

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
28 July 2011 (28.07.2011)

(10) International Publication Number
WO 2011/090895 A4

(51) International Patent Classification:
G05B 19/401 (2006.01)

(21) International Application Number:
PCT/US2011/021262

(22) International Filing Date:
14 January 2011 (14.01.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/296,555 20 January 2010 (20.01.2010) US
61/351,347 4 June 2010 (04.06.2010) US
61/355,279 16 June 2010 (16.06.2010) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,

DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

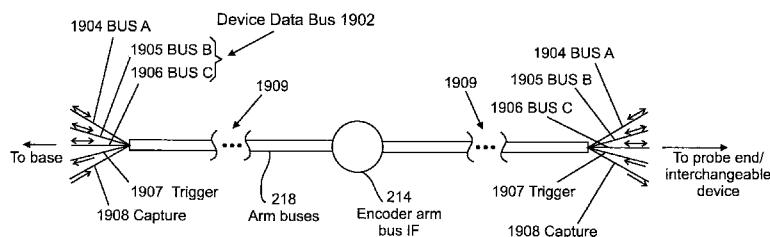
Published:

- with international search report (Art. 21(3))
- with amended claims (Art. 19(1))

Date of publication of the amended claims: 22 September 2011

(54) Title: PORTABLE ARTICULATED ARM COORDINATE MEASURING MACHINE WITH MULTI-BUS ARM TECHNOLOGY

FIG. 19



(57) Abstract: A portable articulated arm coordinate measuring machine (AACMM) with multi-bus arm technology that includes a manually positionable articulated arm portion, a measurement device, and an electronic circuit. The electronic circuit is configured to receive a position signal from the arm portion and to provide data corresponding to a position of the measurement device. The AACMM further includes a probe end, an accessory device, an encoder data bus, and a first device data bus. The encoder data bus is coupled to the arm portion and the electronic circuit, and the encoder data bus is configured to send the position signal to the electronic circuit. The first device data bus is coupled to the accessory device and the electronic circuit. The first device data bus is configured to operate simultaneously with and independently of the encoder data bus for sending accessory device data from the accessory device to the electronic circuit.

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AMENDED CLAIMS

received by the International Bureau on 11 July 2011 (11-07-2011)

1. A portable articulated arm coordinate measurement machine (AACMM), comprising:

a manually positionable articulated arm portion having opposed first and second ends, the arm portion including a plurality of connected arm segments, each of the arm segments including at least one position transducer for producing a position signal;

a measurement device coupled to the first end;

an electronic circuit configured to receive the position signal from the at least one position transducer and to provide data corresponding to a position of the measurement device;

a probe end disposed between the measurement device and the first end;

an accessory device removably coupled to the probe end;

an encoder data bus coupled to the at least one transducer and the electronic circuit, the encoder data bus comprising at least one wire and configured to send the position signal to the electronic circuit; and

a first device data bus coupled to the accessory device and the electronic circuit, the first device data bus comprising at least one wire and configured to operate simultaneously with and independently of the encoder data bus for sending accessory device data from the accessory device to the electronic circuit.

2. The portable AACMM of claim 1, wherein the position signal includes counts.

3. The portable AACMM of claim 1, wherein the accessory device includes at least one of a laser line probe, a camera, a bar code scanner, a thermal scanner, a video camera, a light source, an image projector, a microphone, an audio recording system, and a paint-spray nozzle.

4. The portable AACMM of claim 3, wherein the measurement device is a contact probe.

5. The portable AACMM of claim 3, wherein the measurement device is the accessory device.

6. The portable AACMM of claim 1, wherein the encoder data bus is coupled to the measurement device.

7. The portable AACMM of claim 1, wherein the encoder data bus is further configured to send a button selection from the probe end or the measurement device to the electronic circuit.

8. The portable AACMM of claim 1, wherein the encoder data bus is further configured to send button selection data from the accessory device to the electronic circuit.

9. The portable AACMM of claim 1, wherein the encoder data bus is further configured to send temperature data from the arm segments to the electronic circuit.

10. The portable AACMM of claim 1, wherein the first device data bus is further configured to send data from the accessory device to the electronic circuit to identify characteristics of the accessory device.

11. The portable AACMM of claim 1, wherein the measurement device is a contact probe, the accessory device is a laser line probe (LLP), and the accessory device data includes a plurality of two dimensional data values generated by the LLP.

12. The portable AACMM of claim 1, wherein the measurement device is a contact probe, the accessory device is a camera, and the accessory device data includes image data generated by the camera.

13. The portable AACMM of claim 1, wherein the encoder data bus and the first device data bus are asynchronous buses.

14. The portable AACMM of claim 1, wherein the encoder data bus and the first device data bus operate at different speeds.

15. The portable AACMM of claim 1, wherein the encoder data bus and the first device data bus have different bus widths.

16. The portable AACMM of claim 1, further comprising a second device data bus connected to the accessory device and the electronic circuit, the second device data bus configured to operate independently of the encoder data bus.

17. A portable articulated arm coordinate measurement machine (AACMM), comprising:

a manually positionable articulated arm portion having opposed first and second ends, the arm portion including a plurality of connected arm segments, each of the arm segments including at least one position transducer for producing a position signal;

a measurement device coupled to the first end;

an electronic circuit configured to receive the position signal from the at least one position transducer and to provide data corresponding to a position of the measurement device;

a probe end disposed between the measurement device and the first end;

an encoder data bus coupled to the at least one transducer and the electronic circuit, the encoder data comprising at least one wire and configured to send the position signal to the electronic circuit; and

a first device data bus coupled to the measurement device and the electronic circuit, the first device data bus comprising at least one wire and configured to operate simultaneously with and independently of the encoder data bus.

18. The portable AACMM of claim 17, wherein the encoder data bus and the first device data bus are asynchronous buses.

19. The portable AACMM of claim 17, wherein the encoder data bus and the first device data bus operate at different speeds.

20. The portable AACMM of claim 17, wherein the encoder data bus and the first device data bus have different bus widths.

21. The portable AACMM of claim 17, further comprising a second device data bus connected to the measurement device and the electronic circuit, the second device data bus configured to operate independently of the encoder data bus.

22. The portable AACMM of claim 17, wherein the position signals include counts.

23. The portable AACMM of claim 17, wherein the encoder data bus is further for sending button selection data from the measurement device to the electronic circuit.

24. The portable AACMM of claim 17, wherein the encoder data bus is further for sending temperature data from the arm segments to the electronic circuit.

25. A method of operating a portable articulated arm coordinate measuring machine (AACMM), the method comprising:

receiving a position signal via an encoder data bus, the receiving by an electronic circuit on the portable AACMM, the portable AACMM comprised of a manually positionable articulated arm portion having opposed first and second ends, the arm portion including a plurality of connected arm segments, each arm segment including at least one position transducer for producing the position signal, a measurement device coupled to the first end, a probe end disposed between the measurement device and the first end, an accessory device removably coupled to the probe end, the electronic circuit, the encoder data bus comprising at least one wire and in communication with the at least one position transducer and the electronic circuit, and a device data bus comprising at least one wire and in communication with the accessory device and the electronic circuit; and

receiving at the electronic circuit, via the device data bus, accessory device data from the accessory device, wherein the device data bus operates simultaneously with and independently of the encoder data bus.

26. The method of claim 25, further comprising exporting the position signal and the accessory device data to an external computer.

27. The method of claim 25, further comprising combining the position signal and the accessory device data to generate a view of an object being measured.

28. The method of claim 25, further comprising displaying an object being measured on a user interface located on the portable AACMM.

29. The method of claim 25, wherein the measurement device is a contact probe, the accessory device is a laser line probe and the accessory device data is a plurality of two dimensional values generated by the laser line probe.

30. The method of claim 25, wherein the measurement device is a contact probe, the accessory device is a camera and the accessory device data is image data.

31. The method of claim 25, wherein the measurement device is the accessory device.