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## HYBRID PAPER SEPARATION STRUCTURE

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## **Title: Hybrid paper separation structure**

**Abstract:** Structure for preventing paper double feeding by using the hybrid retard structure

In the case of the reverse retard separation structure, the paper that has passed through the Nip can be returned to its original position, so the separation performance is excellent. However, the Pick-up Roller Unit has to be up/down on every page, which is why it is noisy and vulnerable to durability.

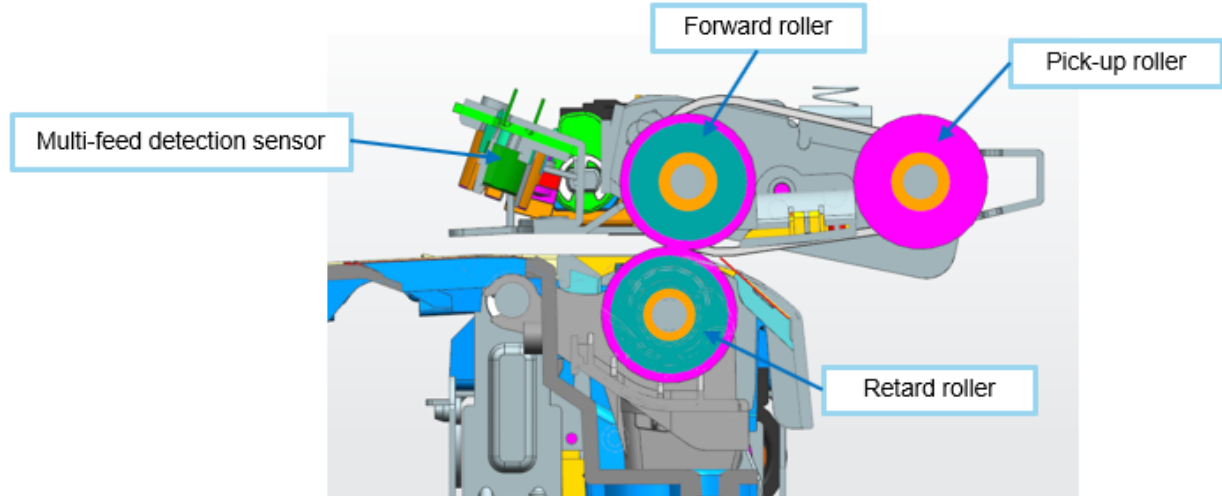
The present invention operates in a semi-retard separation structure during normal operation (normal output), and when a multi-feed is detected, reverse operation is performed to realize only the advantages of the two structures.

**Description:**

**Prior solutions:** Retard separation using torque-Limiter has been implemented in the following two forms, and each has its advantages and disadvantages.

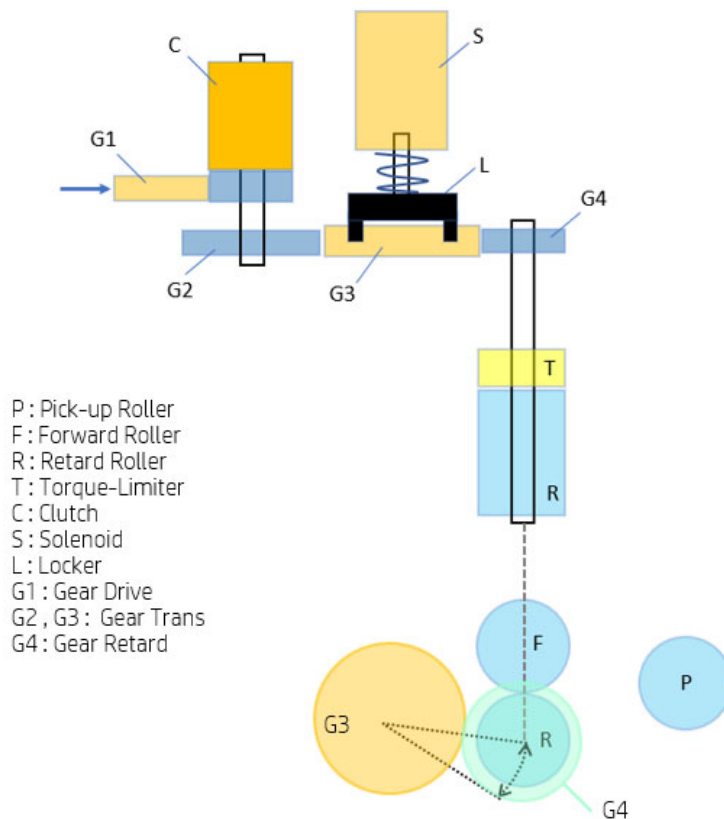
	Semi-Retard	Reverse-Retard
Diagram		
Operating principle	<ul style="list-style-type: none"> <li>Retard roller shaft fixed</li> <li>Always act as separation force for the Retard Roller by the value of Torque-Limiter</li> </ul>	<ul style="list-style-type: none"> <li>Retard Roller shaft is configured to rotate in reverse</li> <li>After pick-up, the pick-up roller goes up and the paper passed through the Nip is returned</li> </ul>
Advantages	<ul style="list-style-type: none"> <li>Simple structure and low cost</li> </ul>	<ul style="list-style-type: none"> <li>After picking up, it is advantageous to separate paper by backing up the paper that has passed through the nip</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>The paper passing through the Nip is irreversible, so there is a limit to the separation of the multi-feed paper.</li> </ul>	<ul style="list-style-type: none"> <li>Pickup unit should be up/down at each page (noise, durability)</li> </ul>

**Configuration:**



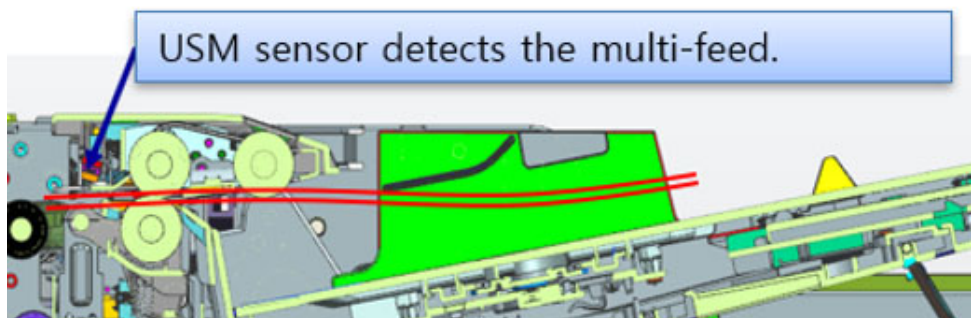
**A. Semi-retard separation structure during normal operation (normal output)**

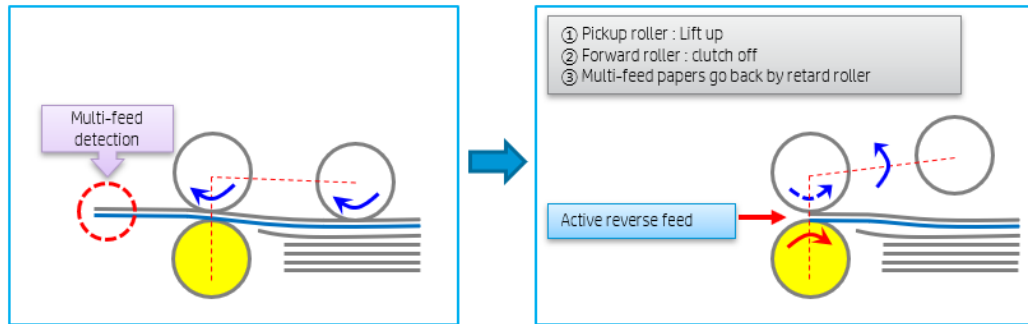
- The below picture is a schematic drawing of the gear train on the retard roller, and it is an example of the design of a drive unit to operate as a semi-retard in normal operation.
- G1 is a gear that is driven from the motor, and when the clutch is off, the driving force is not transmitted to the gears after G2.
- The G3 gear is locked by the locker installed at the end of the solenoid, and the retard shaft is fixed to operate in the same way as the semi-retard.



**B. Reverse-Retard separation structure when detecting multi-feed**

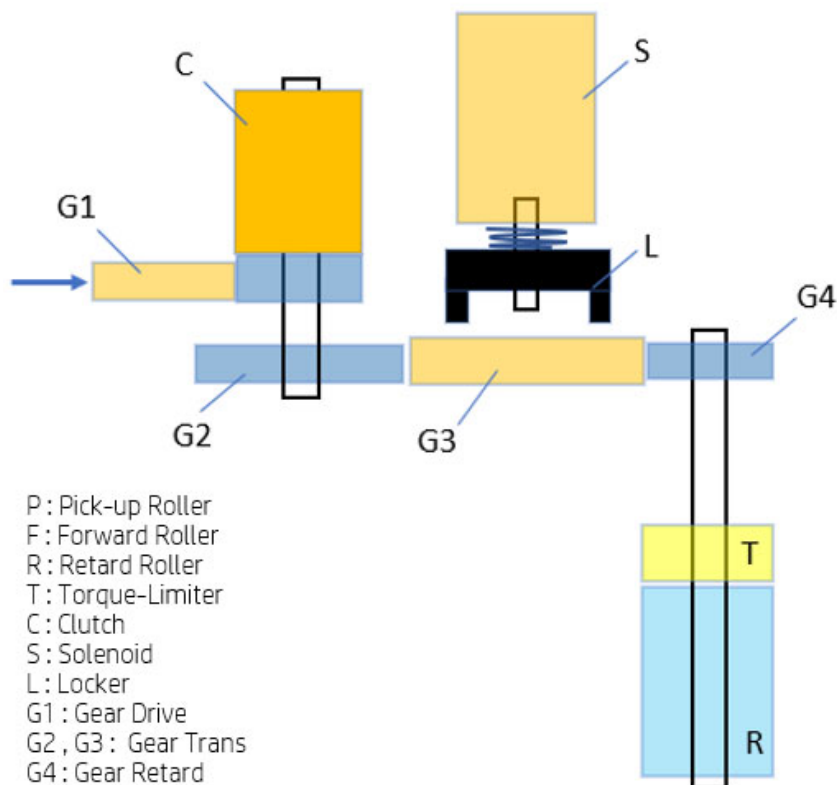
- 1) When multi-feed is detected, the pick-up process is stopped first.
- 2) Perform multi-feed processing
  - ① Pick-up Roller: Lift up
  - ② Forward Roller: Power cut-off
  - ③ Retard Roller: Reverse





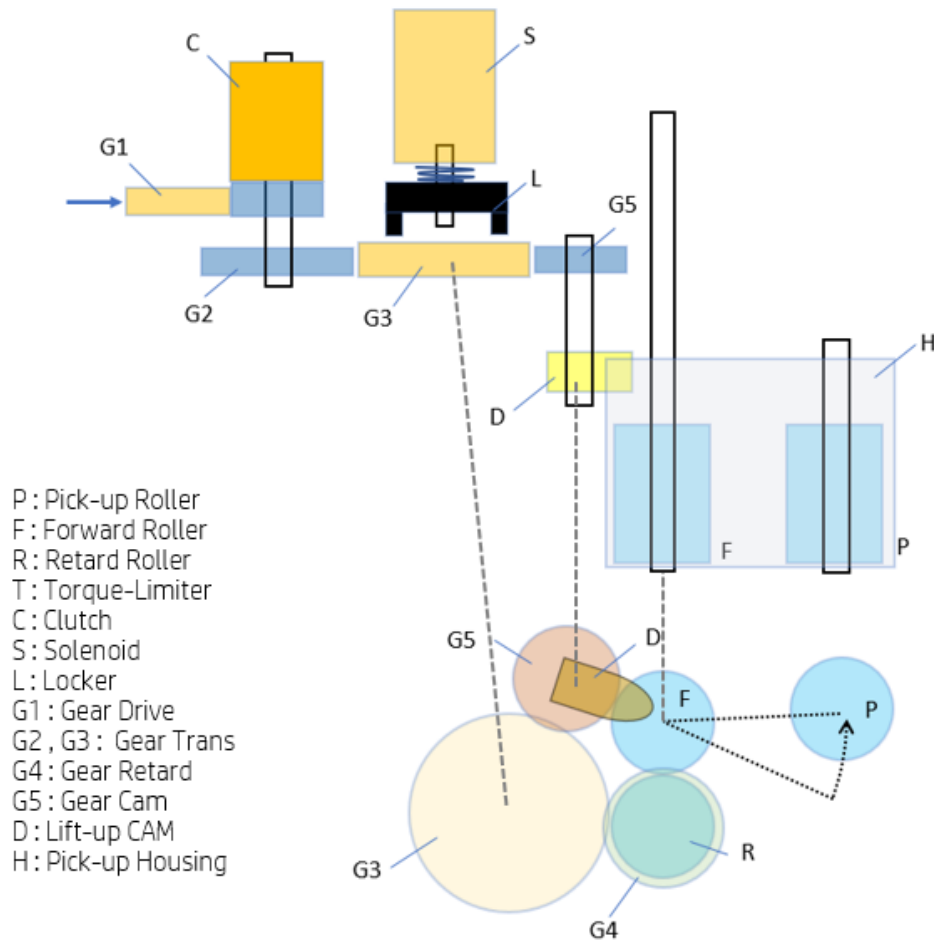
**C. Reverse-retard separation structure on multi-feed detection: Retard gear train**

- The below picture is a schematic diagram of the gear train of the retard roller and is demonstrating the design of the driving unit to operate as a reverse-retard in multi-feed detection.
- Solenoid turns on to unlock the locker, and Clutch turns on to transmit power to the G4, enabling the Retard Shaft to reverse.



**D. Reverse-retard separation structure on multi-feed detection: Gear train related to lift-up on the pick-up unit**

- The below is a schematic of the gear train to the Pick-up Lift and is a demonstration of the drive design to lift Pick-up Housing in the Multi-feed detection.
- G5 is connected to G3 and rotates D(Cam) to lift up the Pick-up Housing.



*Disclosed by CHANGMIN YOUN, YOUNGGOO KANG, SEUNGJIN JUNG, HP Inc.*