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

(11) **EP 4 282 586 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
29.11.2023 Bulletin 2023/48

(21) Application number: **23174802.1**

(22) Date of filing: **23.05.2023**

(51) International Patent Classification (IPC):
B24B 21/00 *(2006.01)* ***B24B 55/00*** *(2006.01)*
B24B 55/04 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B24B 21/00; B24B 55/00; B24B 55/04

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

(30) Priority: **25.05.2022 US 202263345627 P**
04.05.2023 US 202318143143

(71) Applicant: **RTX Corporation**
Farmington, CT 06032 (US)

(72) Inventors:
- **Hayes, Raymond**
  Newington, 06111 (US)
- **Ciarello, Anthony S.**
  Colchester, 06415 (US)

(74) Representative: **Schmitt-Nilson Schraud Waibel Wohlfrom**
Patentanwälte Partnerschaft mbB
Pelkovenstraße 143
80992 München (DE)

(54) MACHINE CONTROL FOR DYNABRAID MACHINE

(57) An abrasive belt machine including a support housing having a pivoting arm that supports an abrasive belt rotatably coupled to a drive motor; a safety controller operatively coupled with the drive motor; an E-stop operatively coupled to the safety controller; a foot pedal switch operatively coupled to the drive motor; and a 480 volt alternating current 3 phase electrical power supply electrically coupled to the drive motor.

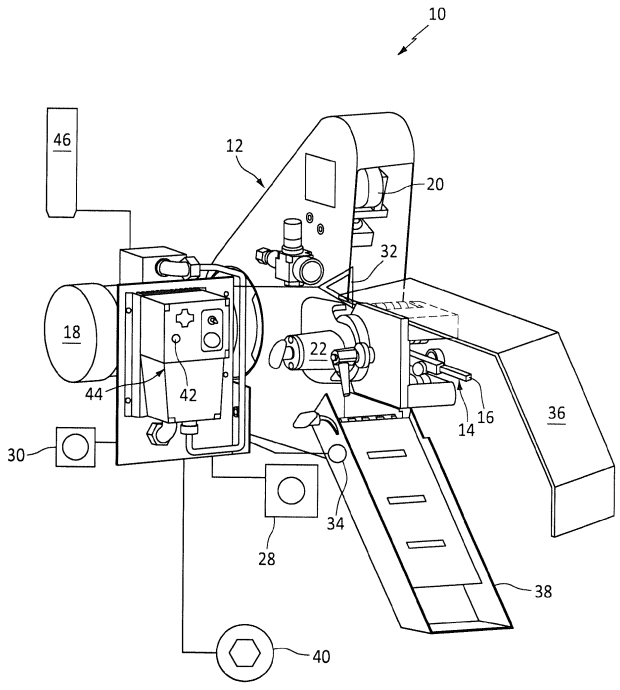

FIG. 1

EP 4 282 586 A1

Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of provisional application Serial No. 63/345,627 filed May 25, 2022.

BACKGROUND

[0002] The present disclosure is directed to grinding machines and particularly to safety features for abrasive belt grinding machines.

[0003] A grinding machine employs an abrasive belt that is coated with an abrasive material or that has an abrasive material thereon. To perform a grinding operation, the abrasive belt is generally caused to rotate via a motor. Once the abrasive belt is rotating at a desired rate, the abrasive belt contacts a workpiece to perform a grinding operation. Typical abrasive belt machines include a latch style on/off switch that allows for the machine to remain in operation even while being unattended by an operator. Moreover, subsequent a power outage, an abrasive belt machine can have the switch remain in the on position, and upon reenergizing, the machine can spontaneously operate, creating a hazard. Grinding machines create substantial quantities of fine airborne particulate during operation. However, grinding machines are optionally equipped with exhaust vacuum particulate removal devices. These exhaust vacuum devices are optionally operated during the grinding operation.

SUMMARY

[0004] In accordance with the present disclosure, there is provided an abrasive belt machine comprising a support housing having a pivoting arm that supports an abrasive belt rotatably coupled to a drive motor; a safety controller operatively coupled with the drive motor; an E-stop operatively coupled to the safety controller; a foot pedal switch operatively coupled to the drive motor; and a 480 volt alternating current 3 phase electrical power supply electrically coupled to the drive motor.

[0005] A further embodiment of any of the foregoing embodiments may additionally and/or alternatively include the safety controller is electronically coupled to the E-stop, a guard door sensor, a vacuum pressure/air flow sensor and the like.

[0006] A further embodiment of any of the foregoing embodiments may additionally and/or alternatively include the safety controller is configured to prevent operation of the drive motor responsive to predetermined conditions.

[0007] In accordance with the present disclosure, there is provided an abrasive belt machine comprising a support housing having a pivoting arm that supports an abrasive belt rotatably coupled to a drive motor; a guard door coupled to the support housing proximate the abrasive belt, the guard door including a guard door sensor; an exhaust vacuum coupled to the support housing proximate the abrasive belt, the exhaust vacuum including a vacuum/air flow sensor; a safety controller operatively coupled with the drive motor; an E-stop operatively coupled to the safety controller; a foot pedal switch operatively coupled to the drive motor; and a 480 volt alternating current 3 phase electrical power supply electrically coupled to the drive motor.

[0008] A further embodiment of any of the foregoing embodiments may additionally and/or alternatively include the safety controller is electronically coupled to the E-stop, the guard door sensor, the vacuum pressure/air flow sensor and the like.

[0009] A further embodiment of any of the foregoing embodiments may additionally and/or alternatively include the safety controller is configured to detect electrical faults, short circuits, welded contacts and the like.

[0010] A further embodiment of any of the foregoing embodiments may additionally and/or alternatively includethe abrasive belt machine further comprising a fault light on a panel, wherein the safety controller is configured to provide a signal to the fault light on the panel.

[0011] In accordance with the present disclosure, there is provided a process for configuring an abrasive belt machine for safety comprising a support housing having a pivoting arm that supports an abrasive belt rotatably coupled to a drive motor; coupling a guard door to the support housing proximate the abrasive belt, the guard door including a guard door sensor; coupling an exhaust vacuum to the support housing proximate the abrasive belt, the exhaust vacuum including a vacuum/air flow sensor; coupling a safety controller with the drive motor; coupling an E-stop to the safety controller; coupling a foot pedal switch to the drive motor; and supplying a 480 volt alternating current 3 phase electrical power supply to the drive motor.

[0012] A further embodiment of any of the foregoing embodiments may additionally and/or alternatively include the process further comprising electronically coupling the safety controller to the E-stop, a guard door sensor, a vacuum pressure/air flow sensor and the like.

[0013] A further embodiment of any of the foregoing embodiments may additionally and/or alternatively include the process further comprising configuring the safety controller to prevent operation of the drive motor responsive to predetermined conditions.

[0014] Other details of the abrasive belt machine are set forth in the following detailed description and the accompanying drawings wherein like reference numerals depict like elements.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

Fig. 1 is a schematic representation of an exemplary abrasive belt grinding machine.

Fig. 2 is an electrical schematic representation of the

exemplary abrasive belt grinding machine and accessories.

DETAILED DESCRIPTION

[0016] Referring now to Fig. 1 and Fig. 2, there is illustrated at Fig. 1 an exemplary abrasive belt grinding machine 10. The abrasive belt grinding machine 10 includes a support housing 12. The support housing 12 supports a pivoting arm 14 that supports an abrasive belt 16. The abrasive belt 16 can be driven by a drive motor 18 coupled to various pulleys 20 and tensioners/tracking devices 22 that maintain proper tension and alignment of the abrasive belt 16.

[0017] An E-stop 28 is operatively coupled to a safety controller 30. The E-stop 28 can be actuated by an operator (not shown) in order to shut down the abrasive belt grinding machine 10. The E-stop 28 can be a dual channel device. The safety controller 30 is electronically coupled to the E-stop 28, a guard door sensor 32, a vacuum pressure/air flow sensor 34 and the like. The safety controller 30 prevents operation of the motor 18 responsive to predetermined conditions. For example, if the safety controller 30 receives a signal from the guard door sensor 32 that the guard door 36 is not positioned properly, then the safety controller 30 will not allow actuation of the drive motor 18. In another example, if the safety controller 30 receives a signal from the vacuum/air flow sensor 34 that the exhaust vacuum 38 is not in operation, then the safety controller 30 will not allow actuation of the drive motor 18.

[0018] A foot pedal switch 40 is operatively coupled to the drive motor 18. An operator provides foot pressure on the foot pedal switch 40 to provide for drive motor 18 operation.

[0019] The safety controller 30 can detect electrical faults, such as short circuits, welded contacts and the like. The safety controller 30 can provide a signal to a fault light 42 on a panel 44.

[0020] A 480 volt AC 3 phase electrical power supply 46 is electrically coupled to the drive motor 18.

[0021] Redundant safety relays 50, 52 can be electrically coupled with the safety controller 30 and power supply 46.

[0022] A technical advantage of the abrasive belt machine disclosed includes redundant safety features that prevent operator injury.

[0023] Another technical advantage of the abrasive belt machine disclosed includes programmable motor controller for speed optimization.

[0024] Another technical advantage of the abrasive belt machine disclosed includes multiple sensors that ensure safety devices are active before operation of the abrasive belt machine.

[0025] There has been provided an abrasive belt machine. While the abrasive belt machine has been described in the context of specific embodiments thereof, other unforeseen alternatives, modifications, and variations may become apparent to those skilled in the art having read the foregoing description. Accordingly, it is intended to embrace those alternatives, modifications, and variations which fall within the broad scope of the appended claims.

Claims

1. An abrasive belt machine (10) comprising:

   a support housing (12) having a pivoting arm (14) that supports an abrasive belt (16) rotatably coupled to a drive motor (18);
   a safety controller (30) operatively coupled with the drive motor (18);
   an E-stop (28) operatively coupled to the safety controller (30);
   a foot pedal switch (40) operatively coupled to the drive motor (18); and
   a 480 volt alternating current 3 phase electrical power supply (46) electrically coupled to the drive motor (18).

2. The abrasive belt machine (10) according to claim 1, wherein the safety controller (30) is electronically coupled to the E-stop (28), a guard door sensor (32), a vacuum pressure/air flow sensor (34) and the like.

3. The abrasive belt machine (10) according to claim 1 or 2, wherein the safety controller (30) is configured to prevent operation of the drive motor (18) responsive to predetermined conditions.

4. The abrasive belt machine (10) according to anyone of claims 1 to 3, further comprising:

   a guard door (36) coupled to the support housing (12) proximate the abrasive belt (16), the guard door (36) including a guard door sensor (32); and
   an exhaust vacuum coupled to the support housing (12) proximate the abrasive belt (16), the exhaust vacuum including a vacuum/air flow sensor (34).

5. The abrasive belt machine (10) according to claim 4, wherein the safety controller (30) is electronically coupled to the E-stop (28), the guard door sensor (32), the vacuum pressure/air flow sensor (34) and the like.

6. The abrasive belt machine (10) according to claim 4 or 5, wherein the safety controller (30) is configured to detect electrical faults, short circuits, welded contacts and the like.

7. The abrasive belt machine (10) according to anyone of claims 4 to 6, further comprising:

a fault light on a panel, wherein the safety controller (30) is configured to provide a signal to the fault light on the panel.

8. A process for configuring an abrasive belt machine (10) for safety comprising:

a support housing (12) having a pivoting arm (14) that supports an abrasive belt (16) rotatably coupled to a drive motor (18);
coupling a guard door (36) to the support housing (12) proximate the abrasive belt (16), the guard door (36) including a guard door sensor (32);
coupling an exhaust vacuum to the support housing (12) proximate the abrasive belt (16), the exhaust vacuum including a vacuum/air flow sensor (34);
coupling a safety controller (30) with the drive motor (18) ;
coupling an E-stop (28) to the safety controller (30);
coupling a foot pedal switch (40) to the drive motor (18); and
supplying a 480 volt alternating current 3 phase electrical power supply (46) to the drive motor (18).

9. The process of claim 8, further comprising:
electronically coupling the safety controller (30) to the E-stop (28), a guard door sensor (32), a vacuum pressure/air flow sensor (34) and the like.

10. The process of claim 8 or 9, further comprising:
configuring the safety controller (30) to prevent operation of the drive motor (18) responsive to predetermined conditions.

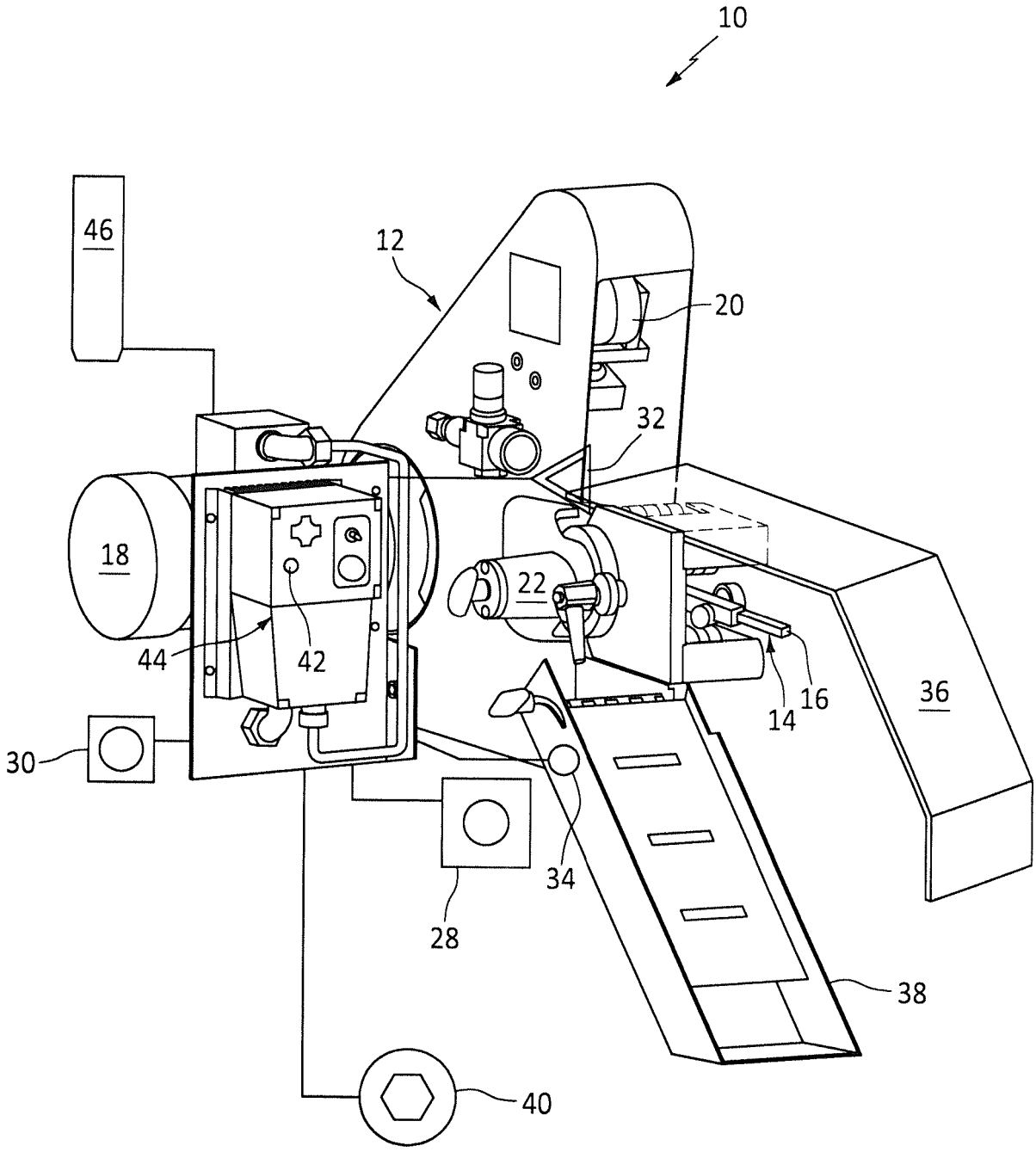

FIG. 1

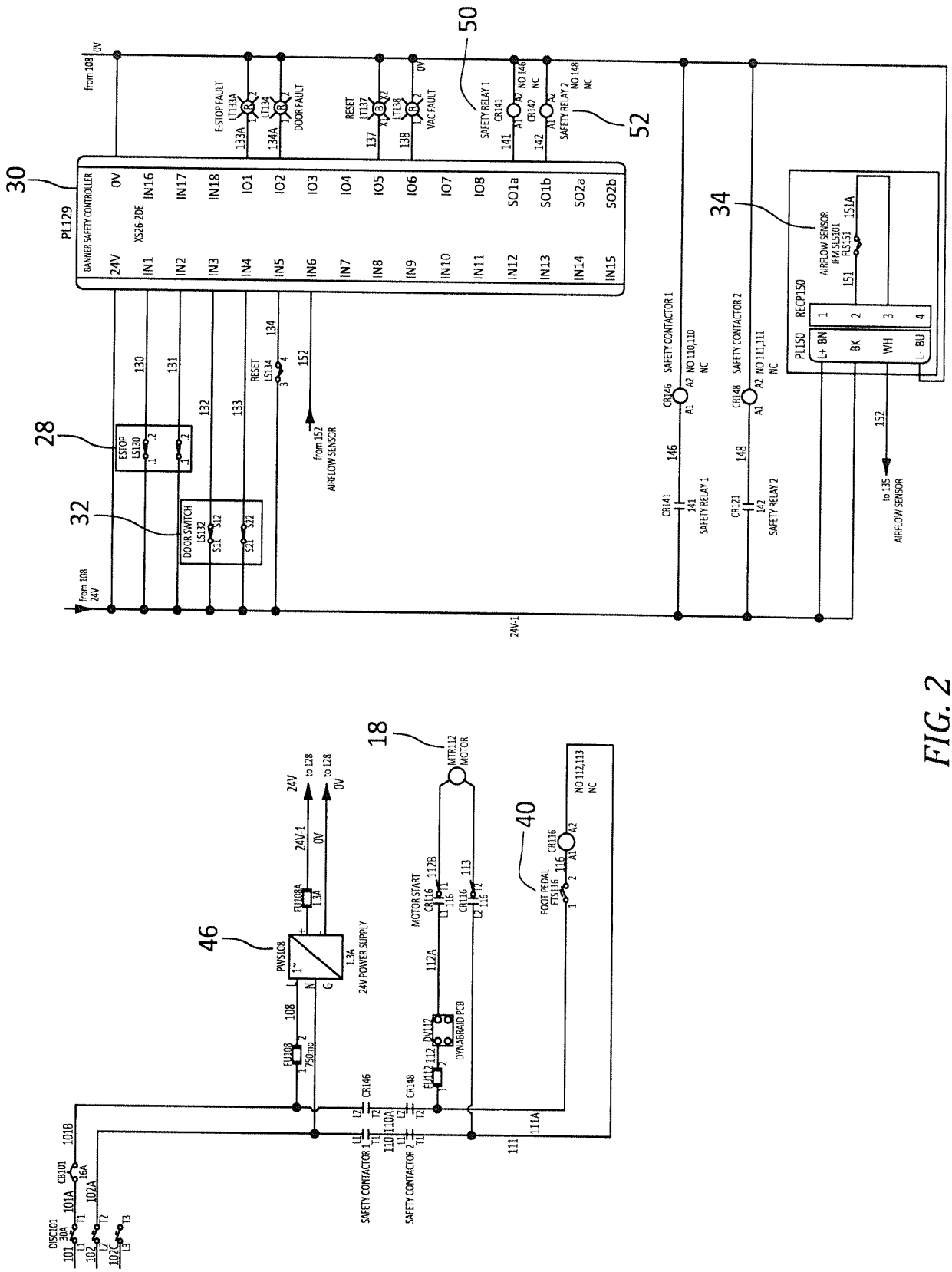
30
PL129
BANNER SAFETY CONTROLLER
XS26-2DE
50
52
34
28
32
18
46
40
E-STOP FAULT
DOOR FAULT
RESET
VAC FAULT
SAFETY RELAY 1
SAFETY RELAY 2
SAFETY CONTACTOR 1
SAFETY CONTACTOR 2
AIRFLOW SENSOR
DOOR SWITCH
ESTOP
MOTOR
DYNABRAID PCB
FOOT PEDAL
24V POWER SUPPLY
from 108
from 152
to 128
to 135
24V-1

FIG. 2

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 23 17 4802

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 4 727 683 A (LAMB MICHAEL W [US]) 1 March 1988 (1988-03-01) * figures 1-7 *	1-10	INV. B24B21/00 B24B55/00
Y	CN 107 695 837 A (JIANGSU CHUANGYUAN ELECTRON CO LTD) 16 February 2018 (2018-02-16) * figures 1-3 *	1-10	ADD. B24B55/04
Y	US 2022/023995 A1 (WOODSON TANNON SHANE [US] ET AL) 27 January 2022 (2022-01-27) * figures 1-14 *	1-10	

TECHNICAL FIELDS SEARCHED (IPC)

B24B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	27 September 2023	Bermejo, Marco

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 17 4802

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

27-09-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4727683 A	01-03-1988	NONE	
CN 107695837 A	16-02-2018	NONE	
US 2022023995 A1	27-01-2022	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 63345627 A **[0001]**