wall of the cable storage means that faces the operating region. The front wall can have a handle for opening or closing the cable storage means, for example.

According to one embodiment, the second passage is closed in the removal position by a wall surface of the container.

This can prevent the operator from inadvertently reaching into the processing region through the second passage when he removes the cables. For example, the second passage can be closed by a rear wall of the cable storage means that faces the processing region.

According to one embodiment, the cable storage means is fastened to the protective wall.

As a result, the cable storage means can be removed or moved together with the protective wall, provided that it is removable or movable.

According to one embodiment, the receiving portion comprises a chute and the removal portion comprises a storage tray, with the chute opening into the storage tray and the feed device being designed to feed the cables either to the conveying device or to the chute.

A chute can be understood to mean an elongate hollow body or a tubular element. The chute can protrude into the processing region. In order to prevent the operator from reaching into the processing region via the chute, the chute can be angled or curved, for example. In particular, the chute can comprise an upper end and a lower end. The upper end can be arranged in the processing region and can be further away from the storage tray in the vertical direction than the lower end, which can open into the storage tray.

If the processing region is surrounded by a protective wall, as described further above, the storage tray can extend through the second passage on both sides of the protective wall, for example. Alternatively, the storage tray can end at the protective wall. For example, the storage tray can also end on a side of the protective wall that faces the processing region without passing through the second passage. The

operator can reach into the storage tray from the operating region through the second passage.

The second passage can be formed, for example, by a correspondingly small opening, which can prevent the operator from reaching into a hazardous region of the cable processing machine when removing the cables from the storage tray.

According to one embodiment, the cable storage means comprises at least two separate cable compartments. Each of the at least two cable compartments has a receiving portion accessible from the processing region for receiving the cables, and a removal portion accessible from the operating region for the operator to safely remove the cables. Accordingly, the feed device is designed to feed the cables either to the conveying device or to one of the receiving portions of the at least two cable compartments.

The cable compartments can be separated from one another in such a way that cables that are fed to different cable compartments do not mix with one another. This allows different types of cables to be provided in a sorted manner. This eliminates the need for time-consuming and error-prone manual sorting.

According to one embodiment, the cable processing machine further comprises a machine table. The cable storage means is fastened to the machine table.

As a result, the cable storage means can be loaded with cables even when the protective wall has been removed, for example during a special operation of the cable processing machine.

According to one embodiment, the feed device comprises a first feed device for loading the conveying device with the cables and a second feed device for loading the cable storage means with the cables. The feed device and the second feed device can be controlled independently of one another.

As a result, the cable storage means and the conveying device can be loaded with cables independently of one another, for example in parallel with one another.

According to one embodiment, the cable processing machine further comprises a signal transmitter for providing a signal which indicates whether or not there are cables in the removal portion, and a control unit for controlling the cable processing machine using the signal.

The signal transmitter can for example be a sensor, a button or a switch or a combination of at least two of the examples mentioned. This means that quality assurance workflows can be controlled in a targeted manner. For example, the control unit can interrupt an ongoing production operation of the cable processing machine if it is determined by means of the signal transmitter that the cables in the removal portions were not removed within a specific time window.

According to one embodiment, the signal transmitter comprises a sensor for providing the signal. In addition or as an alternative, the signal transmitter can comprise a button or a switch for providing the signal.

The sensor can be a light-sensitive, pressure-sensitive or touch-sensitive sensor, for example. The button or the switch can be actuated by the operator either directly or indirectly, for example by means of the cable storage means.

According to one embodiment, the switch is coupled to the cable storage means and can be actuated by moving the cable storage means.

For example, the switch can be actuated in that the cable storage means presses on the switch due to its weight force and actuates the switch as soon as the weight force reaches a certain threshold. Alternatively or additionally, the switch can be actuated by corresponding deformation of the cable storage means, for example by slightly bending a side wall or a bottom of the cable storage means.

Embodiments of the invention will be described in the following with reference to the accompanying drawings, although neither the drawings nor the description should be construed as limiting the invention.

DESCRIPTION OF THE DRAWINGS

The above, as well as other advantages of the present invention, will become readily apparent to those skilled in the art from the following detailed description of a preferred embodiment when considered in the light of the accompanying drawings in which:

FIG. **1** is a front view of a cable processing machine according to one embodiment of the invention;

FIG. **2** is a top plan view of the cable processing machine from FIG. **1**;

FIG. **3** is a perspective view of the cable processing machine from FIGS. **1** and **2**;

FIG. **4** is a detailed view of the cable processing machine from FIG. **3**;

FIG. **5** is a perspective view of the cable processing machine from FIGS. **1** to **4** with the protective wall removed;

FIG. **6** is a perspective view of the cable processing machine according to a further embodiment of the invention;

FIG. **7** is a perspective view of the cable processing machine from FIG. **6** with the protective wall removed;

FIG. **8** is a perspective view of a cable storage means with three cable compartments according to one embodiment of the invention;

FIG. **9** is a simplified view of a tray-shaped cable storage means according to one embodiment of the invention;

FIG. **10** is a simplified view of a cable storage means with a chute according to one embodiment of the invention;

FIG. **11** is a simplified view of a tiltable cable storage means according to one embodiment of the invention in a receiving position;

FIG. **12** is a simplified view of the cable storage means from FIG. **11** in a removal position;

FIG. **13** is a perspective view of the cable storage means from FIGS. **11** and **12** in the receiving position;

FIG. **14** is a perspective view of the cable storage means from FIGS. **11** to **13** in the removal position;

FIG. **15** is a simplified view of a deformable cable storage means with an acknowledgment function according to one embodiment of the invention in a rest position;

FIG. **16** is a simplified view of the cable storage means from FIG. **15** in an actuation position;

FIG. **17** is a simplified view of a cable storage means in the form of a lever with an acknowledgment function according to one embodiment of the invention in a rest position;

FIG. **18** is a simplified view of the cable storage means from FIG. **17** in an actuation position; and

FIG. **19** is a flow chart for a method for operating a cable processing machine according to one embodiment of the invention.

The drawings are merely schematic and not to scale. Like reference signs designate like or equivalent features in the various figures.

DETAILED DESCRIPTION

FIG. **1** is a front view of a cable processing machine **100** according to one embodiment of the invention. The cable

processing machine **100**, for example a crimping machine, is divided into a processing region **102** in which cables are processed, and an operating region **104** for operation of the cable processing machine **100** by an operator. From the operating region **104**, the operator can remove the cables processed by the cable processing machine **100**. In addition, the operator can control the cable processing machine **100** there. For this purpose, the operating region **104** can have a screen **106** and a keyboard **108**, for example. In order to prevent the operator from coming into contact with moving parts in the processing region **102**, the processing region **102** can be at least partially surrounded by a protective wall **110**. A conveying device **112** transports the cables processed in the processing region **102** in batches from the processing region **102** to the operating region **104**, where they can be removed by the operator.

By way of example, the conveying device **112** here comprises an upper batch tray **114** and a lower batch tray **116**. The cables are first placed in the upper batch tray **114**, for example by means of a cable gripper, and from there tipped into the lower batch tray **116**, from which they are finally removed by the operator. The advantage of this arrangement is that the cable processing machine **100** can fill the upper batch tray **114** in a production operation, while the operator can simultaneously remove the cables from the lower batch tray **116**. This allows almost uninterrupted production of a plurality of batches one after the other.

For safety reasons, the upper batch tray **114** is located within the processing region **102** in the production operation and is therefore not accessible to the operator due to the protective wall **110** (in FIG. **1**, the upper batch tray **114** is shown outside the processing region **102** simply for better visibility). As soon as the upper batch tray **114** is filled with a batch, the batch is tipped into the lower batch tray **116** located below, which is then moved from the processing region **102** to the operating region **104**, where it is emptied by the operator.

FIG. **2** is a plan view of the cable processing machine **100** from FIG. **1**, in which a cable storage means **200** can be seen. The cable storage means **200** is used to store cables in the operating region **104** separately from the lower batch tray **116**. The cable storage means **200** comprises a receiving portion **202** for receiving the cables and a removal portion **204** for removing the cables from the cable storage means **200**. The receiving portion **202** is located within the processing region **102** surrounded by the protective wall **110**. The removal portion **204** is accessible from the operating region **104** and is designed in such a way that the operator can remove the cables without reaching into a region of the cable processing machine **100** that is potentially hazardous to him. The protective wall **110** extends here along an outer edge of a machine table **206** of the cable processing machine **100**, for example. The cable storage means **200** can be fastened to the machine table **206** or to the protective wall **110**.

FIG. **3** is a perspective view of the cable processing machine **100** from FIGS. **1** and **2**. The protective wall **110** has a first passage **300** and a second passage **302**. The protective wall **110** is open at the top, for example. The lower batch tray **116** can be moved between the processing region **102** and the operating region **104** through the first passage **300**. The second passage **302** is used to remove the cables from the cable storage means **200** via the removal portion **204**. The cable storage means **200** can be designed with a storage tray **304**, for example. The storage tray **304** can protrude through the second passage **302** into the operating region **104** so that the operator can remove the cables without having to remove the protective wall **110**.

The cable processing machine **100** can have an acknowledgment button **306** as a signal transmitter which can be actuated by the operator, for example. By pressing the acknowledgment button **306**, the cable processing machine **100** can be informed that the storage tray **304** is empty. The acknowledgment button **306** can expediently be arranged in the vicinity of the second passage **302** on the protective wall **110**.

Such monitoring of the removal portion **204** allows for targeted control of quality assurance workflows. For example, it is conceivable for the cable processing machine **100** to interrupt production if the cables, for example a random sample, are not removed from the removal portion **204** within a production cycle that can include a certain number of cables produced one after the other.

FIG. **4** shows an enlarged portion of the cable processing machine **100** from FIG. **3**, in which the removal portion **204** with the storage tray **304** can be seen more clearly.

FIG. **5** is a perspective view of the cable processing machine **100** from FIGS. **3** and **4** with the protective wall **110** removed. The cable storage means **200** is fastened only to the protective wall **110** here. The cable storage means **200** can thus be removed together with the protective wall **110**.

FIG. **6** is a perspective view of a cable processing machine **100** in which, in contrast with FIGS. **3** to **5**, the cable storage means **200** is fastened only to the machine table **206** so that the cable storage means **200** remains on the machine table **206** when the protective wall **110** is removed, as shown in FIG. **7**, where the protective wall **110** is removed from the machine table **206**. As can be seen in FIG. **6**, the second passage **302** is not slot-shaped, as shown in FIGS. **3** to **5**, but is realized as a recess on the outermost lower edge of the protective wall **110**, which recess is adapted to an outer contour of the storage tray **304**.

FIG. **8** is a perspective view of a cable storage means **200** with a plurality of cable compartments **800**. For example, the cable storage means **200** is designed here with three separate cable compartments **800** for the separate storage of the cables. Each of the three cable compartments **800** comprises a storage tray **304** and a chute **802** which extends from the processing region **102** to the storage tray **304** when the cable storage means **200** is mounted. The three chutes **802** are each open at the top toward the processing region **102** and open at the bottom into the relevant storage tray **304** which forms the removal portion **204** of the relevant cable compartment **800**. An opening of each of the chutes **802** that opens into the processing region **102** can, however, be understood as the receiving portion **202** of the relevant cable compartment **800**. If a cable is thrown into one of the three chutes **802**, it lands in the corresponding storage tray **304**.

The three storage trays **304** are arranged one above the other, i.e. the cable storage means **200** has a three-tier structure. However, it is also possible, alternatively or additionally, for the storage trays **304** to be arranged next to one another.

The cable storage means **200** can have more or also less than three separate cable compartments **800**.

For example, a storage location for the cables can be varied by positioning a cable gripper (not shown) over the corresponding chute **802**. This makes it possible to store different types of cables in different storage places. For example, the cable processing machine **100** can store faulty cables, cable portions or other cables that are not wanted in the lower batch tray **116** separately from the lower batch tray **116**. This prevents the cables from being mixed up.

FIG. **9** is a simplified view of a tray-shaped cable storage means **200** which protrudes through the second passage **302** into the processing region **102** on the one hand and into the operating region **104** on the other. A portion of the cable storage means **200** that protrudes into the operating region **104** acts as a storage tray **304**. A portion of the cable storage means **200** that protrudes into the processing region **102** forms, together with a portion of the protective wall **110**, a type of channel **900**.

A feed device **902**, which in this case comprises, for example, a cable gripper **903***a* for gripping and moving cables **904** processed by the cable processing machine **100** in the processing region **102**, positions a single cable **904** above the channel **900** and lets it fall there, for example. The channel **900** guides the dropped cable **904** into the storage tray **304**, as indicated schematically with a dashed line.

The feed device **902** can also be designed to transport the cable **904** into the upper batch tray **114** instead of to the channel **900**, for example.

It is possible for the feed device **902** to comprise a further cable gripper **903***b* in addition to the cable gripper **903***a*. The further cable gripper **903***b* can be used, for example, only to transport cables **904** to the conveying device **112**, for example into the upper batch tray **114**.

FIG. **10** shows a cable storage means **200** similar to that from FIG. **9**. Instead of the channel **900**, the cable storage means **200** in this case has a chute **802** which opens into the processing region **102** and into the storage tray **304**. The feed device **902** lets the cable **904** fall into a chute opening **1000** of the chute **802**. The chute **802** is shaped such that the operator cannot reach into the processing region **102**, or at least cannot reach into it very far, from the operating region **104** with his hand or individual fingers.

In contrast with FIG. **8**, the cable storage means **200** is designed here, for example, with two instead of three cable compartments **800**, each with a storage tray **304**.

FIG. **11** is a simplified view of a rocker-like cable storage means **200** which is mounted on a pivot point **1100** so as to be tiltable between a receiving position and a removal position. In other words, the cable storage means **200** is designed here as a container that is open at the top and has a corresponding container opening **1102**. The container opening **1102** is the only opening in the container. In the receiving position shown in FIG. **11**, the container opening **1102** is arranged in the processing region **102** such that the cable storage means **200** can be filled with one or more cables **904** from above by means of the feed device **902**. The second passage **302** is closed by a front wall **1104** of the cable storage means **200** that faces the operating region **104**, so that the operator cannot reach into the processing region **102** from the operating region **104**.

The pivot point **1100** can be positioned with respect to a center of gravity of the cable storage means **200** in such a way that the cable storage means **200** moves automatically into the receiving position when it is not being held by the operator.

FIG. **12** shows the cable storage means **200** from FIG. **11** in the removal position in which the container opening **1102** is located in the operating region **104** so that the cable or cables **904** can be removed by the operator. The second passage **302** is closed by a rear wall **1200** of the cable storage means **200** that faces the processing region **102** so that, in this case too, the operator cannot reach into the processing region **102** from the operating region **104**.

FIG. **13** is a perspective view of the cable storage means **200** from FIGS. **11** and **12** in the receiving position. As can be seen here, the cable storage means **200** can have a handle **1300** on the front wall **1104** for moving the cable storage means **200** between the receiving position and the removal position.

FIG. **14** is a perspective view of the cable storage means **200** from FIGS. **11** to **13** in the removal position.

FIG. **15** shows a cable storage means **200** with an acknowledgment function. The cable storage means **200** substantially corresponds to the cable storage means shown in FIG. **9**, with the difference that the cable storage means **200** is elastically deformable here in the region of the storage tray **304**. In addition, the cable storage means **200** is coupled to a signal transmitter in the form of a mechanically actuatable switch **1500**, for example a microswitch. The switch **1500** is arranged opposite a bottom **1502** of the cable storage means **200** and can be brought into an actuation position by bending the storage tray **304** accordingly. In FIG. **15**, the cable storage means **200** or the switch **1500** coupled thereto is shown in a rest position.

If the operator **1600** presses on the storage tray **304** with his hand, i.e. if the storage tray **304** is subjected to a downward pressure force **1602** and is thereby elastically deformed in the direction of the switch **1500**, as shown in FIG. **16**, the switch **1500** is brought into the actuation position. The switch **1500** outputs a corresponding signal **1604** which can then be processed in a suitable manner by a control unit **1606** of the cable processing machine **100**, for example. The operator **1600** actuates the switch **1500** in this way, for example, when he wants to acknowledge that he has removed all the cables **904** from the storage tray **304**.

When the storage tray **304** is released, the storage tray **304** or the switch **1500** coupled thereto returns to the rest position. The cable storage means **200**, more precisely the elastically deformable tray **304**, thus functions together with the switch **1500** as a type of acknowledgment button, similar to that shown in FIGS. **3** and **4**.

As an alternative or in addition to the elastically deformable storage tray **304**, the cable storage means **200** can be mounted so as to be movable between the rest position and the actuation position, for example so as to be pivotable on a suitably positioned pivot point **1100** (see FIG. **11**). In this case, the cable storage means **200** functions as a kind of lever for operating the switch **1500**.

FIG. **17** shows an example of a cable storage means **200** functioning as a lever in the rest position.

In FIG. **18**, the cable storage means **200** from FIG. **17** is shown in the actuation position.

The cable storage means **200** can in this case, similarly to that shown in FIGS. **15** and **16**, be brought into the actuation position by applying the pressure force **1602** to the storage tray **304**. A restoring element **1700**, such as a compression spring, can be used to apply a restoring force to the cable storage means **200** which counteracts the pressure force **1602** and causes the cable storage means **200** or the switch **1500** to return to the rest position when the storage tray **304** is released.

Additionally or alternatively, the cable processing machine **100** can comprise a sensor **1800** as a signal transmitter, which monitors whether or not there are cables **904** in the cable storage means **200**, as is shown in FIG. **18**. For example, the sensor **1800** can be part of a light barrier and output the signal **1604** when a light beam emitted by a light source of the light barrier is interrupted by one or more cables **904** located in the storage tray **304**.

FIG. **19** is an example of a flow chart of a method **1900** for operating the cable processing machine **100** described above. The method **1900** can be carried out, for example,

during a normal production operation or also during a special operation, for example with the protective wall removed.

In a first step **1910** of the method **1900**, cables are processed in the processing region **102**, for example by crimping one or two of their respective cable ends with a plug or the like.

In a second step **1920**, the processed cables **904** are then, depending on whether it is a cable from a production batch or a cable to be sorted out from the production batch, such as a random sample, a training or sample cable or scrap, either placed in the receiving portion **202** of the cable storage means **200** by means of the cable gripper **903***a*, or placed in the conveying device **112**, for example the upper batch tray **114**, by means of the further cable gripper **903***b*.

Finally, it should be noted that terms such as "comprising," "including," etc. do not preclude other elements or steps, and terms such as "a" or "an" do not preclude a plurality. Furthermore, it should be noted that features or steps that have been described with reference to one of the above embodiments may also be used in combination with other features or steps of other embodiments described above.

In accordance with the provisions of the patent statutes, the present invention has been described in what is considered to represent its preferred embodiment. However, it should be noted that the invention can be practiced otherwise than as specifically illustrated and described without departing from its spirit or scope.

LIST OF REFERENCE SIGNS

100 cable processing machine
102 processing region
104 operating region
106 screen
108 keyboard
110 protective wall
112 conveying device
114 upper batch tray
116 lower batch tray
200 cable storage means
202 receiving portion
204 removal portion
206 machine table
300 first passage
302 second passage
304 storage tray
306 acknowledgment button
800 cable compartment
802 chute
900 channel
902 feed device
903*a* cable gripper
903*b* further cable gripper
904 cable
1000 chute opening
1100 pivot point
1102 container opening
1104 front wall
1200 rear wall
1300 handle
1500 switch
1502 bottom
1600 operator
1602 pressure force
1604 signal
1606 control unit
1700 restoring element
1800 sensor
1900 method for operating a cable processing machine
1910 step of processing
1920 step of moving

What is claimed is:

1. A cable processing machine for processing cables, the cable processing machine comprising:
- a processing region for processing cables;
- an operating region for operation of the cable processing machine by an operator;
- a conveying device that conveys batches of cables processed in the processing region from the processing region to the operating region;
- a cable storage means having a receiving portion accessible from the processing region for receiving individual cables processed in the processing region, and a removal portion accessible from the operating region for removal of the individual cables from the cable storage means by the operator; and
- a feed device that places each of the cables processed in the processing region either in the conveying device or in the receiving portion.

2. The cable processing machine according to claim **1** wherein the cable storage means is adapted to prevent an operator, when removing the cables from the removal portion, from reaching into a region of the cable processing machine that is potentially hazardous to the operator.

3. The cable processing machine according to claim **1** further comprising:
- a protective wall at least partially surrounding the processing region during operation of the cable processing machine to prevent the operator from reaching into the processing region;
- wherein the protective wall has a first passage and a second passage formed therein;
- wherein the conveying device conveys the batches of cables through the first passage; and
- wherein the removal portion is formed at the second passage.

4. The cable processing machine according to claim **3** wherein the cable storage means is fastened to the protective wall.

5. The cable processing machine according to claim **1** wherein the receiving portion includes a chute and the removal portion includes a storage tray, wherein the chute opens into the storage tray, and wherein the feed device places the individual cables either in the conveying device or in the chute.

6. The cable processing machine according to claim **1** wherein the cable storage means has formed therein at least two separate cable compartments, wherein each of the at least two cable compartments has a receiving portion accessible from the processing region for receiving the individual cables and a removal portion accessible from the operating region for removal of the individual cables by the operator, and wherein the feed device places each of the individual cables either in the conveying device or in one of the receiving portions of the at least two cable compartments.

7. The cable processing machine according to claim **1** further comprising:
- a machine table; and
- wherein the cable storage means is fastened to the machine table.

8. The cable processing machine according to claim **1** wherein the feed device includes a first feed device adapted

to load the conveying device with the bundles of cables and a second feed device adapted to load the cable storage means with the individual cables, and wherein the first feed device and the second feed device are controlled independently of one another.

9. A method for operating a cable processing machine according to claim **1**, the method comprising the steps of:

processing a cable in the processing region of the cable processing machine; and

moving the cable processed in the processing region with the feed device either to the conveying device to form a batch of cables and convey the batch of cables from the processing region to the operating region, or to the receiving portion of the cable storage means to separate the cable from the batch of cables in the operating region.

10. The cable processing machine according to claim **1** wherein the cable storage means is a container having a container opening formed therein, wherein the container is movable between a receiving position and a removal position, and wherein the container opening is accessible from the processing region when in the receiving position and is accessible from the operating region when in the removal position.

11. The cable processing machine according to claim **1** further comprising a control unit controlling the cable processing machine in response to a transmitted signal that indicates whether there are any of the individual cables in the removal portion.

12. A cable processing machine for processing cables, the cable processing machine comprising:

a processing region for processing cables;

an operating region for operation of the cable processing machine by an operator;

a conveying device that conveys batches of cables processed in the processing region from the processing region to the operating region;

a cable storage means having a receiving portion accessible from the processing region for receiving individual cables processed in the processing region, and a removal portion accessible from the operating region for removal of the individual cables from the cable storage means by the operator;

a feed device that places each of the cables processed in the processing region either in the conveying device or in the receiving portion;

a protective wall at least partially surrounding the processing region during operation of the cable processing machine to prevent the operator from reaching into the processing region;

wherein the protective wall has a first passage and a second passage formed therein;

wherein the conveying device conveys the batches of cables through the first passage;

wherein the removal portion is formed at the second passage; and

wherein the cable storage means is a container having a container opening formed therein, wherein the container is arranged in the second passage and is movable between a receiving position and a removal position, and wherein the container opening is accessible from the processing region when in the receiving position and is accessible from the operating region when in the removal position.

13. The cable processing machine according to claim **12** wherein the second passage is closed in the receiving position of the container by a wall of the container.

14. The cable processing machine according to claim **12** wherein the second passage is closed in the removal position of the container by a wall of the container.

15. A cable processing machine for processing cables, the cable processing machine comprising:

a processing region for processing cables;

an operating region for operation of the cable processing machine by an operator;

a conveying device that conveys batches of cables processed in the processing region from the processing region to the operating region;

a cable storage means having a receiving portion accessible from the processing region for receiving individual cables processed in the processing region, and a removal portion accessible from the operating region for removal of the individual cables from the cable storage means by the operator;

a feed device that places each of the cables processed in the processing region either in the conveying device or in the receiving portion;

a signal transmitter providing a signal that indicates whether there are any of the individual cables in the removal portion; and

a control unit controlling the cable processing machine in response to the signal.

16. The cable processing machine according to claim **15** wherein the signal transmitter includes a sensor providing the signal, and wherein the signal transmitter is at least one of a button that provides the signal when actuated and a switch that provides the signal when actuated.

17. The cable processing machine according to claim **16** wherein the switch is coupled to the cable storage means and is actuated by moving the cable storage means.

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