

(19)



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Office européen des brevets



(11) Publication number:

0 552 778 A2

(12)

EUROPEAN PATENT APPLICATION(21) Application number: **93100919.5**(51) Int. Cl.⁵: **B07C 3/02**(22) Date of filing: **21.01.93**(30) Priority: **22.01.92 IT TO920045**(43) Date of publication of application:
28.07.93 Bulletin 93/30(84) Designated Contracting States:
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STUDIO TORTA Società Semplice Via Viotti 9
I-10121 Torino (IT)(54) **A post-sorting machine with holding line.**

(57) A post-sorting machine having an inlet (4) receiving a flow of postal items (7) (letters and post-cards) and an outlet (10) from which the postal items (7) leave. The machine (1) includes a primary conveyor line (17) connecting the inlet (4) to the outlet (10) and a secondary conveyor line (21) as an alternative to the primary line (17) and parallel to this latter. The primary conveyor line (17) is connected

to the secondary line (21) by diverter means (27) which direct the postal items (7) into a plurality of connecting sections (25) along which several holding stations (33) able to receive and retain the postal items (7) are disposed in cascade. After passing through the holding stations (33) the postal items (7) are sent through the secondary line (21) to the outlet (10).

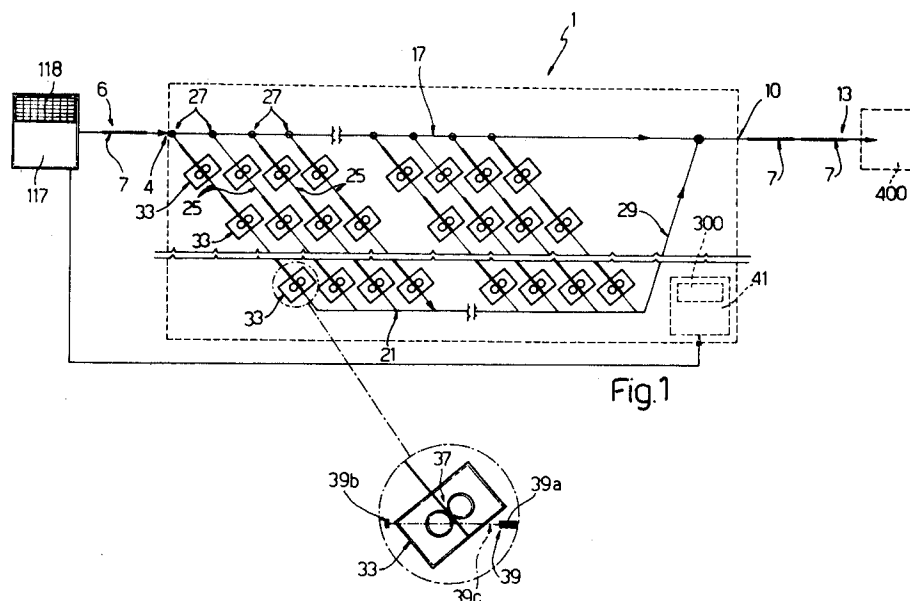


Fig.1

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The present invention relates to a post-sorting machine with a holding line.

Modular post-sorting machines are known which take in a substantially orderly flow of postal items (letters and postcards) and which are provided with an optical coding unit which reads (most conveniently with the assistance of electronic optical reading means) the post code, which must then be printed on the letter to be sorted.

The optical coding time normally varies between 1 second and 10 seconds according to the clarity with which the address has been written on the letter.

During this optical coding time, the letter must be held "waiting" and not sent to subsequent sorting stations.

Prior art post-sorting machines have long stretches of belt onto which letters waiting to be optically coded are sent; owing to the length of these belts such machines are very large, complex and highly expensive.

The object of the present invention is to provide an extremely compact post-sorting machine with a holding line which is able accurately to control the time a letter remains inside the machine.

The said object is achieved by the present invention, which relates to a post-sorting machine with a holding line provided with at least one inlet able to receive a flow of incoming postal items and provided with at least one outlet through which the postal items leave, characterised in that it includes at least one primary conveyor line connecting the inlet to the outlet; at least one secondary conveyor line as an alternative to the primary conveyor line; at least one connecting section joining the primary and the secondary conveyors; at least one holding station along the connecting section; the said station including grip means able to receive, block and move postal items so as to temporarily hold these items in the holding station.

The invention will now be described with particular reference to the appended drawings which illustrate a preferred non-limitative embodiment, in which:

Figure 1 is a schematic view from above of a post-sorting machine with holding line according to the present invention;

Figure 2 is a view from above of a portion of the machine of Figure 1;

Figure 3 shows a detail, on an enlarged scale, of the machine of Figure 2;

Figure 4 is an operational block diagram of an electronic control unit for the machine of Figure 1; and

Figure 5 shows on an enlarged scale a detail of the machine of Figure 1.

With particular reference to Figure 1, a post-sorting machine is generally indicated 1, provided with an inlet 4 for receiving a flow 6 of incoming postal items 7 (letters and postcards) and with an outlet 10 through which a flow 13 of postal items leaves the machine.

The flow 6 does not have the code (subsequently printed onto the letters, for example as a bar-code) which will be printed onto the items after they leave the machine 1.

The machine 1 includes a rectilinear primary conveyor line 17 which connects the inlet 4 with the outlet 10 and conveys the postal items 7 in a manner which will be explained later.

The machine 1 also includes a secondary conveyor line 21, parallel to the line 17 and connected to this by a plurality of connecting sections 25, parallel to each other and connected with the line 17 by diverter means 27.

The secondary line 21 is connected to an introduction section 29 which extends from an end portion of the line 21 to merge with the primary line 17.

The post-sorting machine 1 is also provided with a plurality of holding stations 33 disposed in cascade along the connecting sections 25 and provided with grip means 37 able to receive, retain and move the postal items 7. Each station 33 is further provided with a position sensor 39 able to detect the position of a postal item 7 relative to the grip means 37. These sensors 39 are also able to detect the presence of postal items inside the stations 33.

The sensor means 39 are of an opto-electronic type and include a photoemitter device 39a and a photodetector device 39b which define an optical path 39c through the connecting section 25.

The post-sorting machine 1 includes an electronic control unit 41 which directs the flow of postal items within the machine 1 by controlling the operation of the diverter means 27 and the holding stations 33.

Figures 2 and 3 illustrate some mechanical details of the machine 1; these drawings follow the numbering given earlier to distinguish elements (for example the conveyor lines) which include several mechanical parts.

With particular reference to Figure 2, the primary conveyor line 17 and the introduction section 29 are made up respectively of pairs of belts 60a-60b and 60c-60d positioned alongside for a length defining their respective sections, driven in known manner by pulleys and tensioned by tension rollers 63, 63' mounted on a flat surface 70.

The line 21 is formed on the other hand by a rectilinear section 200 of the belt 60c and a plurality of belts 60e including at least one section 201 parallel to the belt 60c. In addition, each belt 60e

passes around a plurality of pulleys 64 positioned perpendicular to the surface 70.

With particular reference to Figure 3, each diverter means 27 includes a body 65 which has a triangular longitudinal section and is pivotable relative to the surface 70. This body 65 has an end portion 67 able to intersect the flow of postal items 7 along the line 17 in order to direct these items into the section 25 or the line 17 according to the angular position of the portion 67.

A first portion of the connecting section 25 is defined by a belt 68 which passes over a plurality of pulleys 69 and includes a rectilinear portion 68a which extends from the diverter means 27 towards a holding station 33. The section 25 is further formed by two rectilinear rectangular walls 72, 76 which extend substantially from the end of the portion 68a perpendicular to the surface 70 and are positioned parallel to each other, spaced so as to allow the postal items 7 to flow between the walls 72 and 76.

The stations 33 are interposed along the walls 72 and 76 and include a flat rectangular base structure 80 positioned on the surface 70 and supporting the grip means 37. These grip means 37 include a pair of rollers 83, 84 disposed parallel to each other and with cylindrical outer surfaces covered with resilient material (for example rubber).

The roller 83 is driven by a clutch-brake unit 85 of known type (Figure 5) which includes a main shaft 86, fixed at the top end to the roller 83 and connected at the lower end to a clutch unit 87 driven by a belt 88 in turn driven by a three-phase electric motor 89. The clutch unit 87 also includes two discs 87a, 87b facing each other and connected respectively to a lower end of the shaft 86 and to a shaft 90 driven by the electric motor 89 via the belt 88.

The group 85 further includes a brake unit 91 having a brake disc 92 fixed to the shaft 86 and housed in a body 93 fixed to the frame 70 of the machine 1. The shaft 86 is axially movable by an electromagnetic actuator 94, conveniently controlled by the unit 41, between a first, coupled position (not illustrated) in which the two discs 87a, 87b of the clutch unit 87 are positioned in contact with one another (and the motion of the motor 89 is transmitted to the roller 83) and a second, uncoupled position in which the discs 87a, 87b of the clutch unit 87 are spaced from each other and the brake disc 92 presses against the body 93.

The roller 83 drives the roller 84 by friction. The roller 84 is urged towards the roller 83 by a resilient device 95 of known type. All the rollers 83 of the various holding stations of a section 25 can be driven by a single electric motor 89, connected by respective belts to the various clutch-brake units 85.

When a postal item 7 enters a station 33 it passes between the rotating rollers 83 and 84 which then stop under the action of the brake unit 91 causing the postal item to stop between the rollers 83, 84.

The postal item remains in this position until the roller 83 is again driven to rotate by the clutch unit 87, giving a strong acceleration to the item 7 which is thrown along the walls 72, 76 and exits from the station 33.

Subsequently, the item 7 reaches the adjacent station 33 where the operations described above are repeated; in this way the postal item 7 passes from one station 33 to the next, along the connecting section 25.

In use, the flow 6 of postal items 7 enters through the inlet 4 and passes along the section 17 from which it is sorted according to the readings of the unit 41 which controls the position of the diverter means 27 and directs the items 7 into the various parallel sections 25.

In particular, postal items 7 waiting for coding are directed into the various sections 25, occupying the holding stations 33 one after the other, starting in unoccupied stations 33 immediately adjacent the line 21.

When all the stations 33 of a section 25 are occupied, a new postal item 7 is directed into a section 25 along which at least one station 33 is free.

When the coding of a postal item 7 becomes available, this item is sent to line 21. In this way each section 25 operates in known manner as a First In First Out (FIFO) unit, where the first item 7 to enter any section 25 will be the first to leave it.

Subsequently, the item 7 is transferred from the line 21 to the section 29 and onwards to the outlet 10, becoming part of the flow 13 and moving to a subsequent sorting machine (of known type indicated by a broken line 400) which will print the appropriate code on the item 7.

Figure 4 shows the logic block diagram of the operations which the electronic unit 41 controls the machine 1 to perform for each postal item 7 that arrives at the inlet 4.

At the start is a block 100 where a station 33 containing no postal item 7 is sought from the signals from the sensors 39.

When the operation of block 100 is completed, block 110 takes over, directing the postal item to the station 33 identified by block 100. This operation is performed by operating the diverter means 27 so that the item 7 passes along the line 17 until this intersects the diverter means 27 leading into the section 25 containing the empty station 33; at this point, the said diverter means are activated by the unit 41 so that the item 7 is directed along the section 25 into the holding station 33.

The presence of an item 7 near each diverter means 27 may be detected by sensor means, for convenience groups of photoelectric cells, or by a time function of the transport speed of the belts 60a and 60b.

Block 110 is followed by block 115 which checks whether the coding of a postal item 7 in a station 33 at the end of a section 25 near the line 21 is present and complete; if the code is present the item 7 passes on to block 120, otherwise it passes to block 140. This coding is in fact sent to the electronic unit 41 from an external optical coding unit 117 of known type, through which the flow 6 of postal items 7 passes before entering the machine 1. In particular, the unit 117 is provided with an alphanumeric keyboard 118 on which an operator (not shown) manually enters the appropriate code for the item 7.

The electronic unit 41 has memory means 300 which associate each item 7 with its respective identification position in the stations 33 and the respective code which subsequently is to be printed onto each item 7.

Block 120 controls the appropriate station 33, identified by block 115, to send the postal item 7 to the line 21 by means of the rollers 83, 84; in this way the item 7 (which has a completed code) passes to the section 21, on to the section 29 to reach the outlet 10 and leaves the machine to form part of the flow 13 of items 7 to be printed with their associated codes.

Block 120 is followed by block 130 where all the stations 33 along a section 25 before the terminal station 33 are ordered to transfer any postal item 7 to the subsequent station 33, by means of their respective rollers 83, 84.

After block 130 comes block 140 which checks whether coding and sorting operations are completed; if they are, the programme is over, if not, it moves on to block 150 which detects the arrival of a new item 7 at the inlet 4 of the machine 1. Finally, from block 150 it returns to block 100.

From the above, it is clear that the post-sorting machine with holding line according to the present invention overcomes the disadvantages of prior art machines as it is of smaller dimensions and avoids the long sections of belt used in prior art machines to deal with postal items on hold. In addition, the time that postal items remain in the machine 1 is controlled precisely by the electronic unit 41, and postal items 7 leave the machine 1 as soon as the appropriate coding is available. The dwell time in the machine 1 is therefore not constant and equal for all items 7 but depends on the longer or shorter time required for the videocoding.

Under normal conditions, for each postal item 7 entering the machine one item leaves so that the flow of items is constant in quantity, meaning that

even if the optical coding of some items 7 is delayed, there are no breaks in the exit flow 13.

Finally, it is clear that modifications and variations may be made to the present post-sorting machine without departing from the protective scope of the invention.

Each connecting section 25 could include only two stations 33 positioned in cascade, or the various sections 25 could have a different number of stations 33. The shape of the stations 33 could be different from that illustrated and each station could include more rollers for gripping the postal items 7. The various devices for moving and stopping the rollers 83, 84 of the stations 33 could also vary.

Claims

1. A post-sorting machine (1) with holding line having at least one inlet (4) receiving a flow (6) of incoming postal items (7) and at least one outlet (10) through which a flow (13) of outgoing postal items (7) leaves, characterised in that it includes at least one primary conveyor line (17) connecting the inlet (4) to the outlet (10); at least one secondary conveyor line (21) as an alternative to the primary line (17); at least one connecting section (25) linking the primary conveyor line (17) and the secondary conveyor line (21); at least one holding station (33) positioned along the connecting section (25); the station (33) including grip means (37) able to receive, hold and move the postal items (7) so as to temporarily detain them in the station (33).
2. A machine according to Claim 1, characterised in that it includes a plurality of stations (33) arranged in cascade along the connecting section (25).
3. A machine according to Claim 1 or Claim 2, characterised in that it includes diverter means (27) positioned at the junctions between the primary conveyor line (17) and the connecting sections (25); the said diverter means (27) being provided to direct selectively the postal items (7) either along the primary conveyor line (17) or into the connecting sections (25).
4. A machine according to Claim 3, characterised in that the diverter means (27) include a pivotable body (65) having a substantially triangular longitudinal section; the said body having one end (67) able to divert the flow of the postal items (7).
5. A machine according to any one of the preceding Claims, characterised in that the said grip

means (37) include at least a first and a second roller (83, 84) parallel to each other, angularly movable and cooperating with each other.

6. A machine according to Claim 5, characterised in that at least one (83) of the said rollers is motorised.
7. A machine according to Claim 5 or Claim 6, characterised in that the said rollers (83, 84) have a cylindrical outer surface covered in resilient material.
8. A machine according to any Claim from 5 to 7, characterised in that the grip means (37) include rotation control means (87) and stop control means (91) for the rollers (83, 84).
9. A machine according to any one of the preceding Claims, characterised in that each holding station (33) includes sensor means (39) able to detect the position of an item (7) relative to the station (33) itself.
10. A machine according to Claim 9, characterised in that the sensor means (39) include optoelectronic sensor means having a photoemitter device (39a) and a photodetector device (39b) defining an optical path (39c) through the connecting section (25).
11. A machine according to any one of the preceding Claims, characterised in that the primary line (17) and the secondary line (21) include belt conveyor means (60a, 60b, 60c, 60d).
12. A machine according to any one of the preceding Claims, characterised in that the connecting sections (25) include parallel flat walls (72, 76) connecting parts of the holding stations (33).
13. A machine according to any Claim from 3 to 12, characterised in that it includes an electronic unit (41) able to control the movement of the diverter means (27) and the holding stations (33).
14. A machine according to Claim 13, characterised in that the said electronic unit (41) includes first electronic means (100) able to identify an empty holding station (33) into which to direct an item (7); the said electronic unit (41) also includes second electronic means (110) able to send the postal item (7) towards the empty station (33) identified by the first electronic means (100).
15. A machine according to Claim 14, characterised in that the electronic unit (41) includes third electronic means (115) able to verify if a holding station (33) exists containing a postal item (7) with which a completed coding is associated; the said electronic unit (41) also including fourth electronic means (120) able to send the item (7) contained in the said station (33) identified by the third means (115) onto the secondary conveyor line (21).
16. A machine according to Claim 15, characterised in that it includes fifth electronic means (130) able to send to all the holding stations (33) upstream from the station (33) identified by the third means (115) a command to pass a postal item (7) to an adjacent downstream holding station (33).

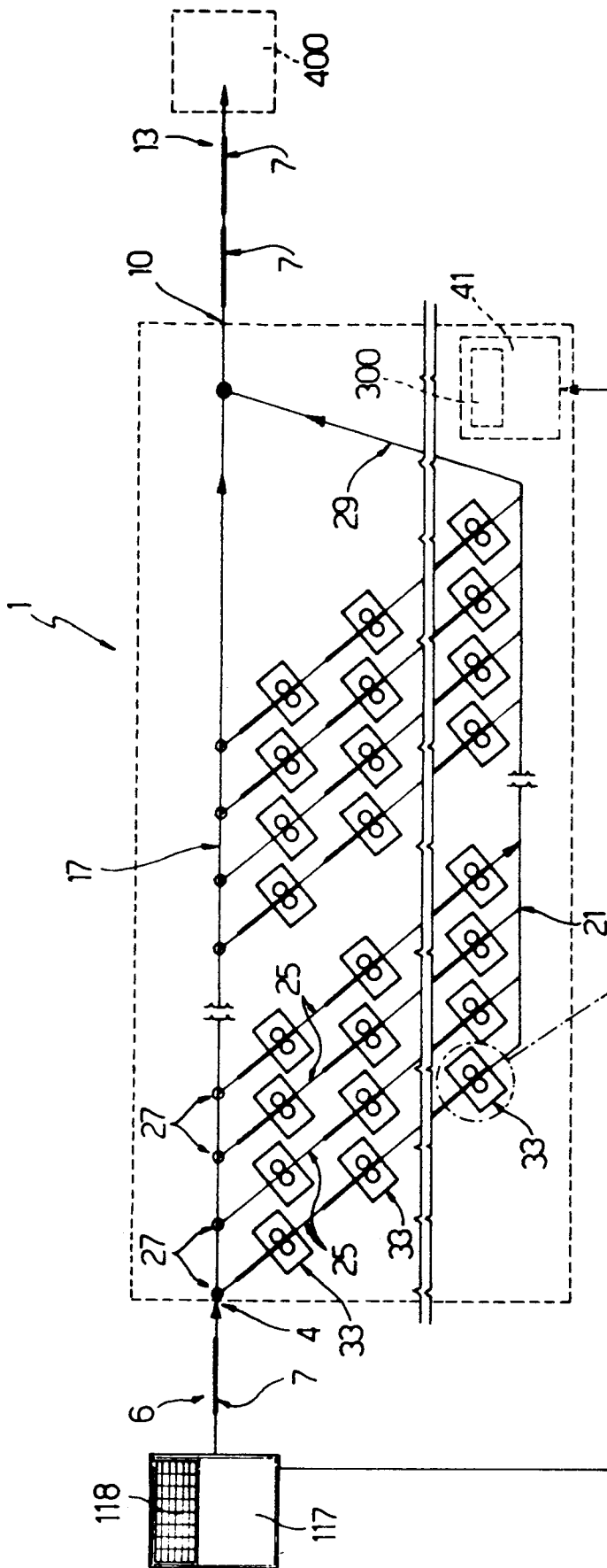
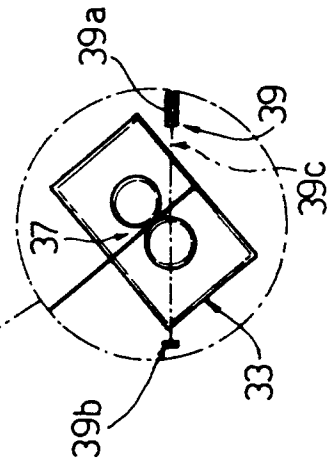


Fig.1



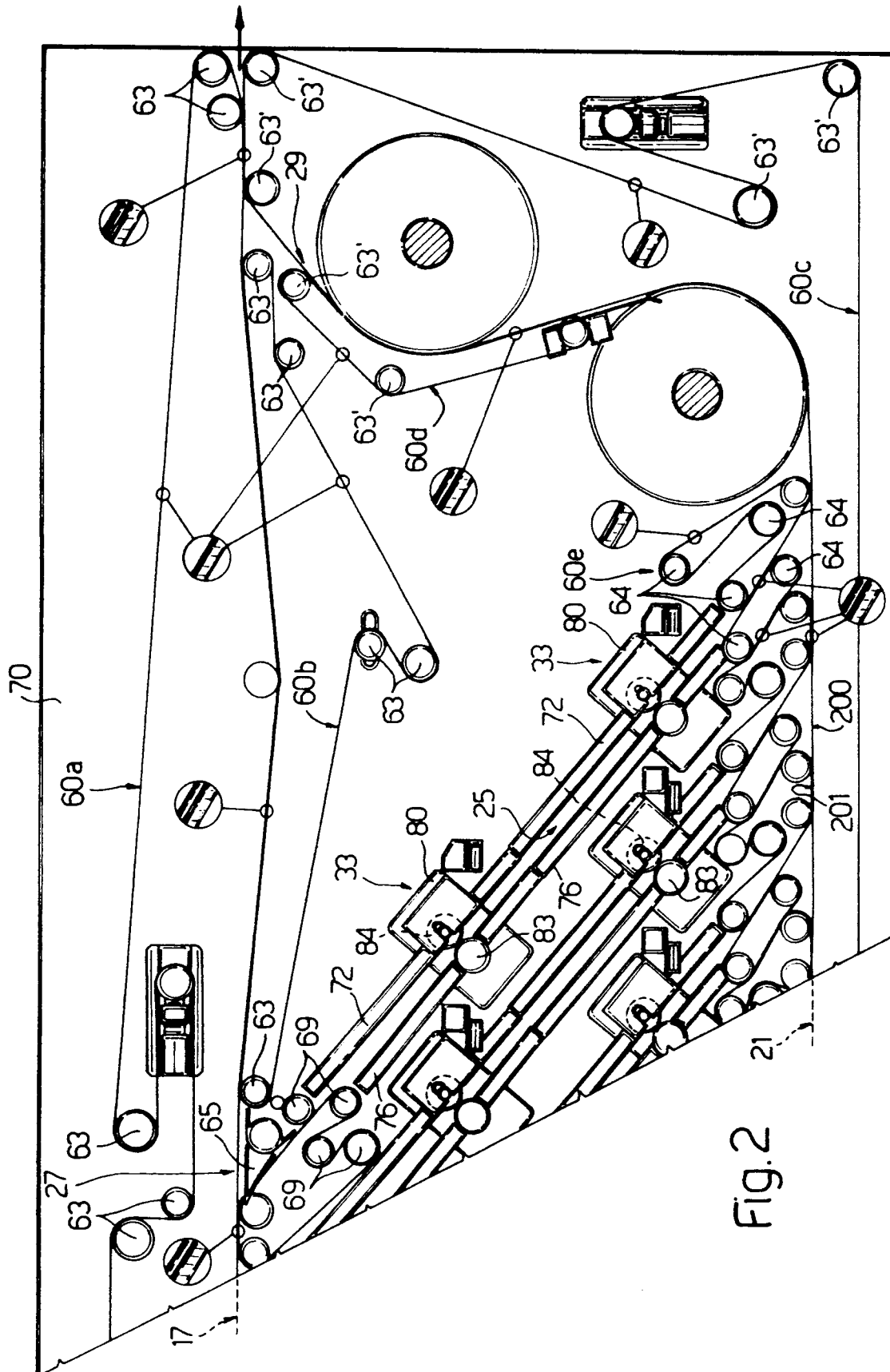


Fig. 2

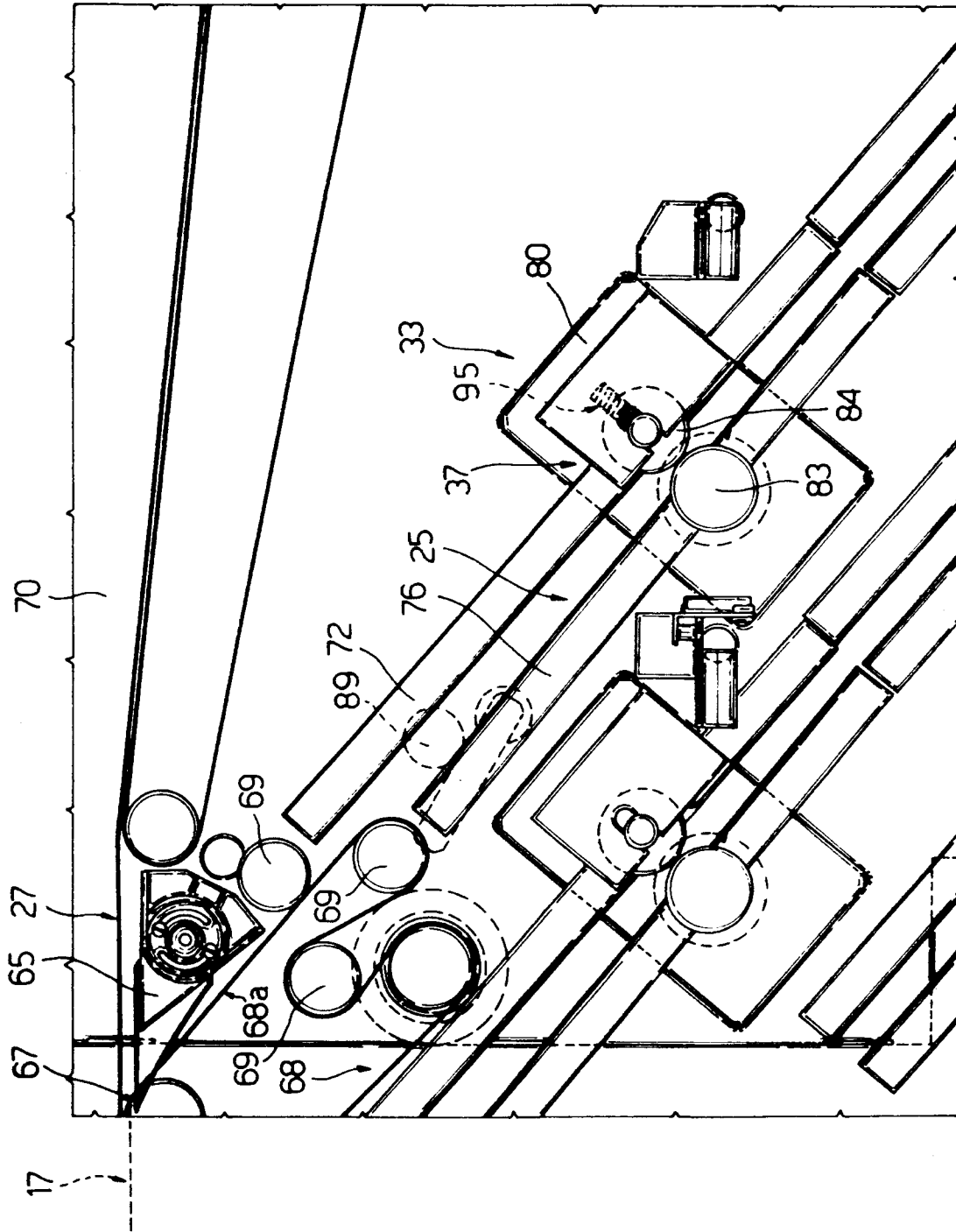


Fig. 3

Fig. 4

