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Chambon

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[54] **APPARATUS FOR RECEIVING SHEETS CUT FROM A WEB**

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[51] **Int. Cl.**.....**B65h 29/20**

[58] **Field of Search**.....271/46, 76, 77, DIG. 8, 69, 271/80

[56] **References Cited**

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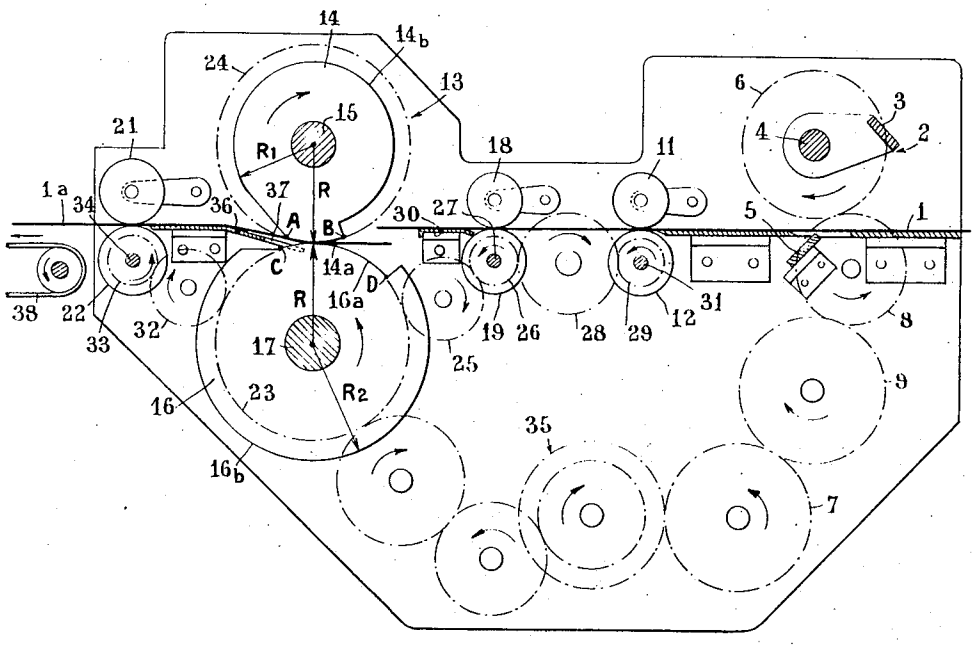
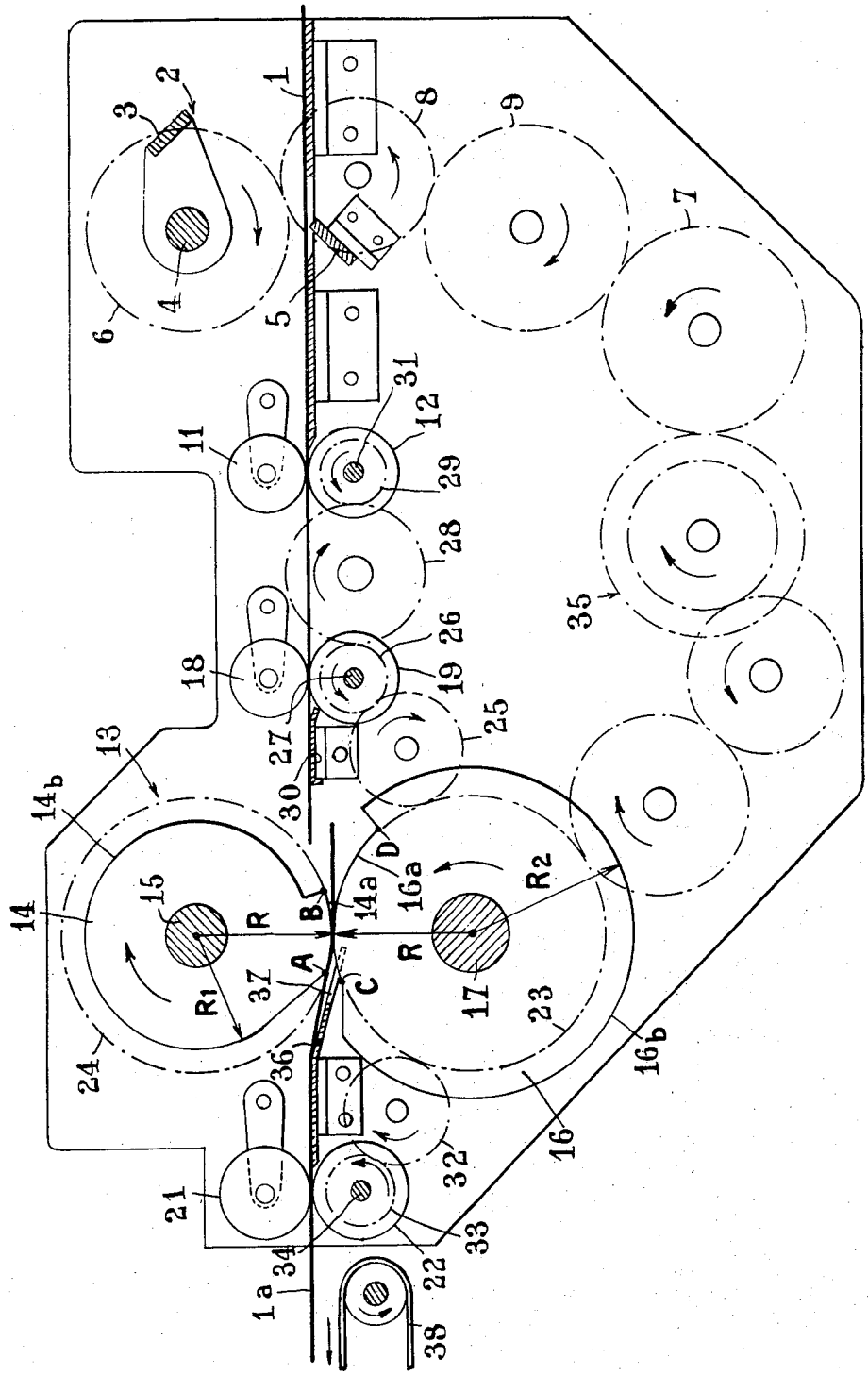
[57] **ABSTRACT**

This apparatus for receiving sheets cut from a web comprises only mechanical means for retarding and braking the successive cut sheets so that they overlap one another before being delivered.

This apparatus comprises downstream of the rotary cutter at least one upper cylinder and a lower cylinder, said upper cylinder having on one portion of its outer peryphery at least one peripheral boss having a cylindrical contour, engageable in at least one recess of same radius formed in the lower cylinder.

4 Claims, 1 Drawing Figure

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APPARATUS FOR RECEIVING SHEETS CUT FROM A WEB

BACKGROUND OF THE INVENTION

The present invention relates to an apparatus for receiving sheets cut from a web.

Apparatus designed for receiving successive sheets cut from a web on an endless conveyor belt are already known; these cut sheets overlap one another somewhat like the tiles of a roof.

These apparatus utilize as a rule air-pervious movable supports such as rotary drums or perforated belts through which an air suction is produced in order to press the sheets by suction against these supports. It is thus possible to slow down one sheet in relation to the next sheet so that the various sheets eventually received on a conveyor belt driven at a relatively low speed overlap one another.

Thus, the U.S. Pat. No. 2,580,469 describes an apparatus for receiving flat articles cut from a continuous web by means of a rotary cutter so as to form a row of sheets on a discharge conveyor comprising, downstream of the cutter, an upper cam and a lower cam and a lower cam mounted for rotation about two transverse shafts respectively, the cut articles being adapted to move between these cams, the upper cam having a gradually decreasing radius; the cam with the increasing radius has a lower coefficient of friction than that of the cam having the decreasing radius, whereby the article is carried along by said lower cam. Means are provided for rotatably driving said cams in opposite directions at a speed such that the tangential speed of the lower cam be equal to the linear speed of the article at the time of its engagement. After this engagement has occurred, the article is slowed down, lowered in relation to the next article issuing from the cutter and eventually laid upon a discharge conveyor. Feed rollers are arranged upstream of the cutter device and driven at a tangential speed equal to the linear speed of the cut articles. The aforesaid cams are operatively interconnected through pinions and also connected through trains of gears or a chain transmission to said feed rollers and to said rotary cutter.

SUMMARY OF THE INVENTION

The apparatus according to the present invention is advantageous notably in that each sheet is positively prevented from abutting against the trailing edge of the preceding sheet; in the other hand, this apparatus does not comprise any rotary member in which an internal suction is produced.

This invention is characterized in that the apparatus constituting the subject-matter thereof, for receiving sheets cut from a web by a rotary cutter and depositing upon a discharge conveyor a succession of sheets wherein each sheet partially overlaps the preceding one, comprises downstream of said rotary cutter at least one pair of transverse cylinders consisting of an upper cylinder and a lower cylinder forming therebetween a passage through which the cut sheets are adapted to move with a minimum clearance, said upper cylinder comprising on one portion of its outer periphery at least one cylindrical boss or projection concentric to said upper cylinder, said lower cylinder comprising, on one portion of its outer periphery, at least one recess formed with a cylindrical bottom coaxial to said lower cylinder, both cylinders being rotatably driven in opposite directions so that during this movement the cylindrical boss of said upper cylinder engages tangentially said cylindrical bottom surface of said recess formed in said lower cylinder and at a same linear speed of same direction as the feed rate of the cut sheets and lower than this speed each time the trailing edge of a cut sheet travels between said cylindrical boss of said upper cylinder and said cylindrical bottom of the recess formed in said lower cylinder.

BRIEF DESCRIPTION OF THE DRAWING

Now a typical form of embodiment of this invention will be described by way of axample with reference to the attached drawing of which the single figure illustrates diagrammatically in longitudinal and vertical section a sheet-receiving apparatus adapted to cause said cut sheets to overlap one another on a discharge conveyor.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The apparatus according to this invention is designed for receiving sheets cut from a continuous web **1** consisting, for example, of paper, although the invention is not limited to this specific material. The sheets are cut by means of a rotary cutter **2** known per se, arranged upstream of the apparatus and comprising essentially a blade **3** rotatably rigid with a shaft **4** and adapted to co-act with a counter-blade **5**. The shaft **4** is rigid with a pinion **6** and rotatably driven at a speed depending of course on the format or size of the cut sheets, from a power pinion **7**, through a pair of lay pinions **8** and **9**.

Each time the movable cutter blade **3** engages the fixed lower counter-blade **5**, it cuts a sheet from the web **1** and the cut sheet **1***a* is carried along, downstream of the cutter between idle upper feed rollers **11** and driven lower feed rollers **12**. These feed rollers **12** are rotatably driven from a device to be described presently at a tangential speed slightly greater than the tangential speed of the rotary cutter which corresponds to the size of the cut sheet, so that the rollers **11** and **12** produce a slight relative spacing between the successive cut sheets.

The sheet receiving apparatus according to this invention comprises downstream of the cutter **2**, a slow-down device designated as a whole at **13** and comprising essentially a set of upper cylinders **14** rigid with a transverse horizontal shaft **15**, and a set of lower cylinders **16** rigid with a transverse and horizontal lower shaft **17**. The slow-down device **13** also comprises an upstream feed device comprising upper idle rollers **18** co-acting with lower driven rollers **19**, and a downstream feed device comprising upper idle rollers **21** co-acting with lower driven rollers **22**. The shaft **17** carrying the lower cylinders **16** is rotatably rigid with a pinion **23** meshing with another pinion **24** rigid with the shaft **15** carrying the upper cylinders **14**.

Pinion **23** is in constant meshing engagement with an intermediate or lay pinion **25** meshing in turn with a pinion **26** rigid with a shaft **27** carrying the lower rollers **19**. This pinion **26** is also drivingly connected via pinion **28** to another pinion **29** rigid with a shaft **31** carrying the lower driven rollers **12**.

On the other hand, the aforesaid pinion **23** is operatively connected through an intermediate pinion **32** to another pinion **33** rigid with a shaft **34** carrying the lower driven rollers **22**.

Finally, the same pinion **23** is drivingly connected to the power pinion **7** via a train of gears designated as a whole by the reference numeral **35**.

The transmission ratios provided by the various pinions and gears are so selected that the lower feed rollers **12, 19** and **33** are rotatably driven at a tangential speed slightly higher than the linear speed of the cut sheets which is subordinate to size selected for the cutting operation.

Each upper cylinder **14** has formed on one fraction of its outer peripheral surface a boss or projection **14***a* of circular contour, extending along an arc $\overset{\frown}{AB}$ and having a radius R greater than radius R_1 of the portion **14***b* of the same cylinder. At each revolution of cylinders **14** and **16** this boss **14***a* engages a corresponding recess **16***a* formed in the outer periphery of cylinder **16**, this recess having a circular contour extending along an arc $\overset{\frown}{CD}$ and having a radius R shorter than the radius R_2 of the remaining portion **16** *b* of cylinder **16**. The distance between centers of shafts **15** and **17** is twice the radius R of boss **14***a* and recess **16***a*, so that at each revolution of cams **14** and **16** (revolving at the same angular speed) the boss **14***a* engages the recess **16***a* and rolls thereon without slipping.

As clearly shown in the drawing, the arc $\overset{\frown}{AB}$ covered by the contour of boss **14***a* corresponds to about 30° and is definitely smaller than the arc CD along which extends the recess **16***a* (about 75°). Between the cylinders **14** and **16** and the upstream forwarding rollers **18, 19** and downstream feed rollers **21, 22**, horizontal tables **30** and **36** extend respectively, the sheets being adapted to slide on the top surface of these tables. Table **36** has a comb-like extension **37** inclined downwards and towards the cams **14** and **16**, which fits inbetween the adjacent cams, as shown.

Finally, the sheet-receiving apparatus according to this invention comprises at its outlet an endless conveyor belt **38** driven at a moderate speed definitely lower than the linear speed of the sheets emerging from the feed rollers **21** and **22**.

The above described apparatus operates as follows: when a sheet such as **1***a* has been separated from the web **1** by the rotary cutter **2** it is carried along the feed rollers **21** and **12**, then by rollers **18** and **19**, and finally by rollers **21** and **22**. In fact, it passes freely between the cylinders **14** and **16** for at that time the boss **14***a* of cam **14** is in its lower position and the recess **16***a* of cam **16** is in its upper position. The cut sheet **1***a* may thus pass between the cylindrical portion **14***b* (having the small radius R_1) of cam **14** and the portion **16***b* (of greater radius R_2) of cam **16**, and is supported by the latter during this passage.

When the rear or trailing portion of sheet **1***a* emerges from feed rollers **18** and **19**, the boss **14***a* of upper cylinder **14** engages the upper face of cut sheet **1***a*, the recess **16***a* lying beneath this sheet during this phase. Subsequently, the boss **14***a* causes the trailing edge of sheet **1***a* to be lowered into the recess **16***a*.

When the endmost front edge A of boss **14***a* engages the circular contour **16***a*, the trailing edge of the sheet begins to be pinched between boss **14***a* and recess **16***a*. This pinching effect takes place at a distance of, say, 60 mm from the rear or tailing end of the sheet.

This pinching of sheet **1***a* between boss **14***a* and recess **16***a* takes place throughout the rolling engagement between the boss and the hollow circular contour, for instance along a peripheral distance of, say, 30 mm.

Since the tangential speeds of boss **14***a* and recess **16***a* are definitely lower than the linear speed of the sheets (for example the three-fourths of this speed), the sheet **1***a* is "braked" or slowed down while the next sheet continues to be driven at the tangential speed of rollers **18** and **19**. Under these conditions, an overlap of about 10 mm. is formed between the two sheets.

During the retaining action exerted on sheet **1***a* the downstream feed rollers **21** and **22** slip while the upstream feed rollers **18** and **19** carry along the next at the normal linear speed, thus permitting the desired degree of overlap.

After a rotation of about 30° of the upper cam **14**, the trailing edge B of boss **14***a* leaves the recess **16***a* and the pinching action is discontinued. Thus, sheet **1***a* is again carried along the tangential speed of downstream feed rollers **21** and **22**, like the next sheet, thus permitting the overlap of the two successive sheets. Then, cam **16** holds with its portion **16***b* the sheets between the two tables **30** and **36**.

The sheets overlapping in the manner set forth hereinabove are received by the conveyor belt **38** which reduces their speed, thus permitting, during the pinching of the next sheet, of maintaining the initial overlap.

The apparatus according to this invention may be utilized for a wide range of cut sheet sizes. In fact, it is only necessary to provide in the means for rotatably driving the cylinders **14** and **16** a variable-speed transmission mechanism permitting of adjusting at the pinching time a constant ratio of the tangential speed corresponding to the cut size to the tangential speed of boss **14***a* and recess **16***a*.

In the above-described form of embodiment of the invention each upper cylinder **14** carries only one boss **14***a* and similarly each lower cylinder **16** has formed only one recess **16***a* therein, both cylinders revolving at the same angular speed, so that a sheet is pinched at each revolution.

According to a modified form of embodiment of this invention, the upper cylinder **14** may comprise a single boss **14***a* and the lower cylinder **16** may be formed with a plurality of recesses **16***a* disposed at spaced angular intervals about its axis. In this case, the upper cylinder **14** of smaller radius than the lower cylinder **16** revolves at a greater speed so that the boss **14***a* of cam **14** and recesses **16***a* of cylinder **16** have equal tangential speeds, the boss **14***a* engaging in succession the various recesses **16***a* of cam **16** during each revolution of cylinder **14**.

According to another modified form of embodiment of this invention, the lower cylinder **16** may comprise a single recess **16***a* and the upper cylinder **14** carries on its outer periphery a plurality of bosses **14***a* disposed at spaced intervals about its axis. The lower cylinder **16** having a smaller radius than upper cylinder **14** will thus rotate faster than this cylinder **14**, whereby the various bosses **14***a* of upper cylinder **14** engage the single recess **16***a* of lower cylinder **16** each time the latter has accomplished a complete revolution

What I claim is:

1. An apparatus for receiving sheets cut from a web by a rotary cutter and forming on a discharge conveyor a sequence of sheets wherein each sheet partially overlaps the preceding one, which comprises, downstream of the rotary cutter, at least one pair of transverse cylinders consisting of an upper cylinder and a lower cylinder forming therebetween a passage engaged with a small clearance by the cut sheets, said upper cylinder comprising on one portion of its outer periphery at least one cylindrical boss coaxial to said upper cylinder, said lower cylinder comprising on the other hand along one fraction of its outer periphery at least one recess formed with a cylindrical bottom surface concentric to said lower cylinder, both cylinders being rotatably driven in opposite directions so that during their movement of rotation the cylindrical boss of the upper cylinder engages tangentially the cylindrical bottom of the recess formed in said lower cylinder and at a same linear speed and in the same direction as the linear speed of said cut sheet, but at a lower speed each time the trailing edge of a cut sheet passes between said cylindrical boss of said upper cylinder and said cylindrical bottom of said recess in said lower cylinder.

2. Apparatus according to claim 1, which comprises, upstream and downstream of the passage between the upper cylinder and the lower cylinder, pairs of feed rollers rotatably driven at a tangential speed equal to a same driving speed.

3. Apparatus according to claim 2, which comprises a driving pinion, a train of gears transmitting the drive from said driving pinion to said rotary cutter, another pinion coaxially rigid with one of said cylinders, another train of gears operatively connecting said driving pinion to said pinion coaxially rigid with one of said cylinders, a third train of gears connecting said pinion coaxially rigid with said one cylinder to the feed rollers disposed upstream of said passage between said cylinders, a fourth train of gears operatively connecting said pinion rigid with said one cylinder to the feed rollers disposed downstream of said passage between said cylinders and a pinion coaxially rigid with the other cylinder and meshing with the pinion rigid with said first cylinder.

4. Apparatus as set forth in claim 2 and comprising a horizontal table disposed with its upstream end downstream of said passage between the two cylinders, and a set of comb teeth rigidly carried by said upstream end and inclined downwards so as to extend into the outlet area of said passage between said cylinders.

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