FIG. 1A

CONVENTIONAL CALCULATIONAL METHOD (LATTICE METHOD)

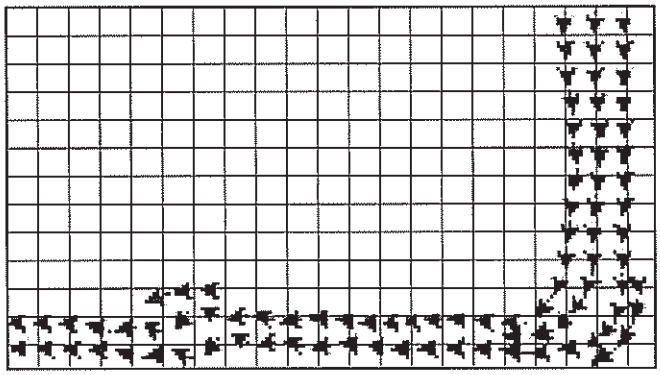


FIG. 1B

NEW CALCULATIONAL METHOD (PARTICLE METHOD)

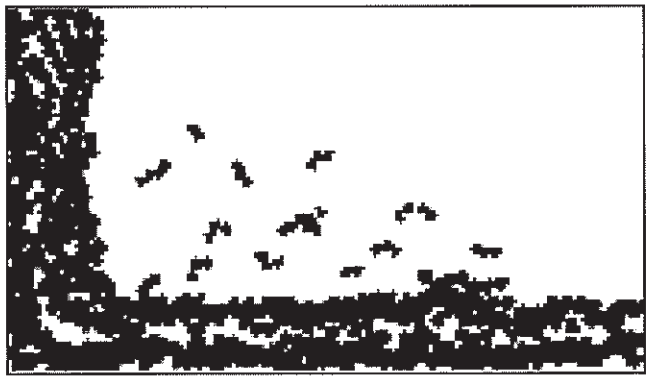


FIG. 2

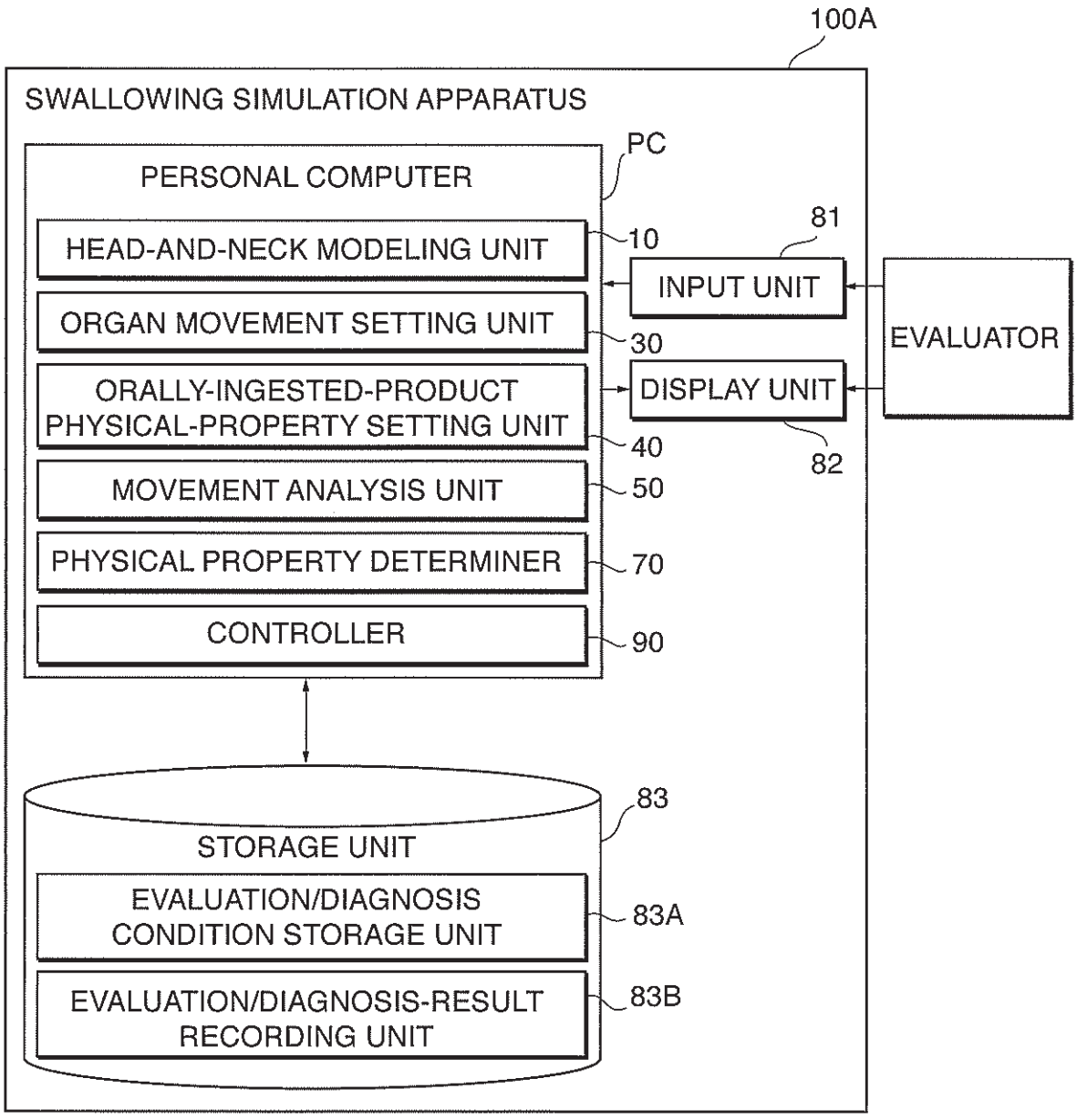

100A
SWALLOWING SIMULATION APPARATUS
PC
PERSONAL COMPUTER
HEAD-AND-NECK MODELING UNIT
10
ORGAN MOVEMENT SETTING UNIT
30
ORALLY-INGESTED-PRODUCT PHYSICAL-PROPERTY SETTING UNIT
40
MOVEMENT ANALYSIS UNIT
50
PHYSICAL PROPERTY DETERMINER
70
CONTROLLER
90
81
INPUT UNIT
DISPLAY UNIT
82
EVALUATOR
83
STORAGE UNIT
EVALUATION/DIAGNOSIS CONDITION STORAGE UNIT
83A
EVALUATION/DIAGNOSIS-RESULT RECORDING UNIT
83B

FIG. 3A

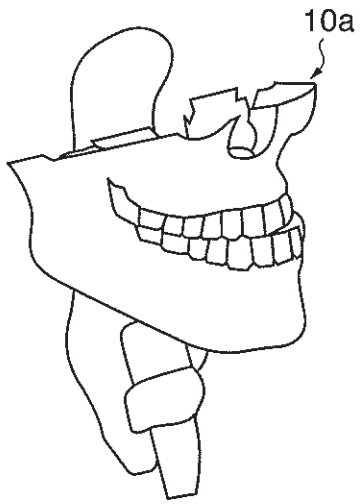


FIG. 3B

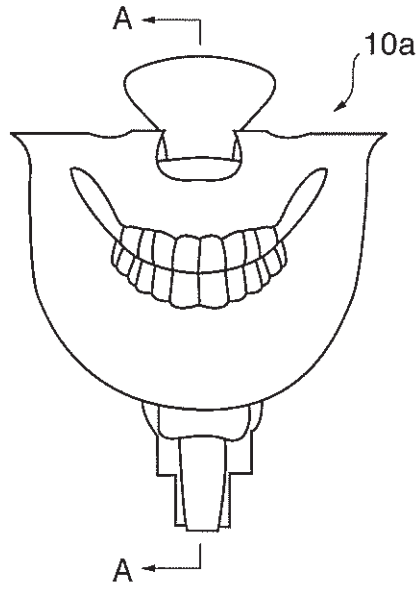


FIG. 3C

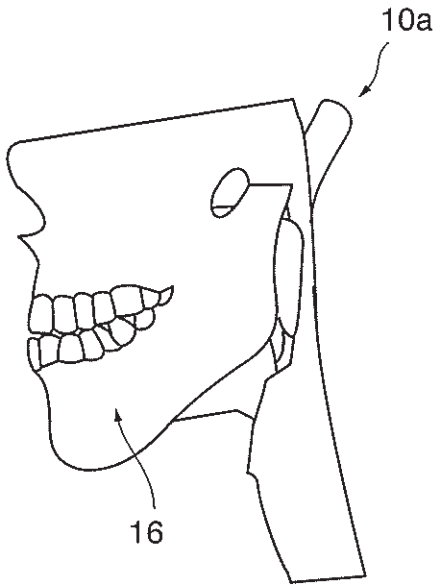


FIG. 3D

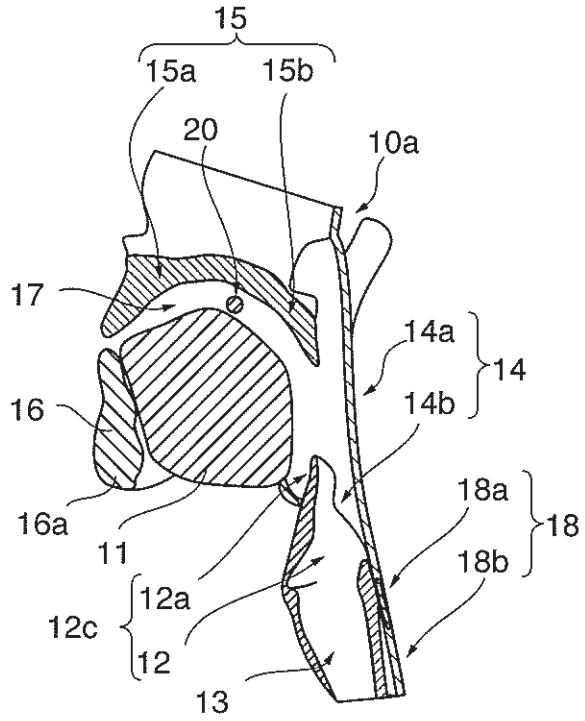


FIG. 4A

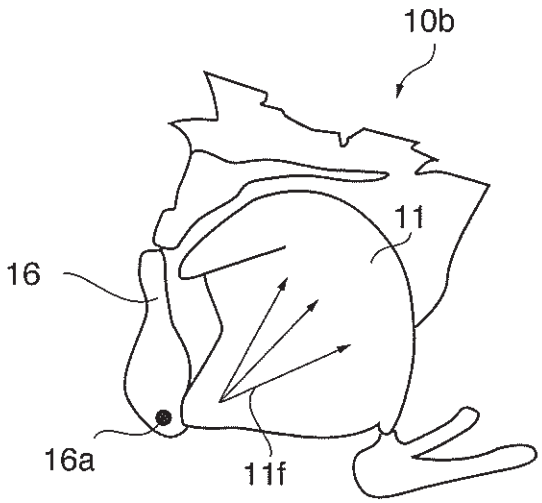


FIG. 4B

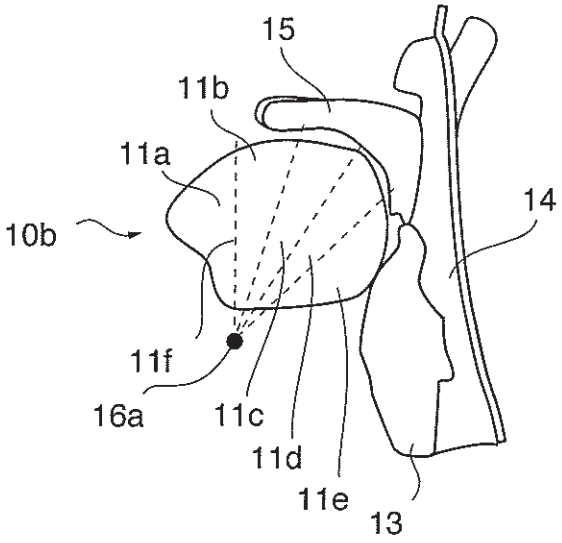


FIG. 5A

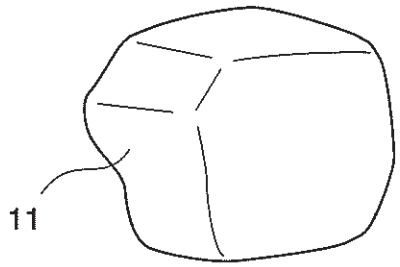


FIG. 5B

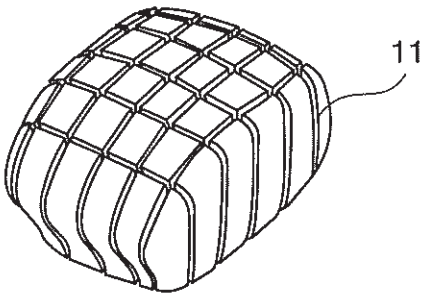


FIG. 6A

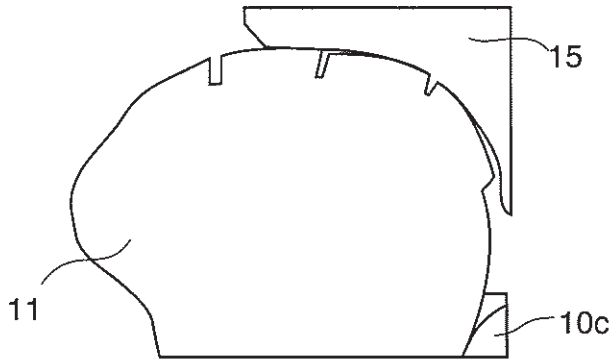


FIG. 6B

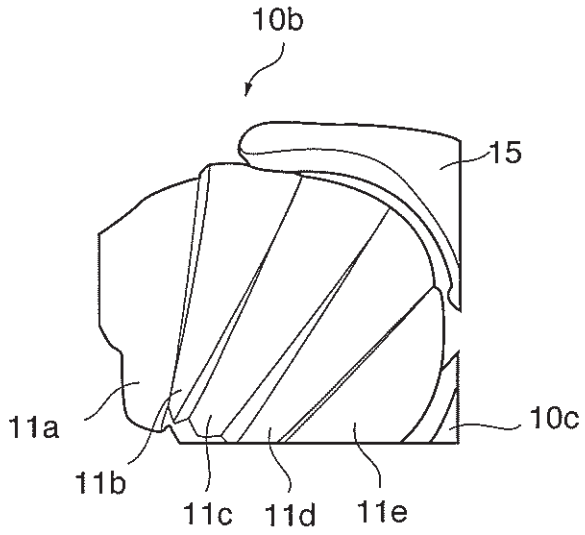


FIG. 6C

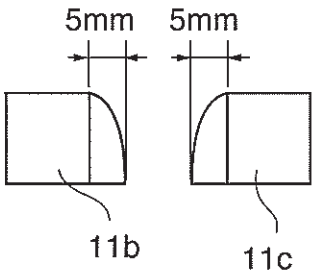


FIG. 7A

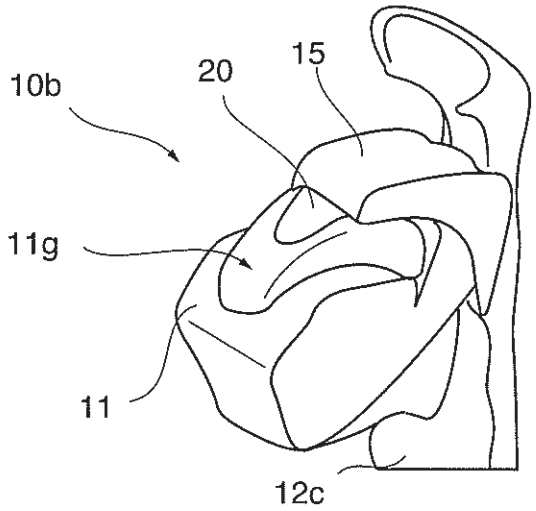


FIG. 7B

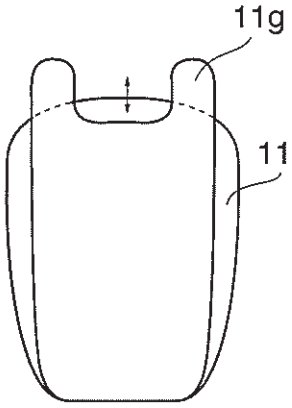


FIG. 8

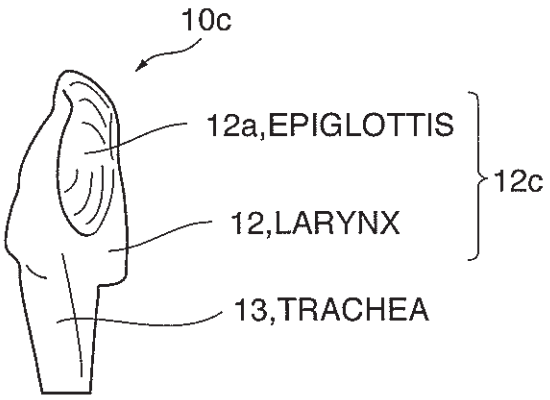


FIG. 9A

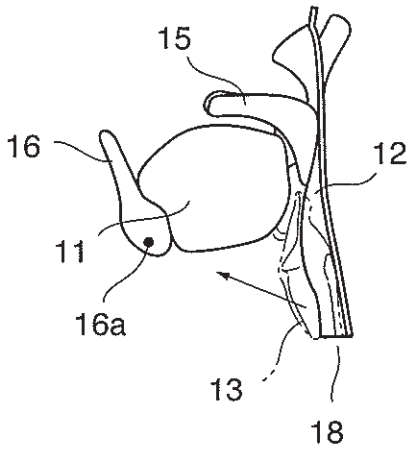


FIG. 9B

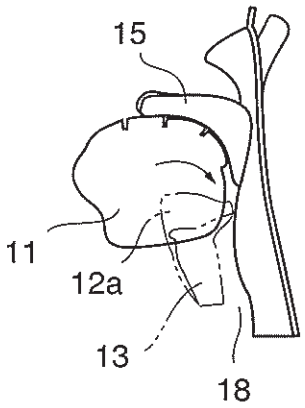


FIG. 9C

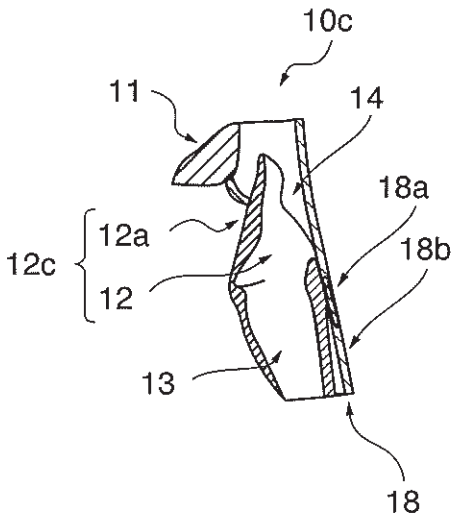


FIG. 10A

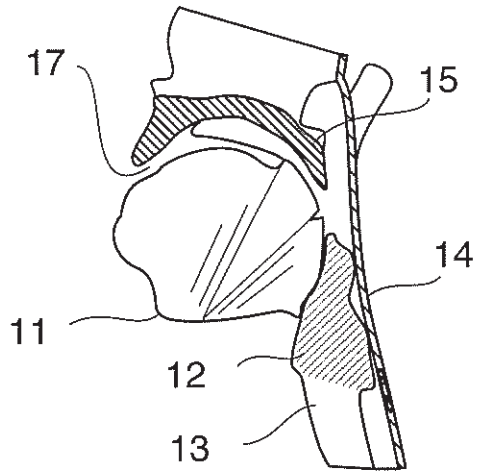


FIG. 10B

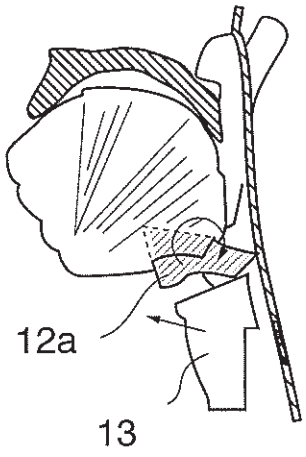


FIG. 11A

Time:0.000000

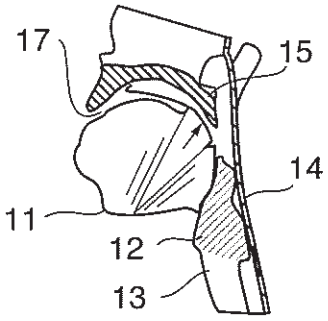


FIG. 11B

Time:0.200100

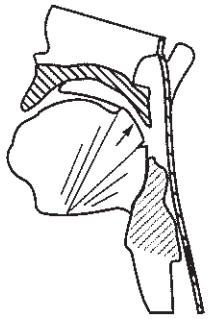


FIG. 11C

Time:0.400100

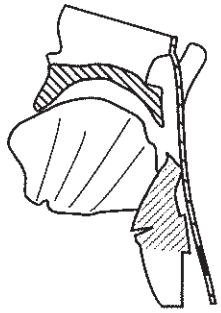


FIG. 11D

Time:0.500100

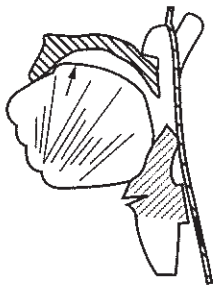


FIG. 11E

Time:0.600100

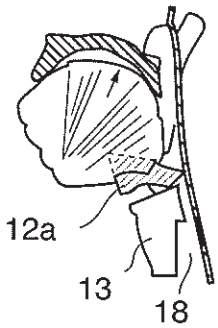


FIG. 11F

Time:0.700100

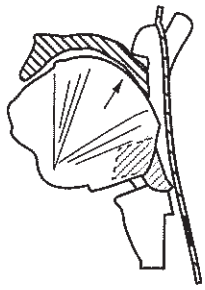


FIG. 11G

Time:0.800000

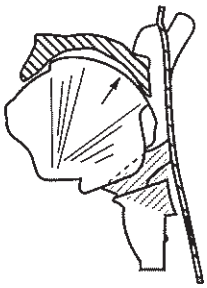


FIG. 11H

Time:0.900100

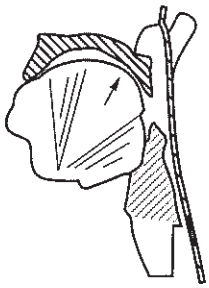
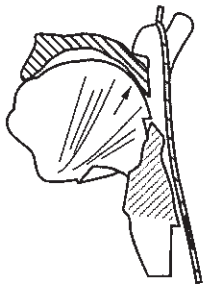


FIG. 11I

Time:1.000100



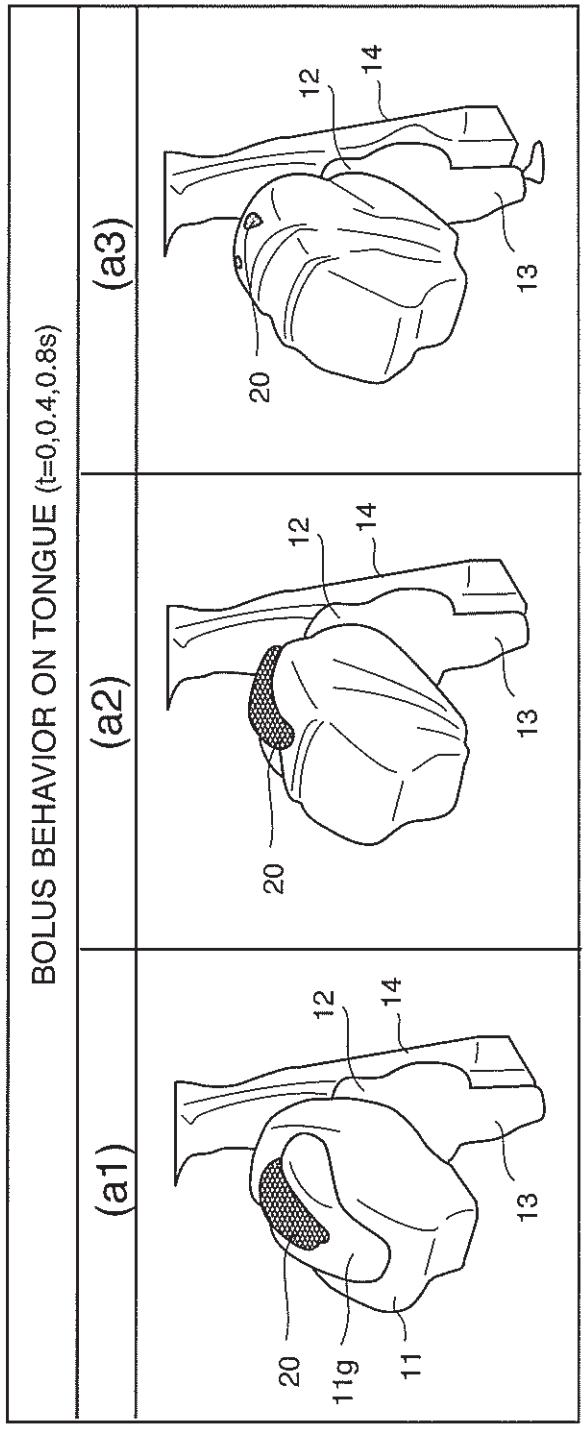


FIG. 12A

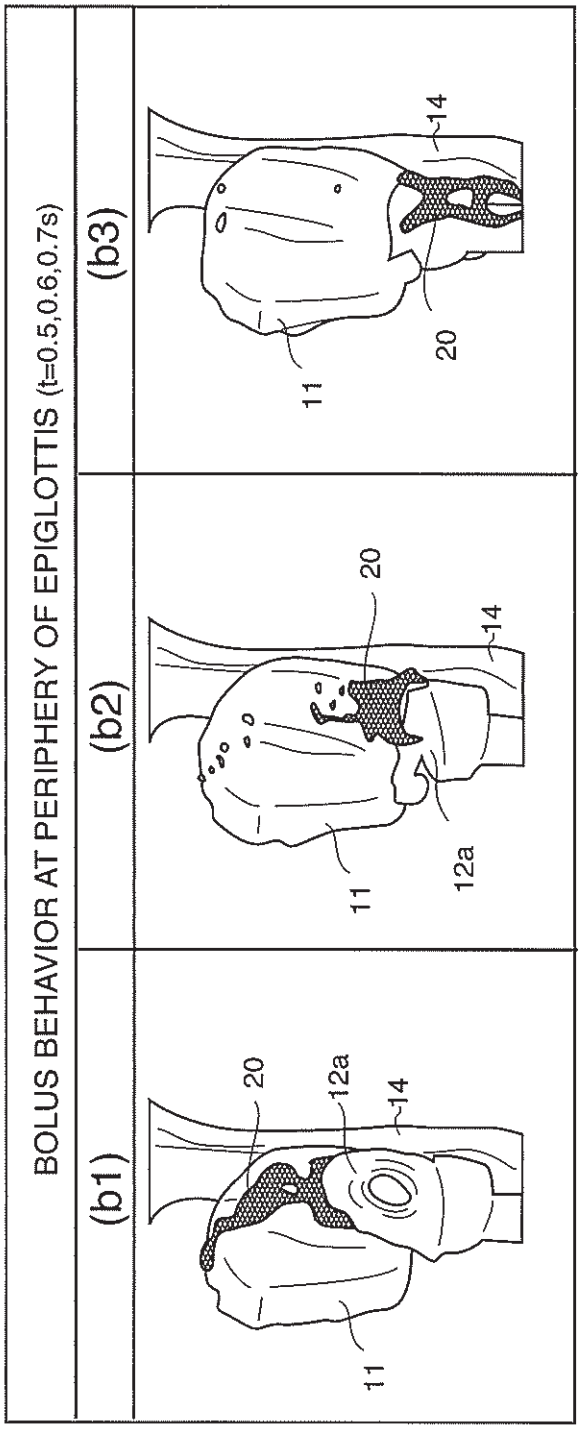


FIG. 12B

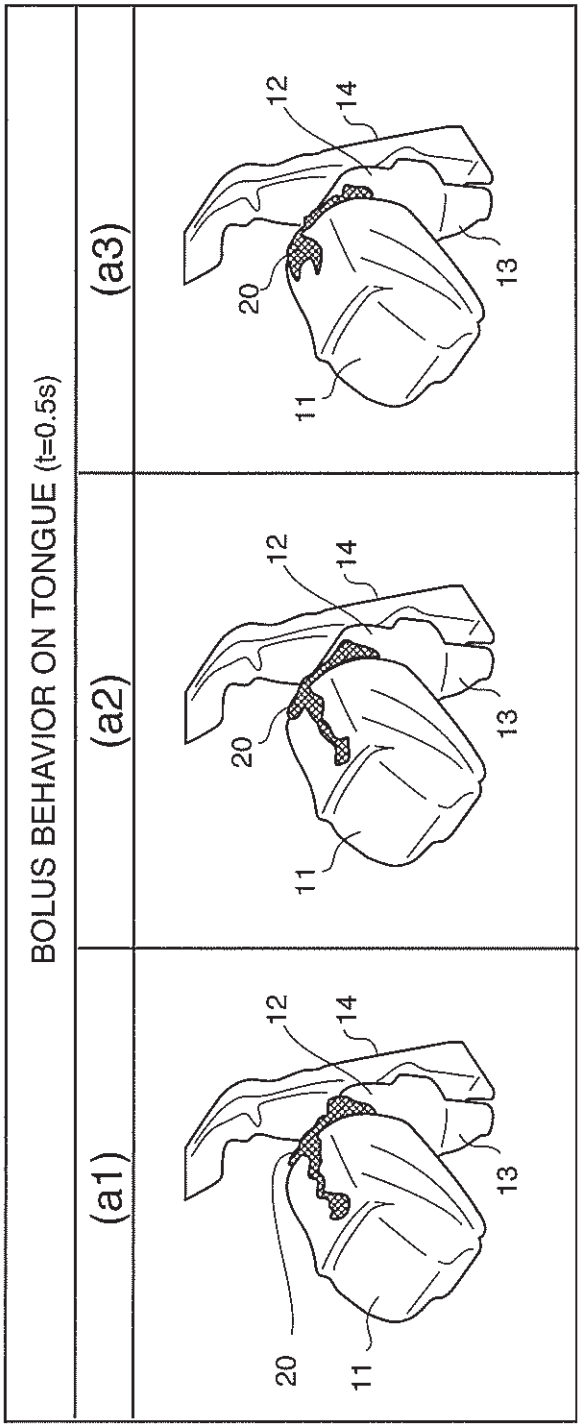


FIG. 13A

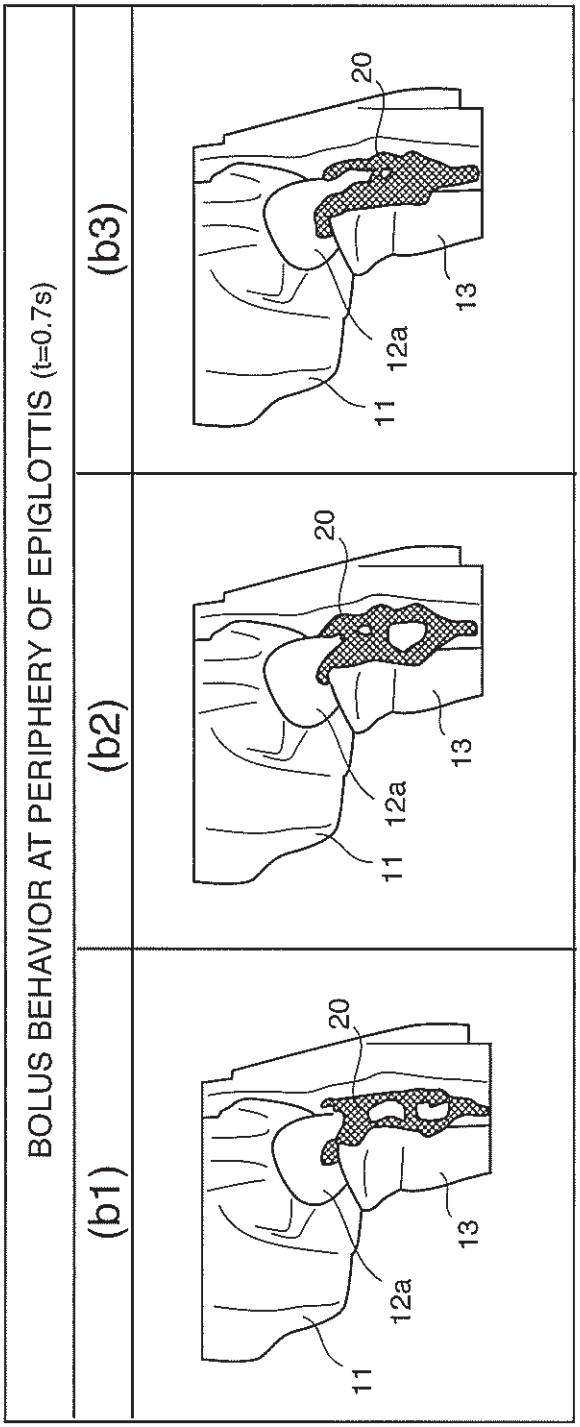
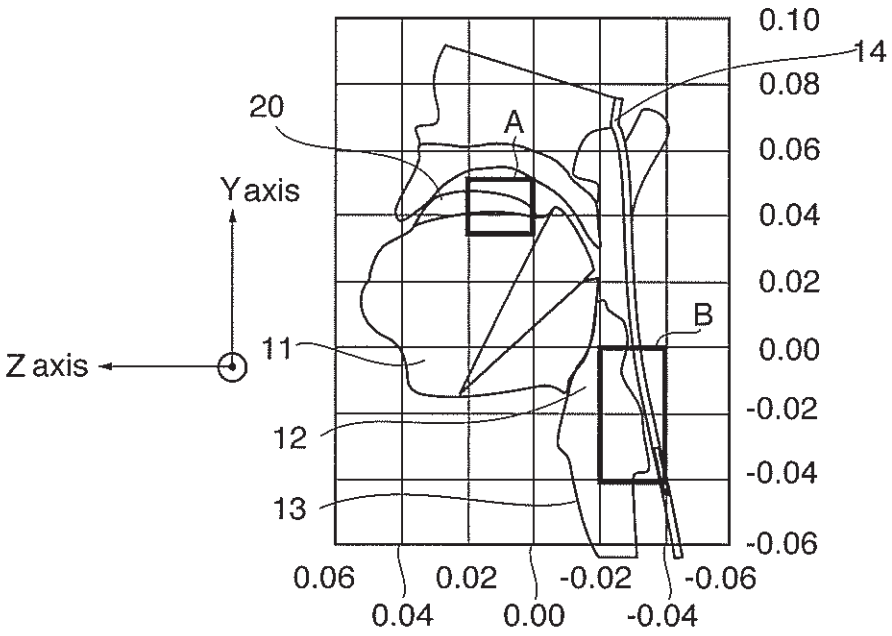


FIG. 13B

FIG. 14



(AREA A) AREA ON TONGUE IN ORAL CAVITY

(0.035≦Y≦0.050)
(0.000≦Z≦0.020)

(AREA B) AREA OF ESOPHAGEAL ENTRANCE IN PHARYNX SPACE

(-0.04≦Y≦0.000)
(-0.04≦Z≦-0.020)

FIG. 15

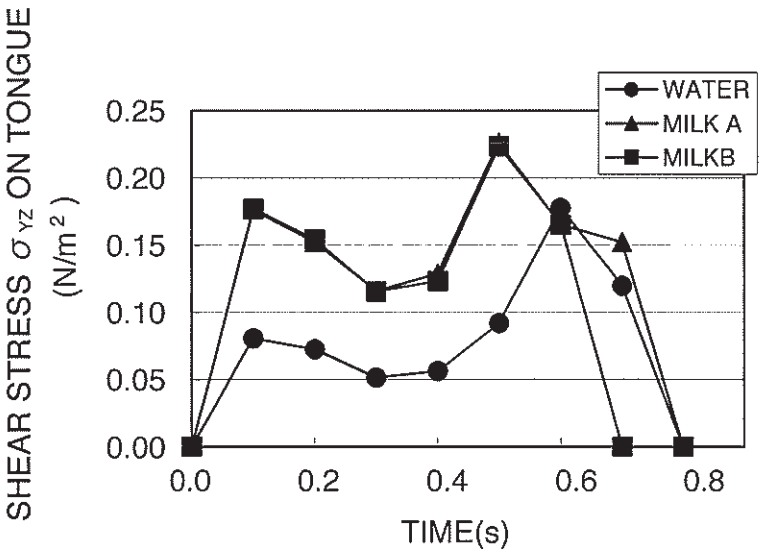

SHEAR STRESS σ YZ ON TONGUE
(N/m 2)
0.25
0.20
0.15
0.10
0.05
0.00
0.0
0.2
0.4
0.6
0.8
TIME(s)
WATER
MILK A
MILKB

FIG. 16

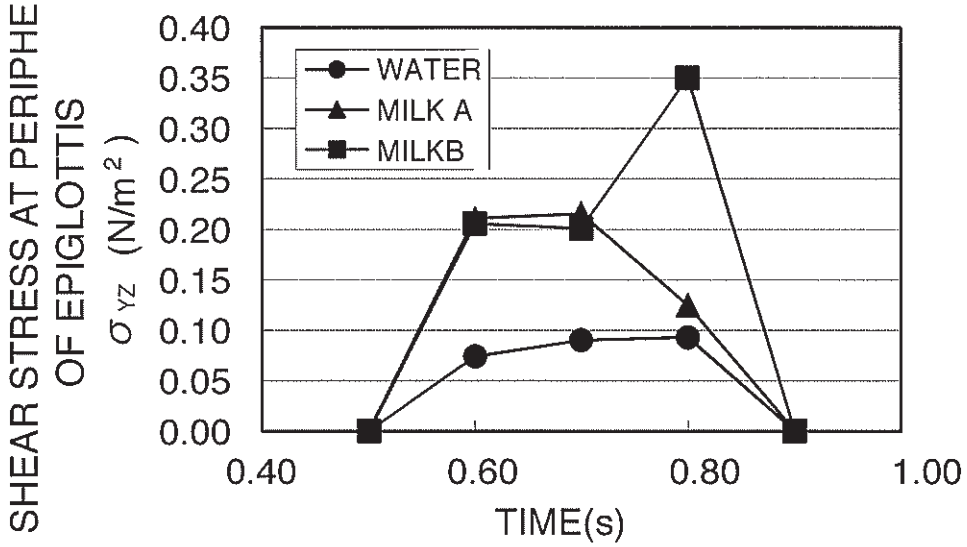

SHEAR STRESS AT PERIPHERY OF EPIGLOTTIS
σ YZ (N/m 2)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.40
0.60
0.80
1.00
TIME(s)
WATER
MILK A
MILKB

FIG. 17

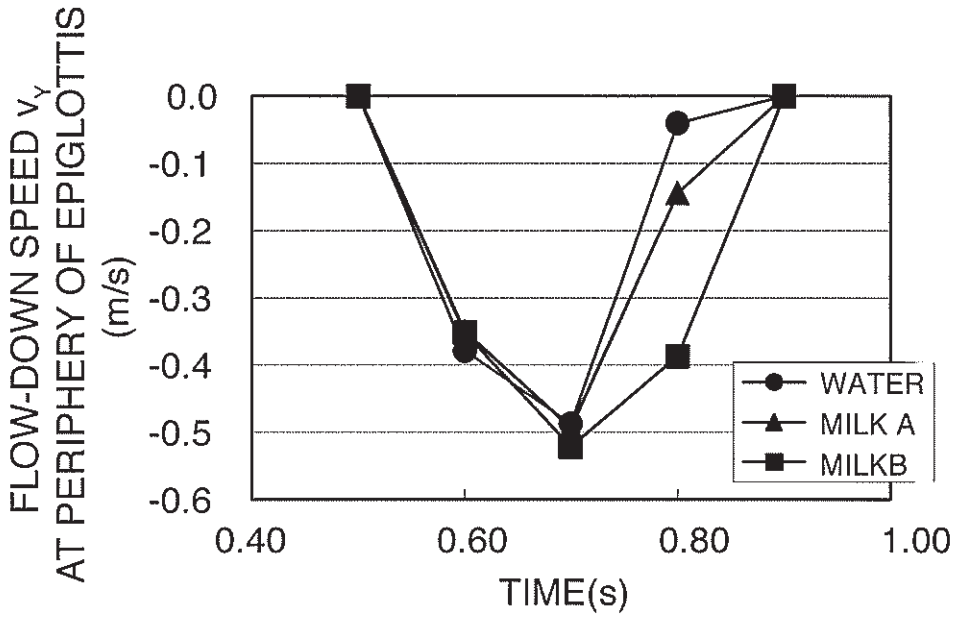

FLOW-DOWN SPEED v Y AT PERIPHERY OF EPIGLOTTIS (m/s)
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
0.40
0.60
0.80
1.00
TIME(s)
WATER
MILK A
MILKB

FIG. 18

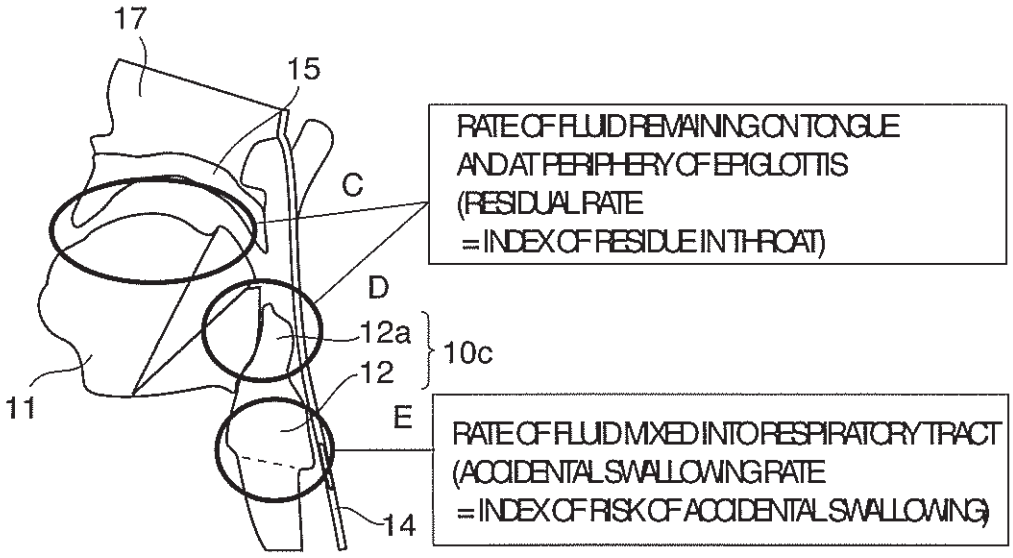

17
15
C
D
12a
12
10c
11
E
14
RATE OF FLUID REMAINING ON TONGUE AND AT PERIPHERY OF EPIGLOTTIS (RESIDUAL RATE = INDEX OF RESIDUE IN THROAT)
RATE OF FLUID MIXED INTO RESPIRATORY TRACT (ACCIDENTAL SWALLOWING RATE = INDEX OF RISK OF ACCIDENTAL SWALLOWING)

FIG. 19

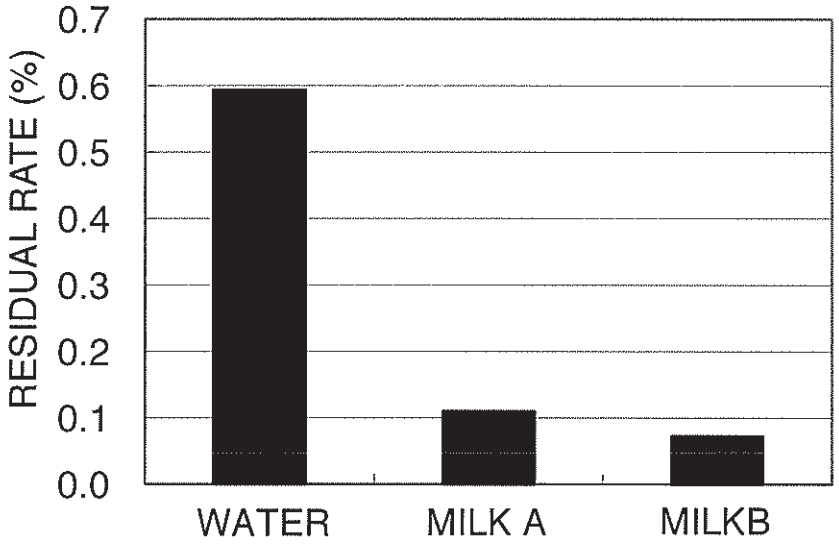
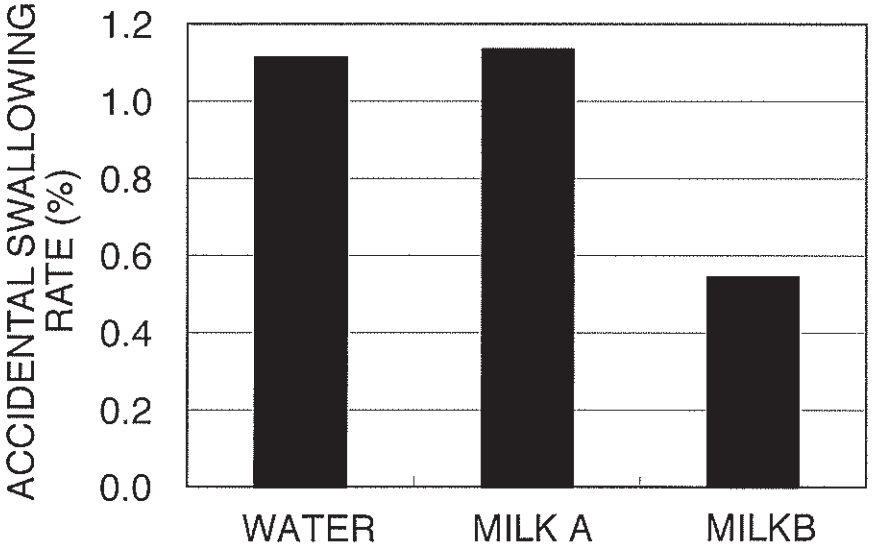

RESIDUAL RATE (%)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
WATER
MILK A
MILKB

FIG. 20


ACCIDENTAL SWALLOWING RATE (%)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
WATER
MILK A
MILKB

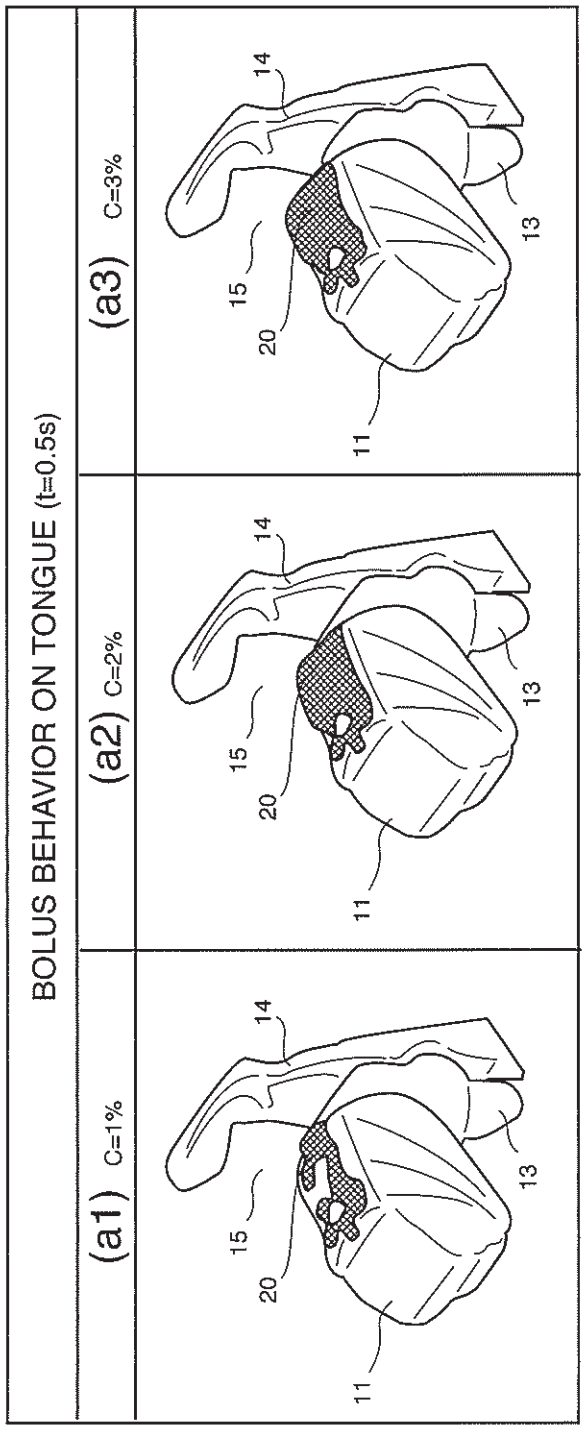


FIG. 21A

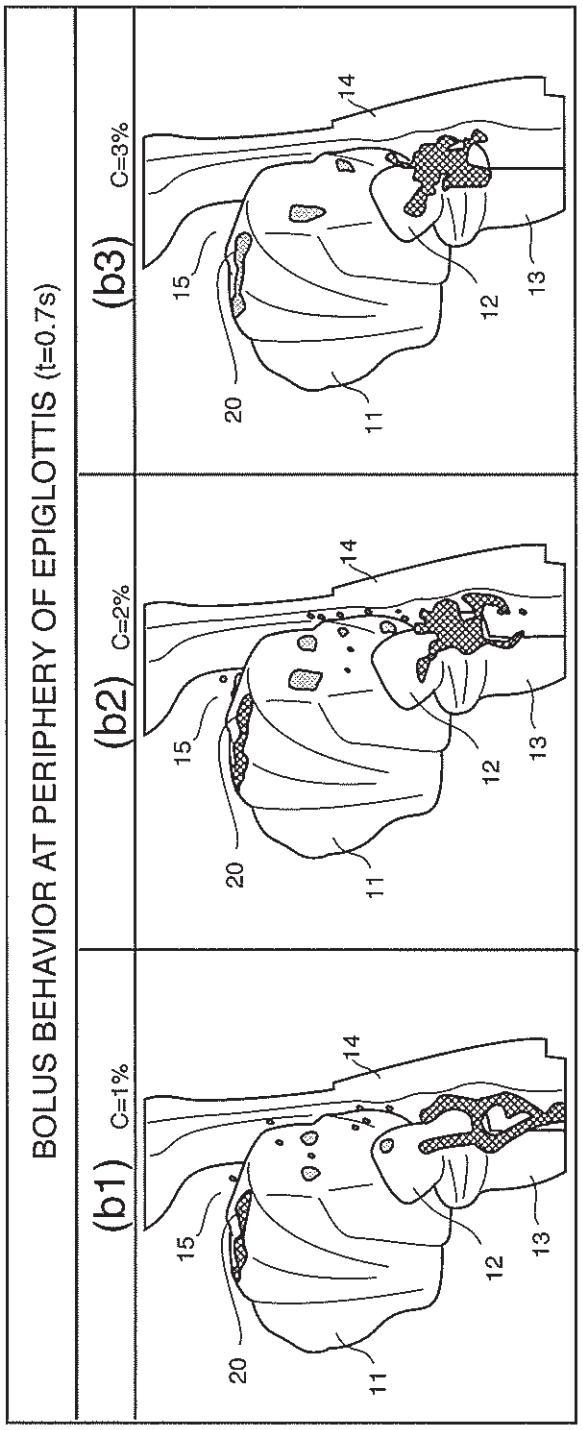


FIG. 21B

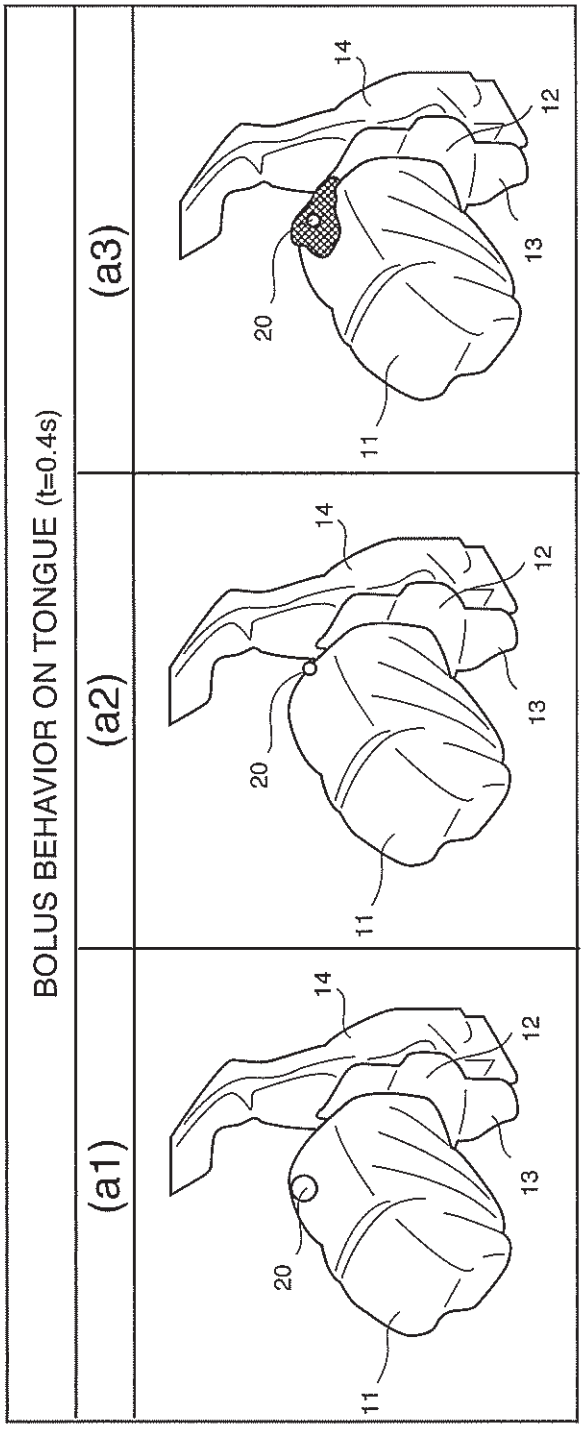


FIG. 22A

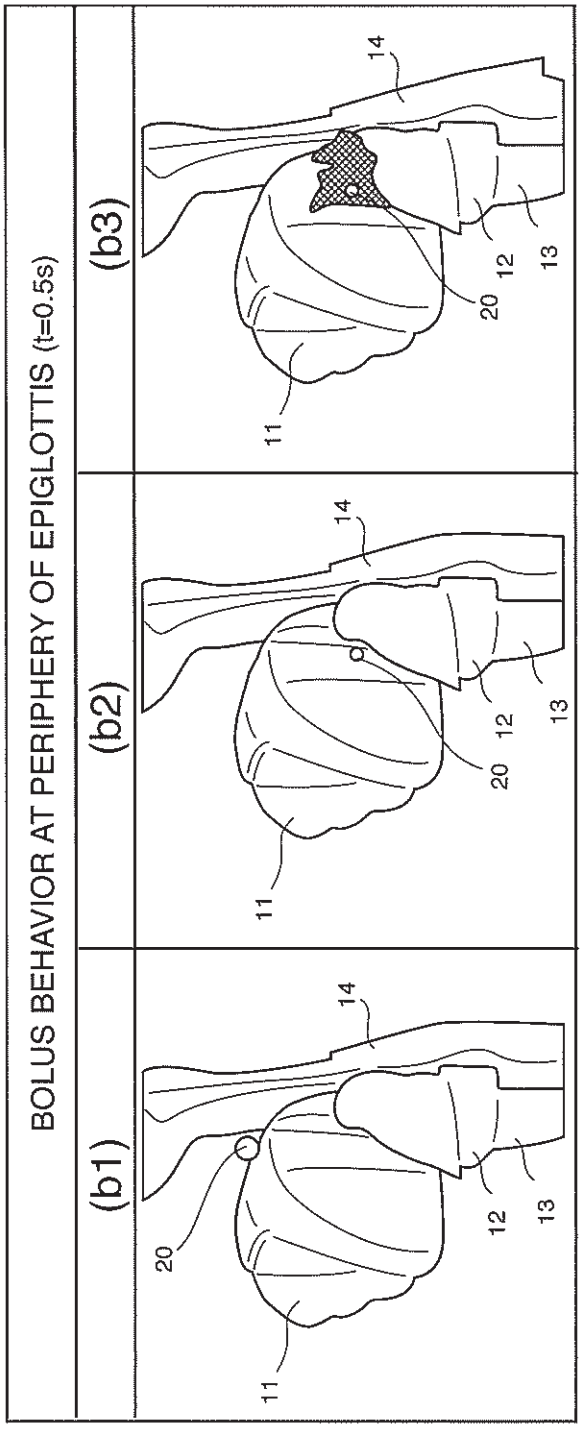


FIG. 22B

FIG. 23

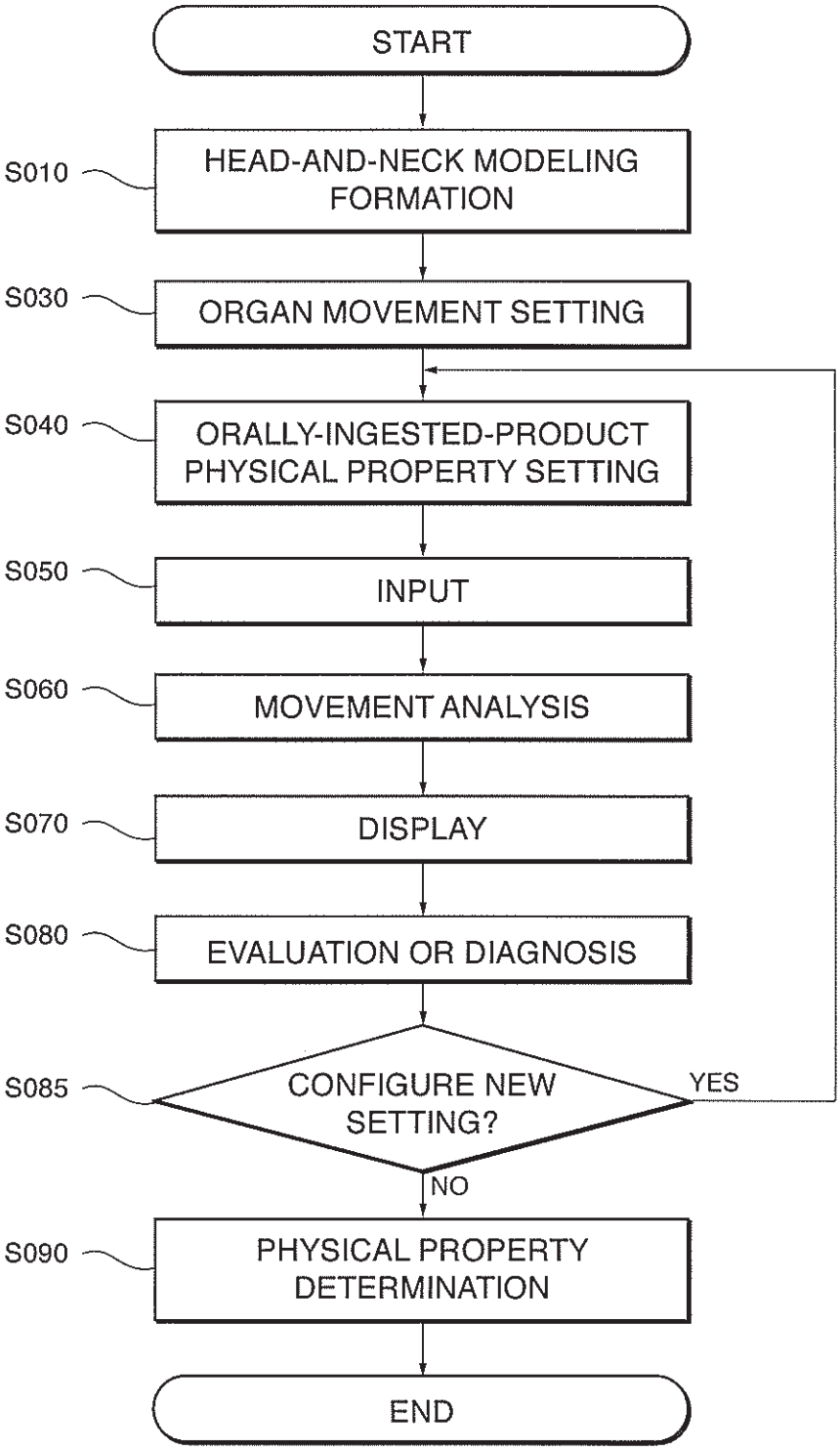

START
S010
HEAD-AND-NECK MODELING FORMATION
S030
ORGAN MOVEMENT SETTING
S040
ORALLY-INGESTED-PRODUCT PHYSICAL PROPERTY SETTING
S050
INPUT
S060
MOVEMENT ANALYSIS
S070
DISPLAY
S080
EVALUATION OR DIAGNOSIS
S085
CONFIGURE NEW SETTING?
YES
NO
S090
PHYSICAL PROPERTY DETERMINATION
END

FIG. 24

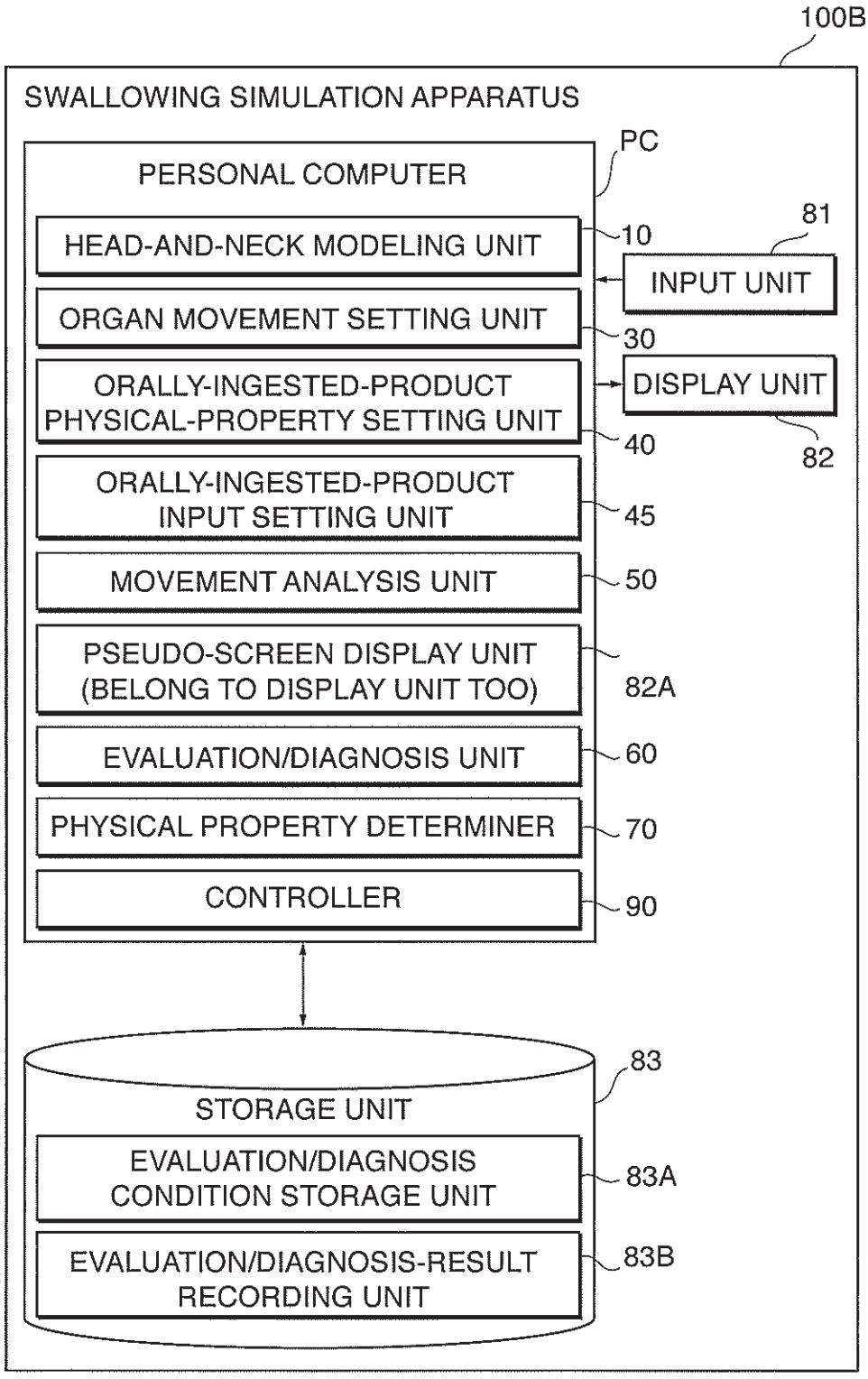

100B
SWALLOWING SIMULATION APPARATUS
PC
PERSONAL COMPUTER
HEAD-AND-NECK MODELING UNIT
10
ORGAN MOVEMENT SETTING UNIT
30
ORALLY-INGESTED-PRODUCT PHYSICAL-PROPERTY SETTING UNIT
40
ORALLY-INGESTED-PRODUCT INPUT SETTING UNIT
45
MOVEMENT ANALYSIS UNIT
50
PSEUDO-SCREEN DISPLAY UNIT (BELONG TO DISPLAY UNIT TOO)
82A
EVALUATION/DIAGNOSIS UNIT
60
PHYSICAL PROPERTY DETERMINER
70
CONTROLLER
90
81
INPUT UNIT
DISPLAY UNIT
82
83
STORAGE UNIT
EVALUATION/DIAGNOSIS CONDITION STORAGE UNIT
83A
EVALUATION/DIAGNOSIS-RESULT RECORDING UNIT
83B

FIG. 25

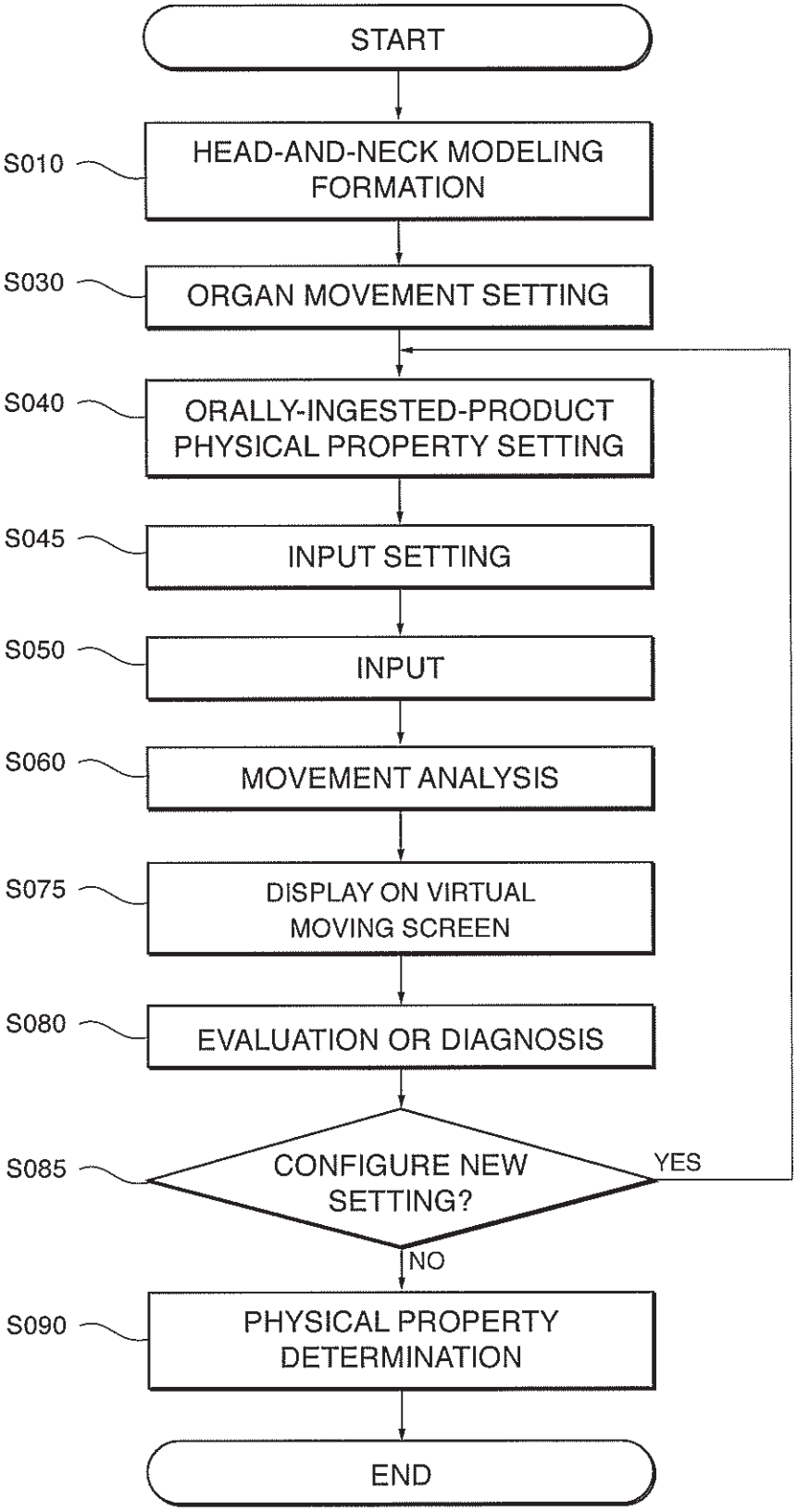

START
S010
HEAD-AND-NECK MODELING FORMATION
S030
ORGAN MOVEMENT SETTING
S040
ORALLY-INGESTED-PRODUCT PHYSICAL PROPERTY SETTING
S045
INPUT SETTING
S050
INPUT
S060
MOVEMENT ANALYSIS
S075
DISPLAY ON VIRTUAL MOVING SCREEN
S080
EVALUATION OR DIAGNOSIS
S085
CONFIGURE NEW SETTING?
YES
NO
S090
PHYSICAL PROPERTY DETERMINATION
END

FIG. 26

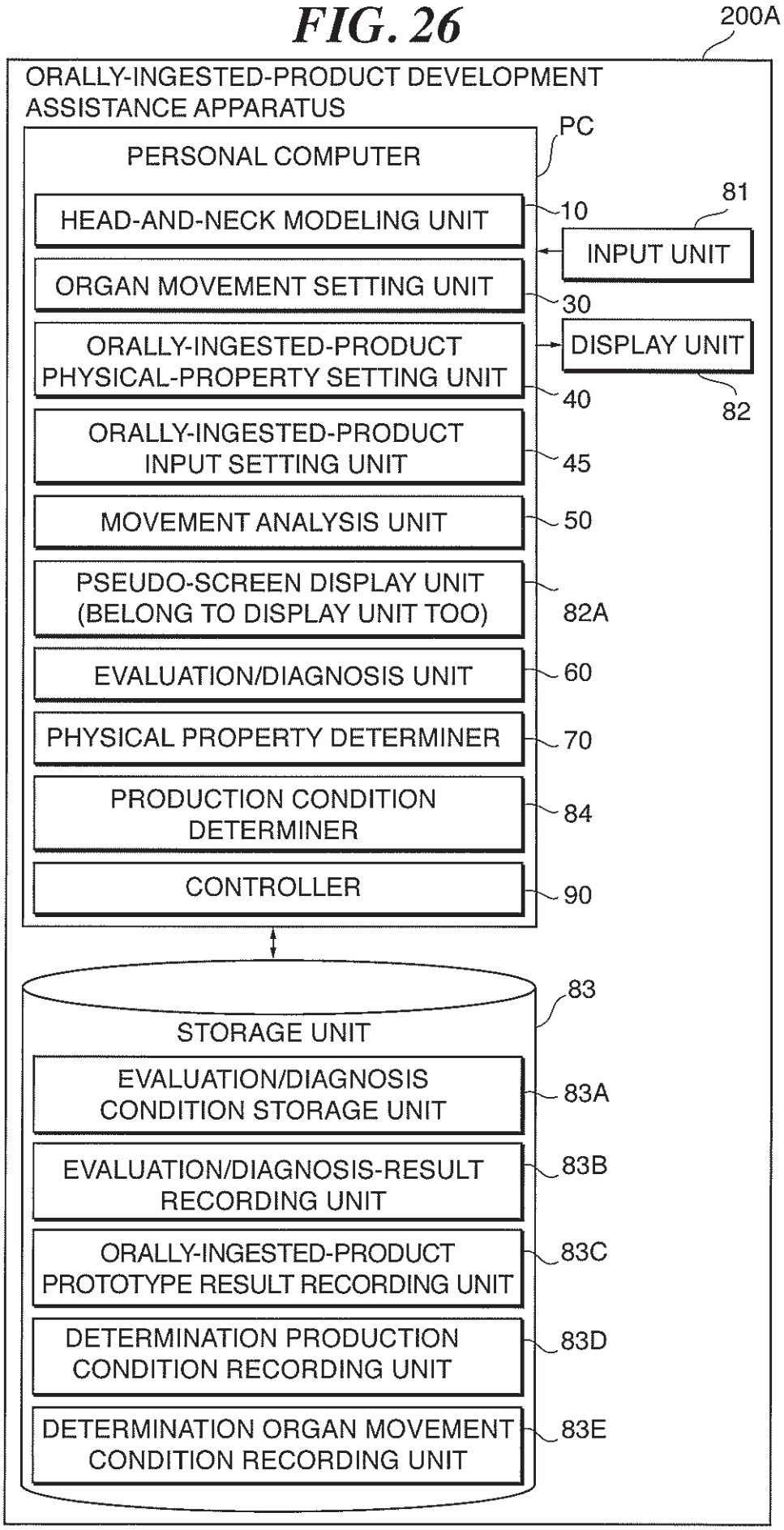

200A
ORALLY-INGESTED-PRODUCT DEVELOPMENT ASSISTANCE APPARATUS
PC
PERSONAL COMPUTER
HEAD-AND-NECK MODELING UNIT
10
81
INPUT UNIT
ORGAN MOVEMENT SETTING UNIT
30
ORALLY-INGESTED-PRODUCT PHYSICAL-PROPERTY SETTING UNIT
40
DISPLAY UNIT
82
ORALLY-INGESTED-PRODUCT INPUT SETTING UNIT
45
MOVEMENT ANALYSIS UNIT
50
PSEUDO-SCREEN DISPLAY UNIT (BELONG TO DISPLAY UNIT TOO)
82A
EVALUATION/DIAGNOSIS UNIT
60
PHYSICAL PROPERTY DETERMINER
70
PRODUCTION CONDITION DETERMINER
84
CONTROLLER
90
83
STORAGE UNIT
EVALUATION/DIAGNOSIS CONDITION STORAGE UNIT
83A
EVALUATION/DIAGNOSIS-RESULT RECORDING UNIT
83B
ORALLY-INGESTED-PRODUCT PROTOTYPE RESULT RECORDING UNIT
83C
DETERMINATION PRODUCTION CONDITION RECORDING UNIT
83D
DETERMINATION ORGAN MOVEMENT CONDITION RECORDING UNIT
83E

FIG. 27

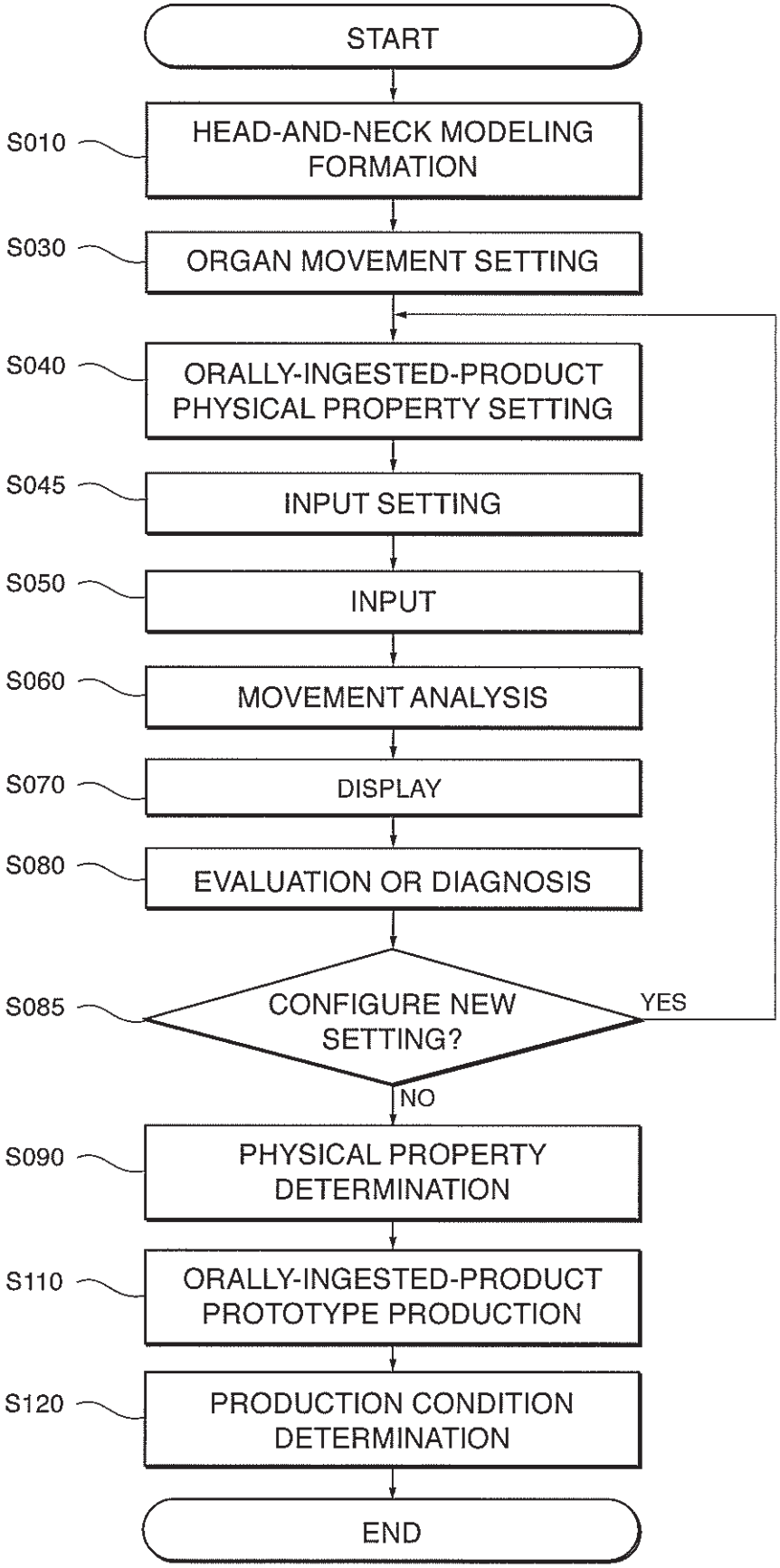

START
S010
HEAD-AND-NECK MODELING FORMATION
S030
ORGAN MOVEMENT SETTING
S040
ORALLY-INGESTED-PRODUCT PHYSICAL PROPERTY SETTING
S045
INPUT SETTING
S050
INPUT
S060
MOVEMENT ANALYSIS
S070
DISPLAY
S080
EVALUATION OR DIAGNOSIS
S085
CONFIGURE NEW SETTING?
YES
NO
S090
PHYSICAL PROPERTY DETERMINATION
S110
ORALLY-INGESTED-PRODUCT PROTOTYPE PRODUCTION
S120
PRODUCTION CONDITION DETERMINATION
END

FIG. 28

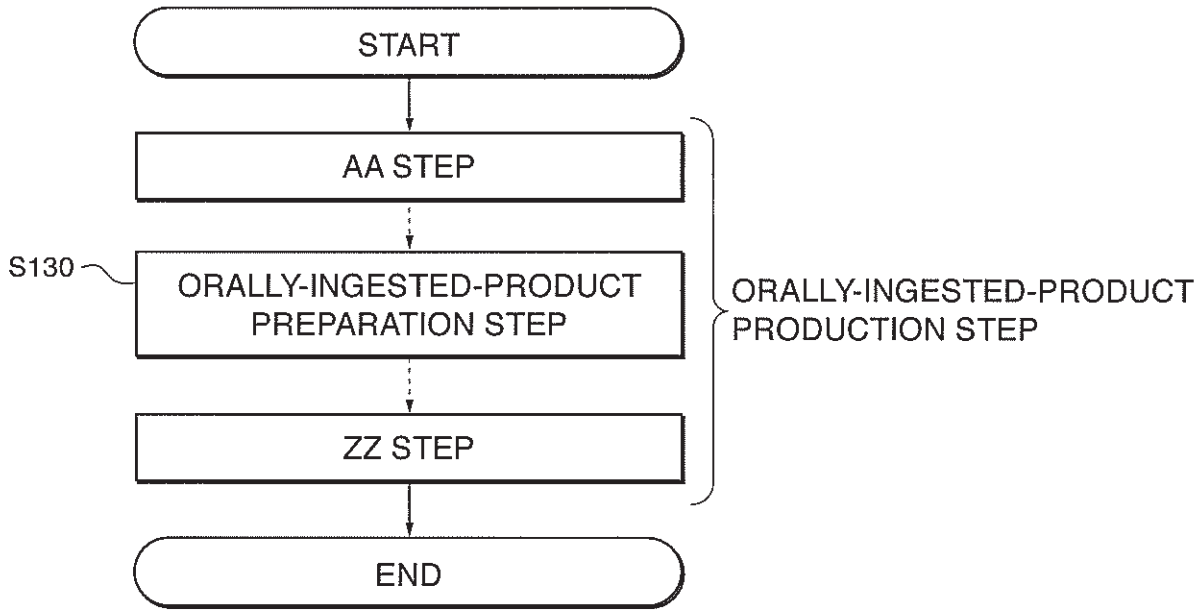

START
AA STEP
S130
ORALLY-INGESTED-PRODUCT PREPARATION STEP
ZZ STEP
END
ORALLY-INGESTED-PRODUCT PRODUCTION STEP

FIG. 29

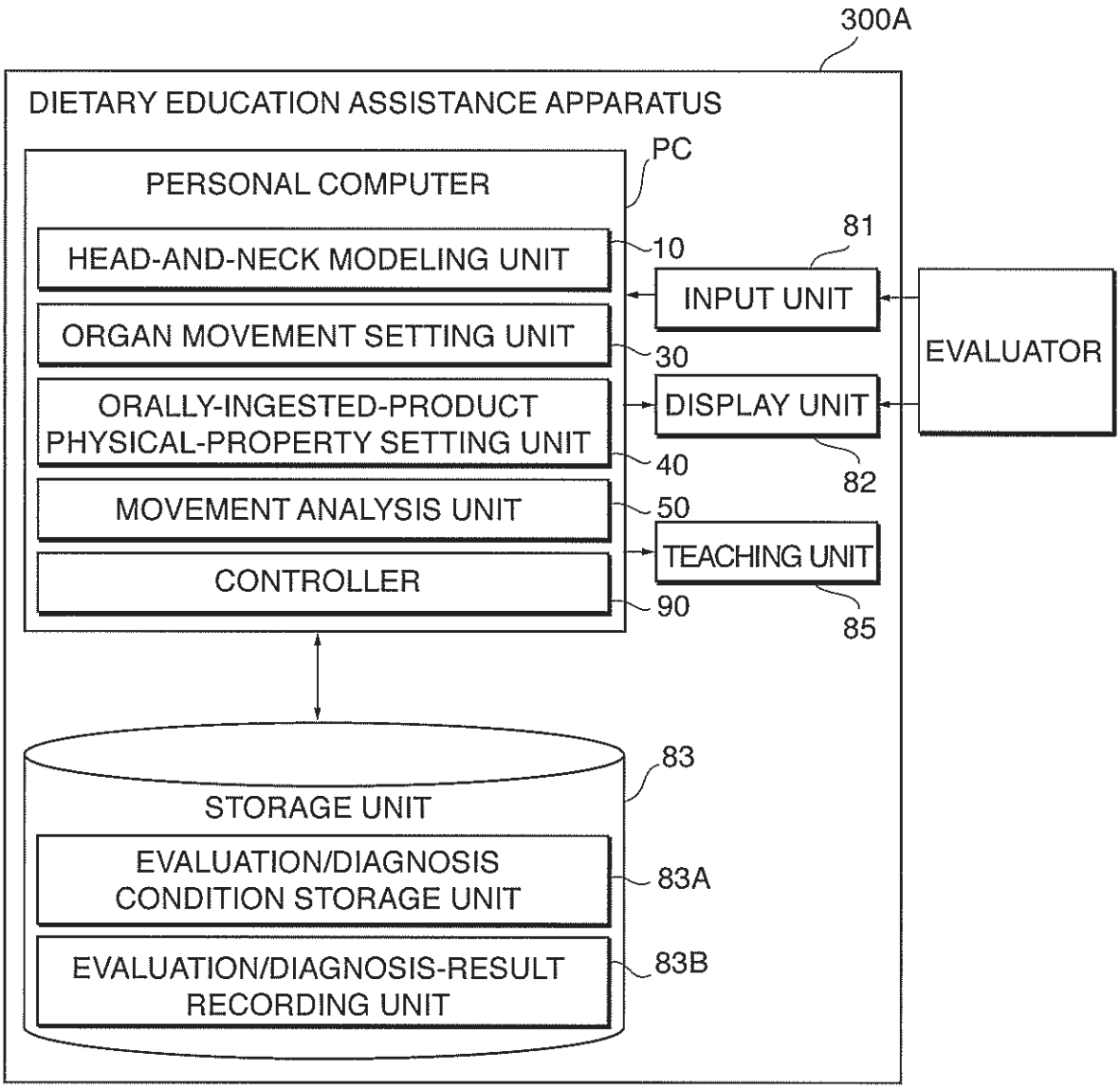

300A
DIETARY EDUCATION ASSISTANCE APPARATUS
PERSONAL COMPUTER
PC
HEAD-AND-NECK MODELING UNIT
10
ORGAN MOVEMENT SETTING UNIT
30
ORALLY-INGESTED-PRODUCT PHYSICAL-PROPERTY SETTING UNIT
40
MOVEMENT ANALYSIS UNIT
50
CONTROLLER
90
81
INPUT UNIT
DISPLAY UNIT
82
TEACHING UNIT
85
EVALUATOR
STORAGE UNIT
83
EVALUATION/DIAGNOSIS CONDITION STORAGE UNIT
83A
EVALUATION/DIAGNOSIS-RESULT RECORDING UNIT
83B

FIG. 30

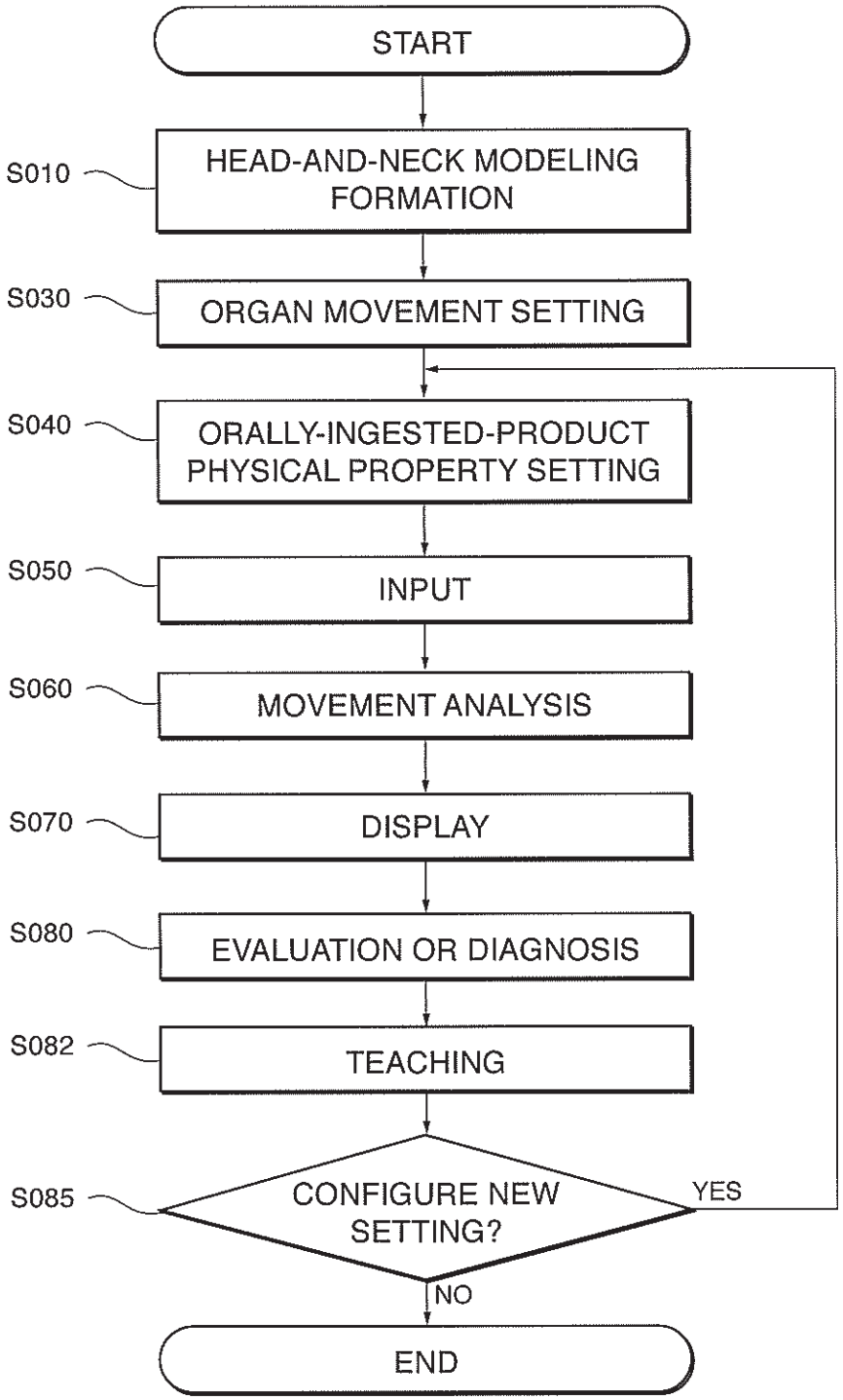

START
S010
HEAD-AND-NECK MODELING FORMATION
S030
ORGAN MOVEMENT SETTING
S040
ORALLY-INGESTED-PRODUCT PHYSICAL PROPERTY SETTING
S050
INPUT
S060
MOVEMENT ANALYSIS
S070
DISPLAY
S080
EVALUATION OR DIAGNOSIS
S082
TEACHING
S085
CONFIGURE NEW SETTING?
YES
NO
END

FIG. 31

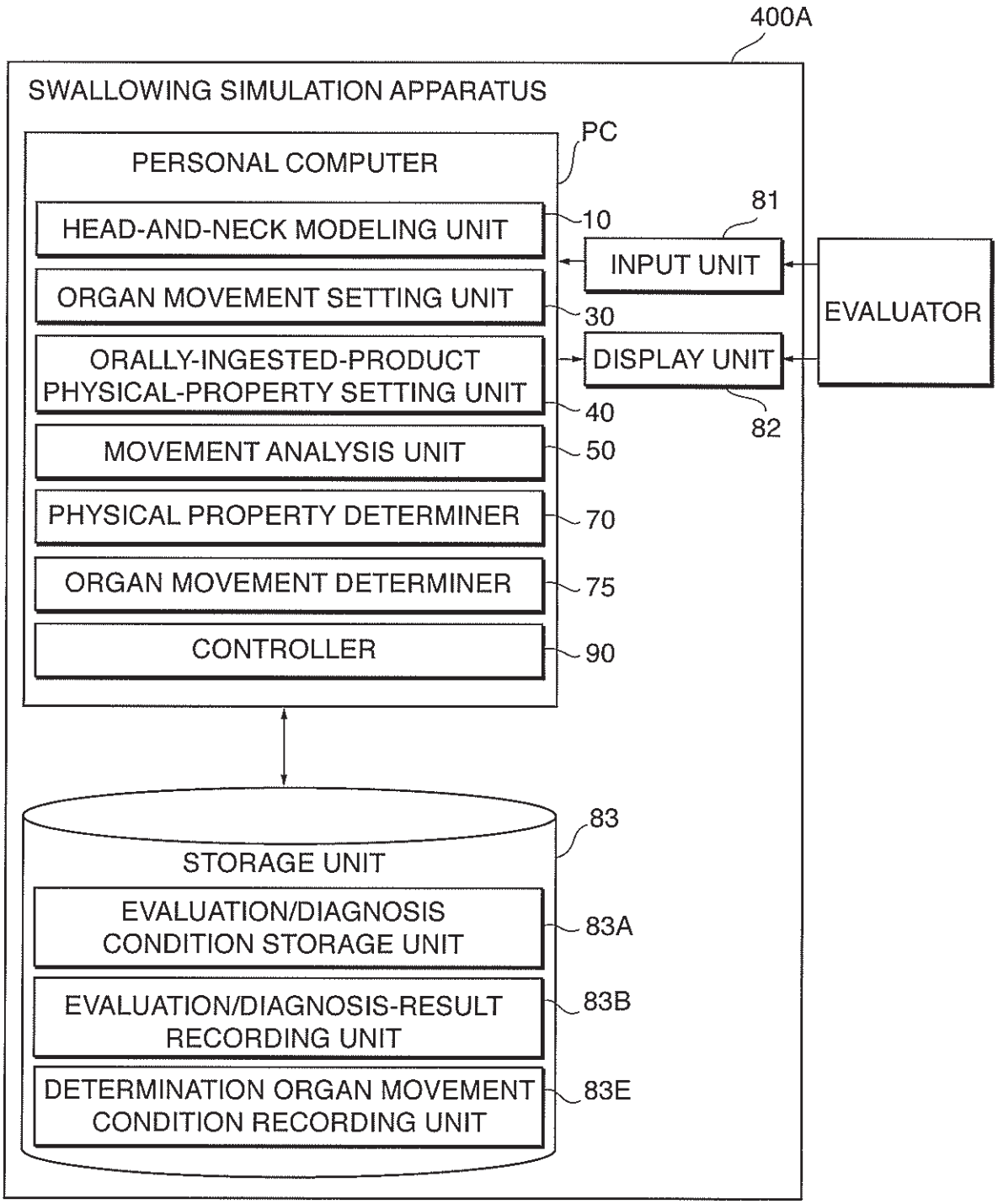
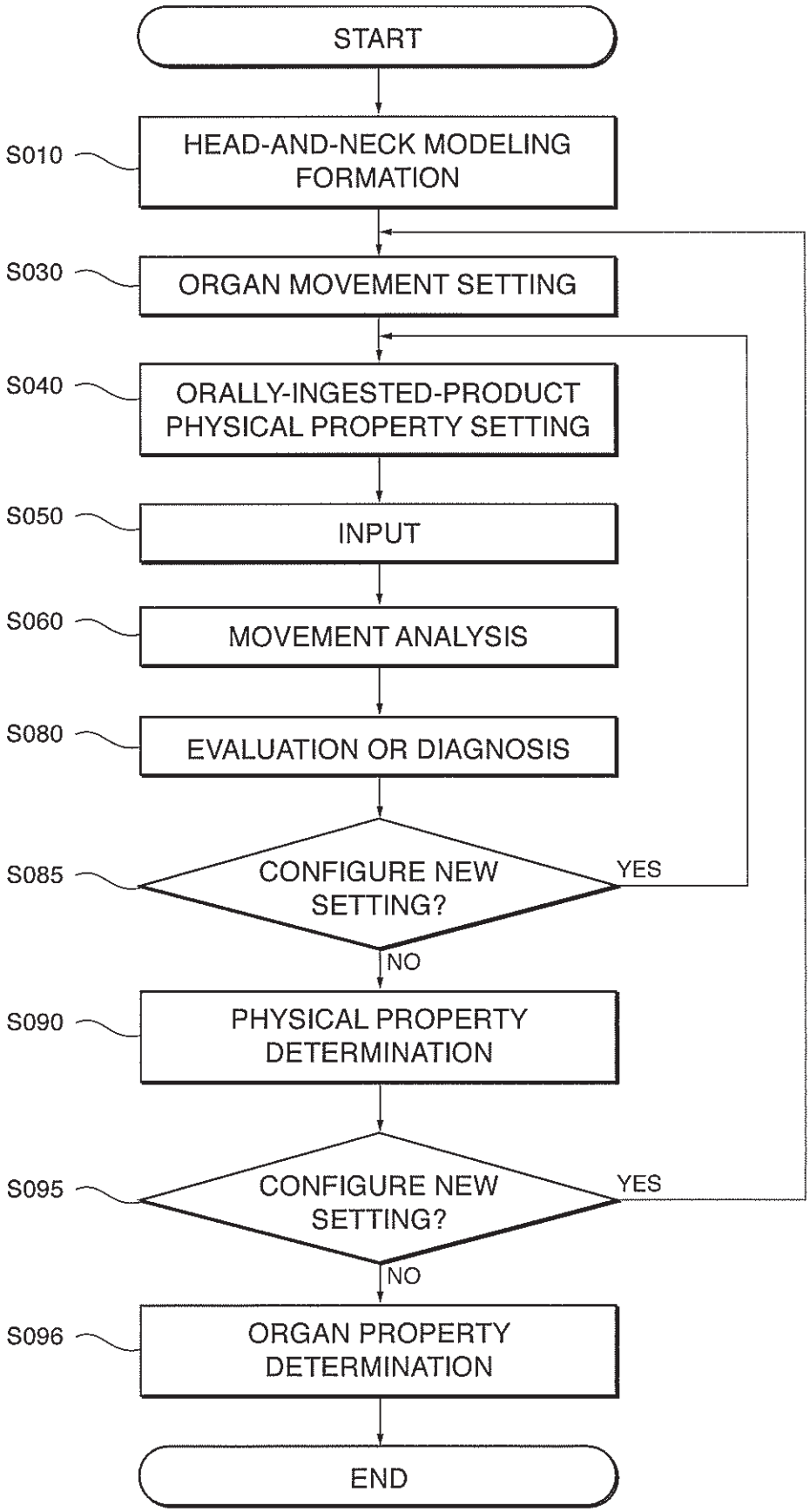

400A
SWALLOWING SIMULATION APPARATUS
PERSONAL COMPUTER
PC
HEAD-AND-NECK MODELING UNIT
10
ORGAN MOVEMENT SETTING UNIT
30
ORALLY-INGESTED-PRODUCT PHYSICAL-PROPERTY SETTING UNIT
40
MOVEMENT ANALYSIS UNIT
50
PHYSICAL PROPERTY DETERMINER
70
ORGAN MOVEMENT DETERMINER
75
CONTROLLER
90
81
INPUT UNIT
DISPLAY UNIT
82
EVALUATOR
83
STORAGE UNIT
EVALUATION/DIAGNOSIS CONDITION STORAGE UNIT
83A
EVALUATION/DIAGNOSIS-RESULT RECORDING UNIT
83B
DETERMINATION ORGAN MOVEMENT CONDITION RECORDING UNIT
83E

FIG. 32


START
S010
HEAD-AND-NECK MODELING FORMATION
S030
ORGAN MOVEMENT SETTING
S040
ORALLY-INGESTED-PRODUCT PHYSICAL PROPERTY SETTING
S050
INPUT
S060
MOVEMENT ANALYSIS
S080
EVALUATION OR DIAGNOSIS
S085
CONFIGURE NEW SETTING?
YES
NO
S090
PHYSICAL PROPERTY DETERMINATION
S095
CONFIGURE NEW SETTING?
YES
NO
S096
ORGAN PROPERTY DETERMINATION
END