2. MECHANISMS

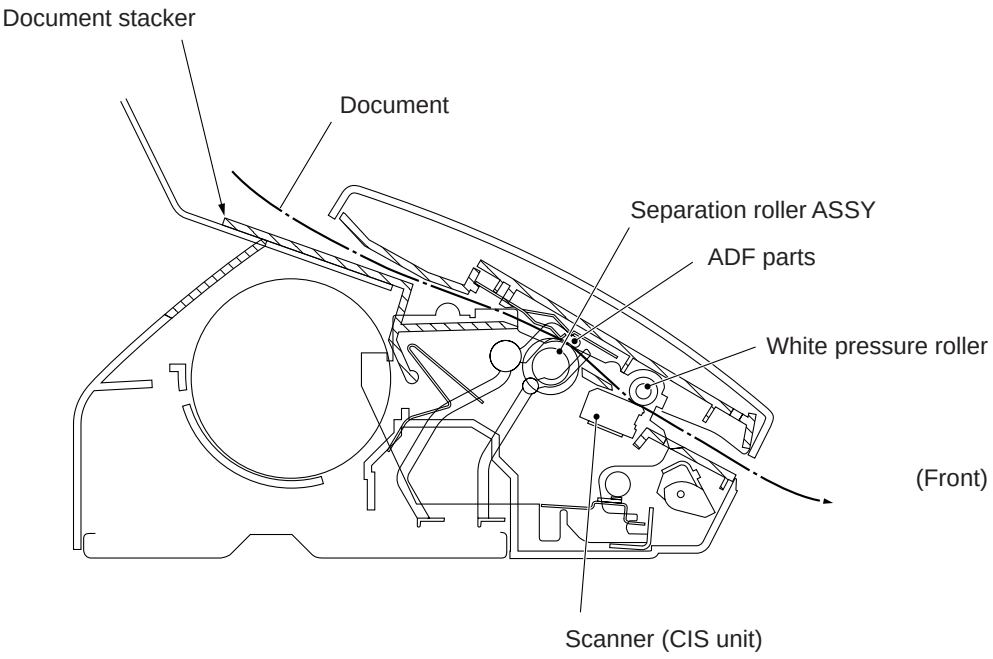
The equipment is classified into the following mechanisms:

- Transmitting Mechanism — Feeding and scanning documents
- Receiving Mechanism — Feeding recording paper and printing data
- Power Transmission Mechanism — Switching the power transmission route
- Sensors and Actuators

2.1 Transmitting Mechanism (Feeding and scanning documents)

The transmitting mechanism consists of the document stacker, automatic document feeder (ADF), document feeding related rollers, scanner, and document sensors. (For details about the sensors, refer to Section 2.4.)

For the drive power source, refer to Section 2.3.



2.1.1 Automatic document feeder (ADF)

If the operator sets documents on the stacker and starts the transmitting operation, the ADF (consisting of the separation roller ASSY and ADF parts) feeds those documents into the equipment, starting from the bottom sheet to the top, page by page. Each document advances to the scanner, and then it is fed out of the equipment with the white pressure roller.

2.1.2 Scanner

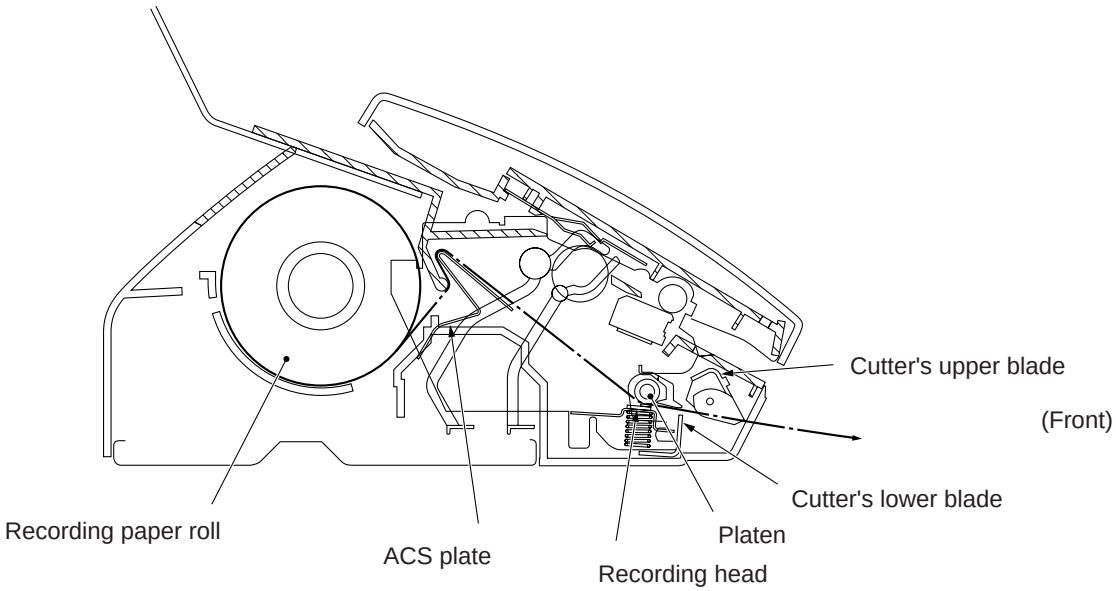
The scanner uses a contact image sensor (CIS) unit which consists of an LED array illuminating documents, a self-focus lens array collecting the reflected light, a CIS PCB carrying out photoelectric conversion to output picture element data, and a cover glass on which a document advances. When the document passes between the white pressure roller and the cover glass, it is scanned.

2.2 Receiving Mechanism (Feeding recording paper and printing data)

The receiving mechanism consists of the recording paper roll holder, anti-curl system (ACS) plate, platen, thermal recording head, automatic cutter, and sensors. (For details about the sensors, refer to Section 2.4.)

The recording paper is routed on the ACS plate to the recording head which prints onto the heat-sensitive recording paper pressed by the platen according to received image signals. The printed paper is further fed through the cutter chute and cut by the automatic cutter page by page.

For the drive power source, refer to Section 2.3.



2.2.1 Anti-curl system (ACS)

The ACS eliminates curl peculiar to rolled recording paper by curving the paper towards the opposite side of the curl with the ACS plate.

2.2.2 Automatic cutter

The automatic paper cutter consists of an upper blade (rotary) and a lower blade (stationary). As the upper blade rotates around the left end hub, the recording paper will be cut. Upon completion of cutting, the upper blade returns to its home position which is detected by the cutter HP sensor.

2.2.3 Recorder

The recorder, which is incorporated in the middle of the machine, consists of the recording head unit, coil spring, and platen. It prints according to received image signals.

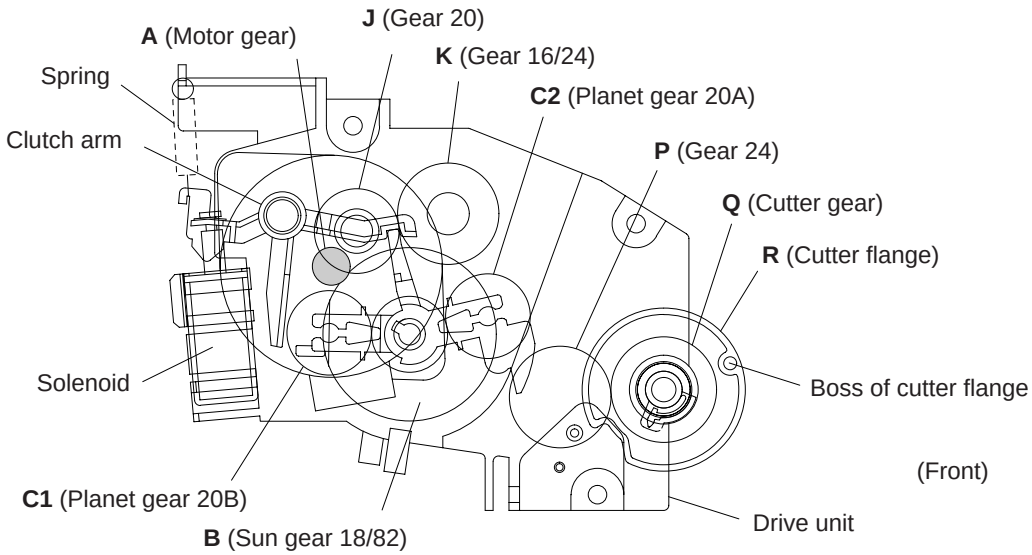
2.3 Power Transmission Mechanism

The equipment has a single drive motor whose power transmission route can be switched by the planetary gear train and the solenoid. This switching allows the equipment to function in four operation modes (recording, scanning, copying, and cutter driving modes).

2.3.1 Structure of the gear train

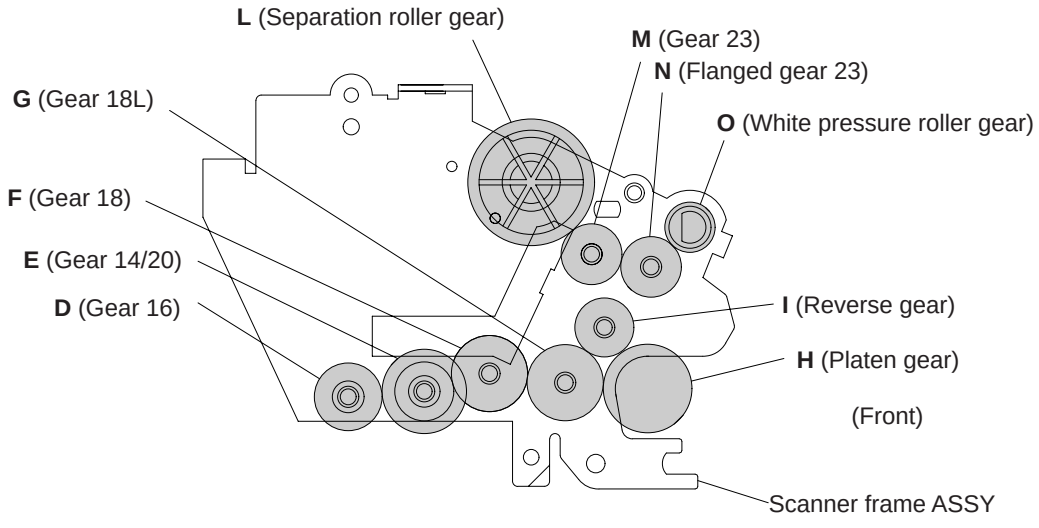
The gear train consists of two groups of gears: one group on the drive unit and the other on the scanner frame ASSY. Mounting the drive unit onto the scanner frame ASSY makes those two groups of gears engage with each other so that the rotation torque of the motor on the drive unit is transmitted to the separation roller, white pressure roller, and platen.

Shown below are a group of gears, the motor and solenoid on the drive unit. The cutter gear (Q) is integrated in the cutter flange (R) whose boss is placed in the hole provided in the cutter's upper blade.



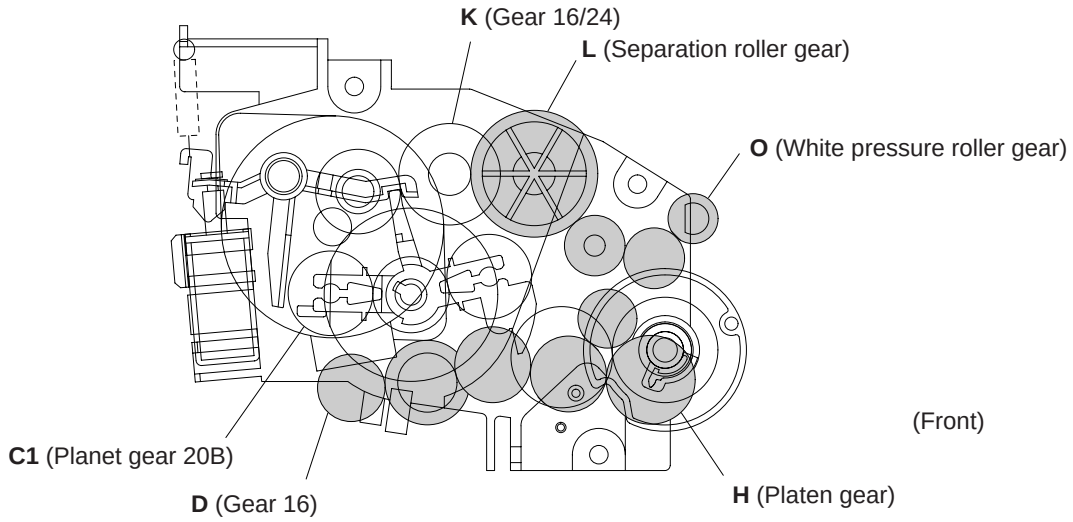
Drive Unit (viewed from the motor mounting side)

Shown below is a group of gears on the scanner frame ASSY.



Scanner Frame ASSY

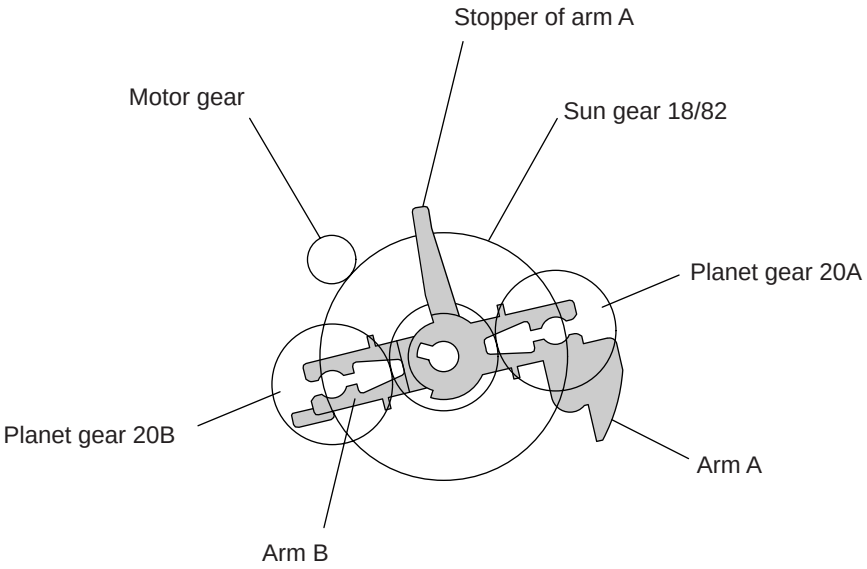
Shown below is a gear train constructed by combining the drive unit and scanner frame ASSY. The motor rotation is transmitted via the planet gear 20B (C1) to the gear 16 (D) and via the gear 16/24 (K) to the separation roller gear (L).



Combination of Drive Unit and Scanner Frame ASSY

2.3.2 Description of planetary gear system

The planetary gear train consists of the sun gear 18/82, two planet gears 20, arm A, and arm B, as shown below.



Planetary Gear System

If the motor rotates, the sun gear 18/82 rotates so that the rotational torque is transmitted to the engagement between the sun gear and the planet gears 20. Since the arms and planet gears are so designed that the moment of the arms is less than that of the planet gears, the arms turn around the center shaft in the same direction as the sun gear 18/82.

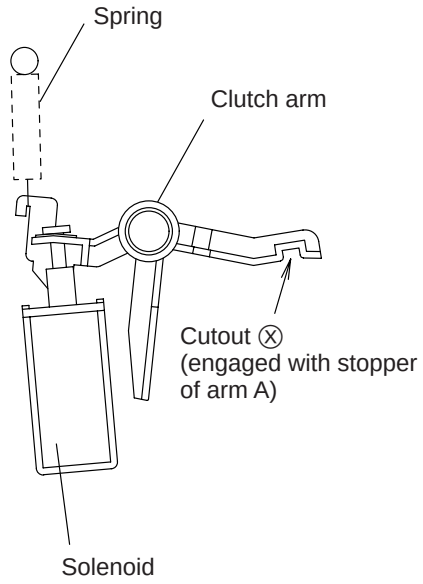
If the planet gear(s) becomes engaged with any other gear so that the arm cannot turn any more, the rotational torque of the sun gear 18/82 is transmitted to that planet gear. Accordingly, the planet gear starts rotation in the opposite direction of the sun gear 18/82.

2.3.3 Power transmission for four operation modes

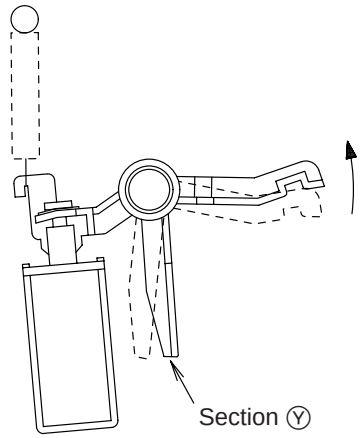
Depending upon the solenoid ON/OFF state and the motor rotation direction, the planetary gear train switches the power transmission route for the four operation modes.

Solenoid ON/OFF state

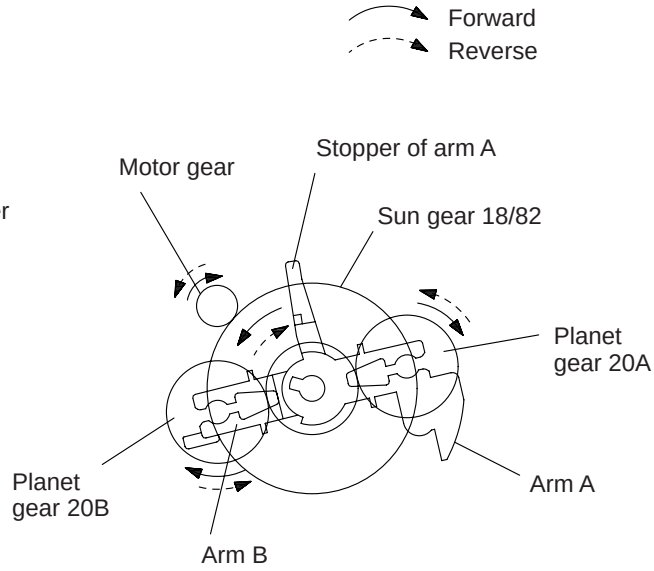
Solenoid: OFF



Solenoid: ON



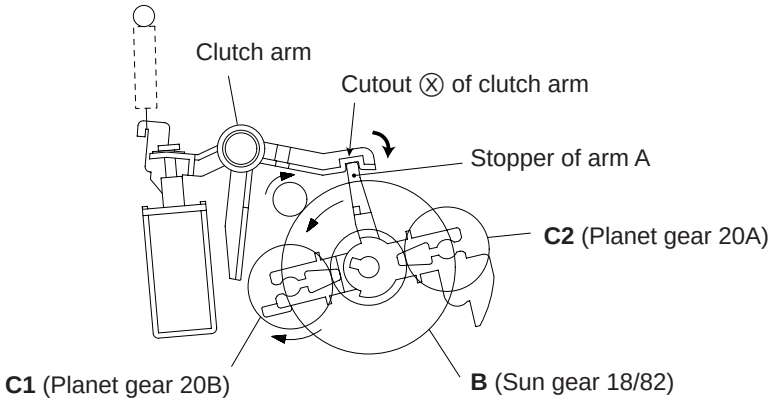
Motor rotation direction



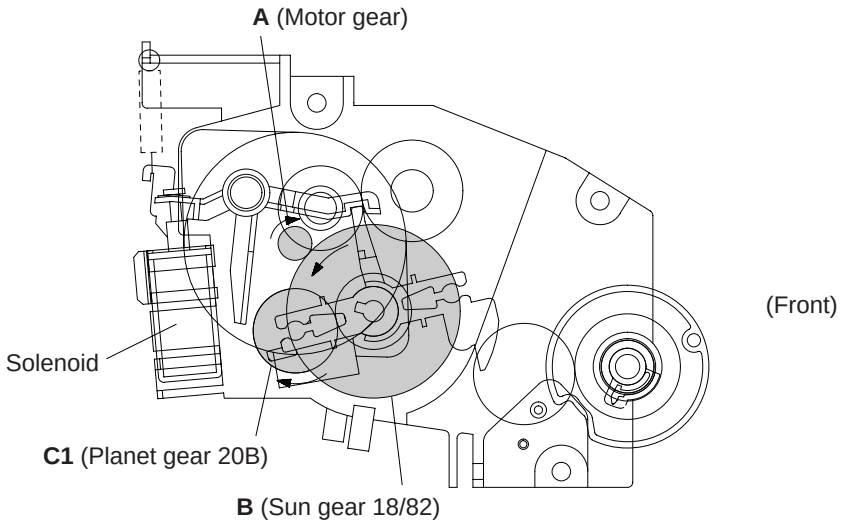
[1] Recording mode (Solenoid: OFF, Motor rotation: Forward)

In the recording mode, the control electronics deactivates the solenoid. When the motor rotates in the forward direction, the clutch arm turns clockwise with the spring and its cutout ⓧ becomes engaged with the stopper of arm A. Once arm A is locked, the planet gear 20A (C2) will not be engaged with any other gear but simply idle.

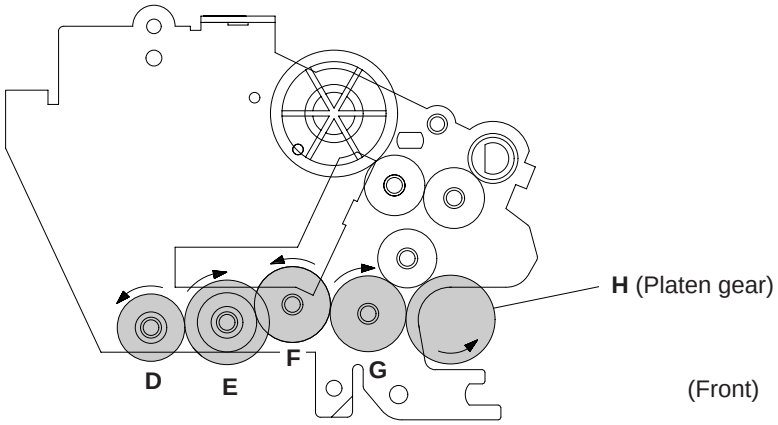
The motor rotation turns the sun gear 18/82 (B) counterclockwise so that the planet gear 20B (C1) transmits the rotation via the gears D through G to the platen gear (H).



Arm A Locked by Cutout ⓧ of Clutch Arm



Active Gears on the Drive Unit

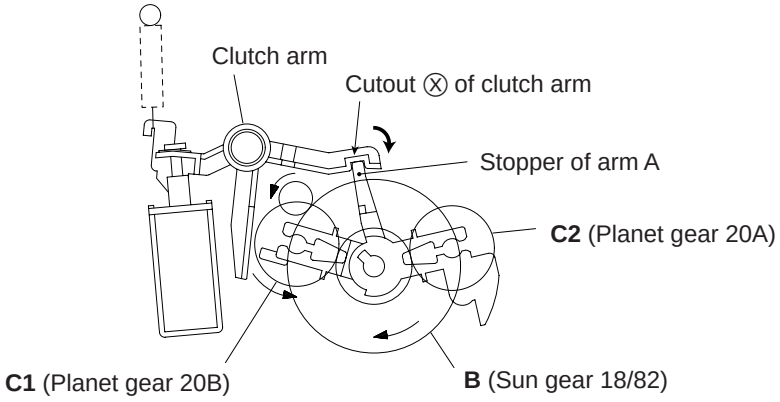


Active Gears on the Scanner Frame ASSY

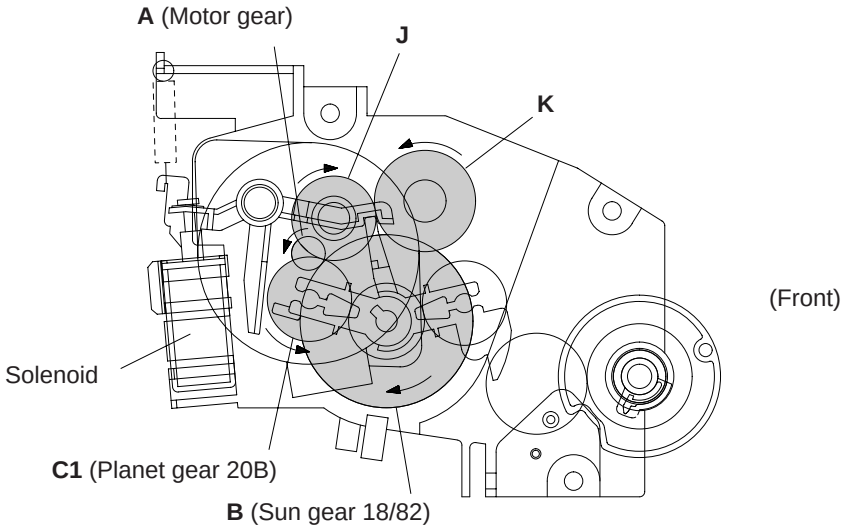
[2] Scanning mode (Solenoid: OFF, Motor rotation: Reverse)

Just as in the recording mode, the control electronics deactivates the solenoid in the scanning mode to lock arm A.

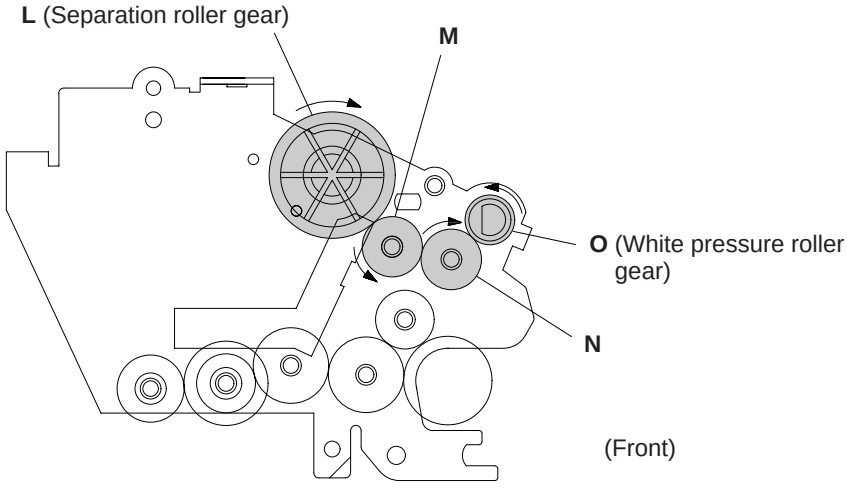
The motor rotates in the reverse direction and the sun gear 18/82 (B) rotates clockwise so that the planet gear 20B (C1) transmits the rotation to the separation roller gear (L) and white pressure roller gear (O) via the several gears.



Arm A Locked by Cutout ⓧ of Clutch Arm



Active Gears on the Drive Unit

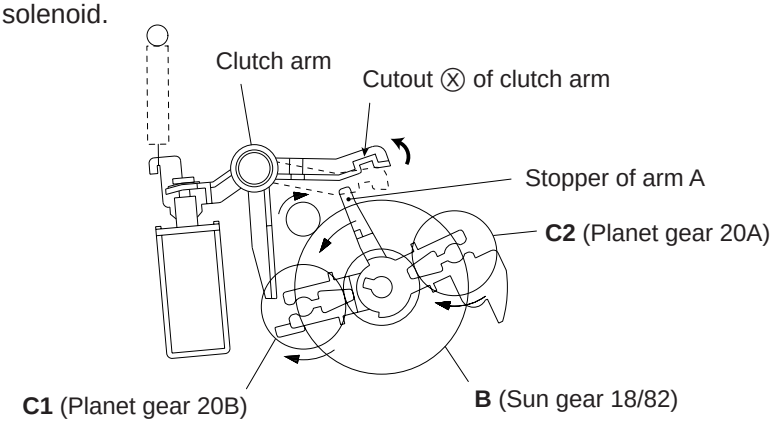


Active Gears on the Scanner Frame ASSY

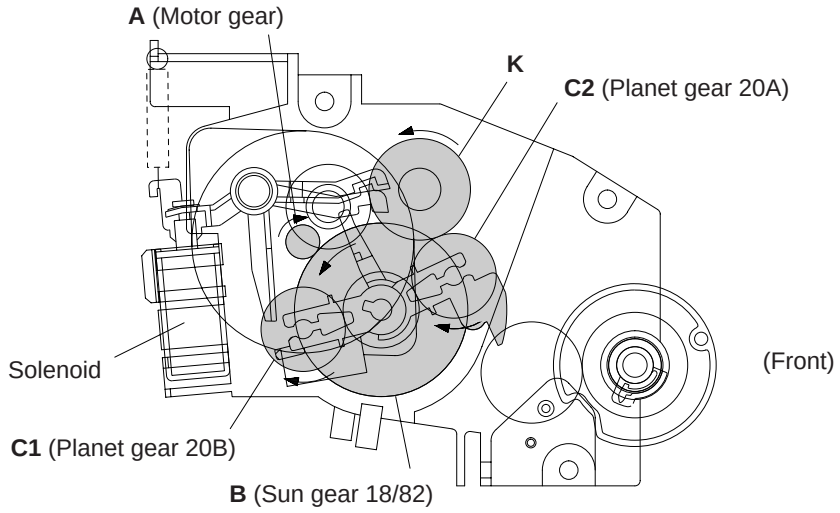
[3] Copying mode (Solenoid: ON→OFF, Motor rotation: Forward)

The control electronics at first activates the solenoid to release the stopper of arm A from the cutout ⓧ of the clutch arm while rotating the motor in the forward direction. Accordingly, the sun gear 18/82 (B) rotates counterclockwise so that both the planet gears 20B (C1) and 20A (C2) transmit the rotation; C1 rotation to the platen gear (H) and C2 rotation to the separation roller gear (L) and white pressure roller gear (O).

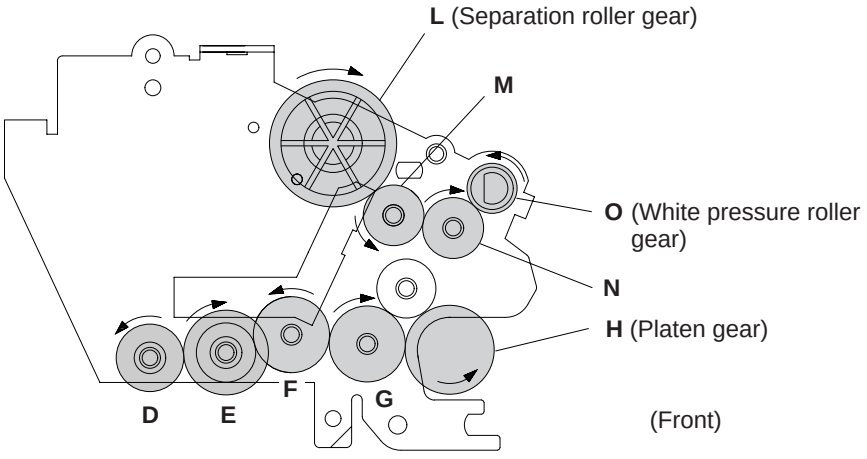
Once the planet gear 20A (C2) becomes engaged with gear K, the control electronics deactivates the solenoid.



Arm A Released from Cutout ⓧ of Clutch Arm



Active Gears on the Drive Unit

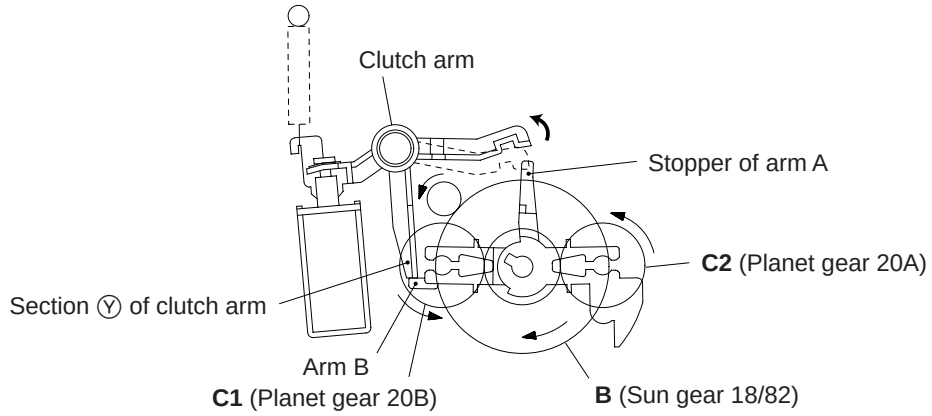


Active Gears on the Scanner Frame ASSY

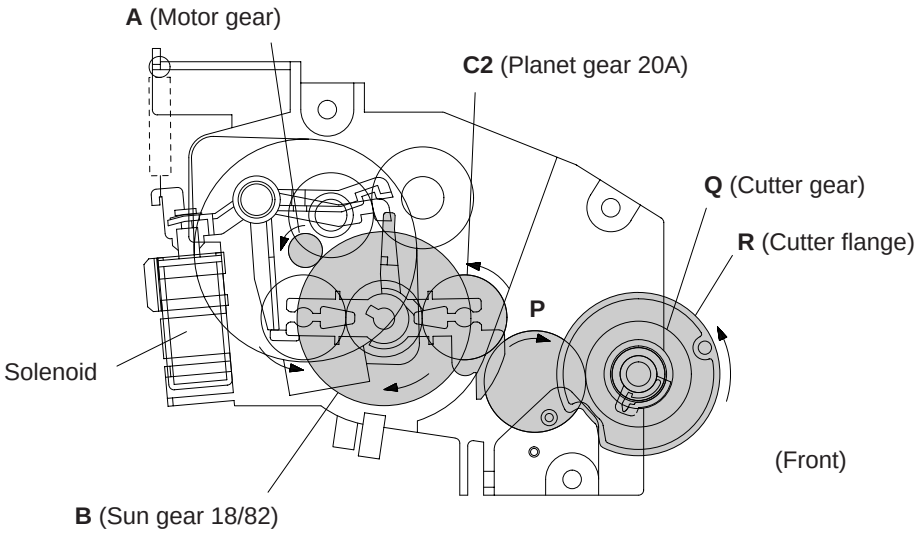
[4] Cutter driving mode (Solenoid: ON, Motor rotation: Reverse)

The control electronics activates the solenoid to release the stopper of arm A from the clutch arm. When the motor rotates in the reverse direction, the sun gear 18/82 (B) rotates clockwise so that the planet gear 20A (C2) transmits the rotation to the cutter gear (Q) via gear P.

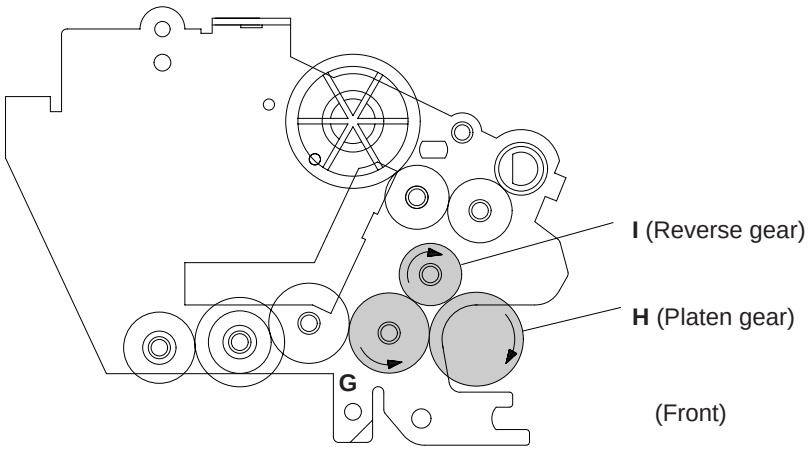
Since the planet gear 20B (C1) is blocked by the section Ⓨ of the clutch arm, it is merely idle without engaging with any other gear.



Arm B Blocked by Section Ⓨ of Clutch Arm

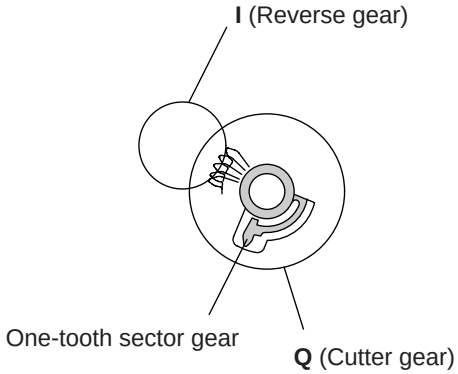


Active Gears on the Drive Unit



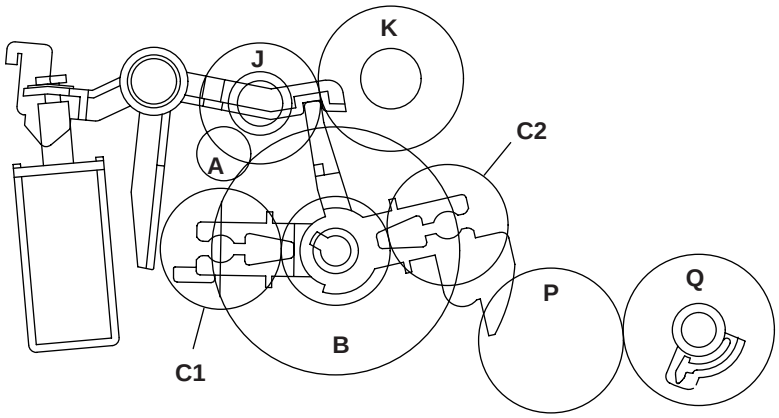
Active Gears on the Scanner Frame ASSY

The cutter gear (Q) is a two-stepped gear whose inside gear is a one-tooth sector gear. While the cutter gear (Q) rotates by one turn for one stroke of the upper blade of the cutter, the one-tooth sector gear slightly turns the platen gear (H) clockwise via the reverse gear (I) to feed the recording paper back into the equipment. This prevents the upper blade of the cutter from scratching the leading edge of the remaining paper.

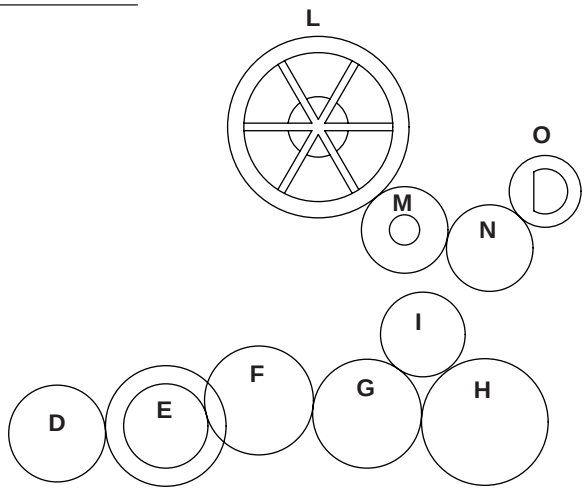


2.3.4 Power transmission route

Rotation of the motor gear is transmitted as shown below.



Gears on the Drive Unit



Gears on the Scanner Frame ASSY

A: Motor gear
B: Sun gear 18/82
C1: Planet gear 20B
C2: Planet gear 20A
D: Gear 16
E: Gear 14/20
F: Gear 18
G: Gear 18L
H: Platen gear
I: Reverse gear
J: Gear 20
K: Gear 16/24
L: Separation roller gear
M: Gear 23
N: Flanged gear 23
O: White pressure roller gear
P: Gear 24
Q: Cutter gear

[1] Recording Mode (Solenoid: OFF, Motor rotation: forward)

A → B → C1 → D → E → F → G → H
A → B → C2 (idling)

[2] Scanning Mode (Solenoid: OFF, Motor rotation: reverse)

A → B → C1 → J → K → L → M → N → O
A → B → C2 (idling)

[3] Copying Mode (Solenoid: ON→OFF, Motor rotation: forward)

A → B → C1 → D → E → F → G → H
A → B → C2 → K → L → M → N → O

[4] Cutter Driving Mode (Solenoid: ON, Motor rotation: reverse)

A → B → C1 (idling)
A → B → C2 → P → Q (→ I → G → H)
(Reverse-feeds recording paper)

2.4 Sensors and Actuators

This equipment has two photosensors and four mechanical switches as described below.

Sensor name	Type	Located on
Document front sensor	Photosensor (PH1)	Main PCB
Document rear sensor	Photosensor (PH2)	Main PCB
Paper empty (PE) sensor	Mechanical switch (SW1)	Main PCB
Cover sensor	Mechanical switch (SW2)	Main PCB
Hook switch sensor*	Mechanical switch (SW3)	Main PCB
Cutter home position (HP) sensor	Mechanical switch	Drive unit

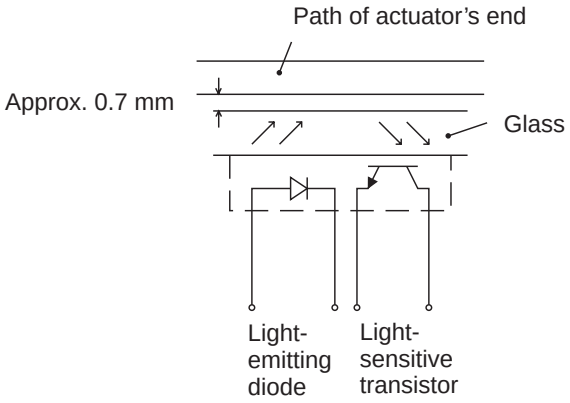
(*In those versions equipped with a Binatone handset, the hook switch sensor serves no function.)

- Document front sensor which detects the presence of documents.
- Document rear sensor which detects the leading and trailing edges of pages to tell the control circuitry when the leading edge of a new page has reached the starting position and when the scan for that page is over.

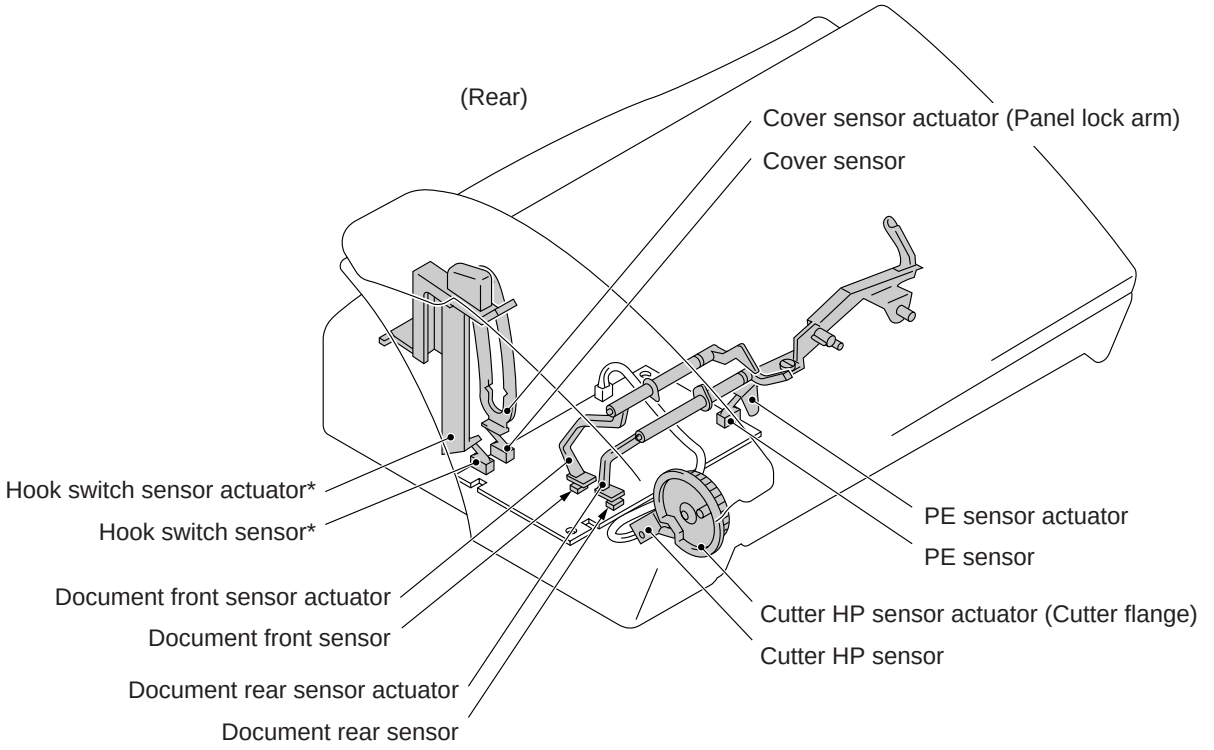
These photosensors are of a reflection type consisting of a light-emitting diode and a light-sensitive transistor. Each of them has an actuator separately arranged (see the next page). When an actuator is not activated, its white end lies in the path of light issued from the light-emitting diode and reflects its light into the light-sensitive transistor. If a document is fed in so as to activate the actuator, the actuator's white end goes out of the light path. With no reflected light to go into the light-sensitive transistor, the sensor detects the presence of documents.

- PE sensor which detects when the recording paper runs out.
- Cover sensor which detects whether the control panel is closed.
- Hook switch sensor which detects whether the handset is placed on the handset mount.
- Cutter HP sensor which detects the home position of the upper rotary blade of the automatic cutter.

Each of these four sensors has an actuator separately arranged (see the next page). If an actuator is activated, its lower end releases or pushes down the lever provided on the corresponding sensor so that the sensor signals the detection.



Photosensor



(*In those versions equipped with a Binatone handset, the hook switch sensor serves no function. Those versions have no hook switch sensor actuator.)

Location of Sensors and Actuators