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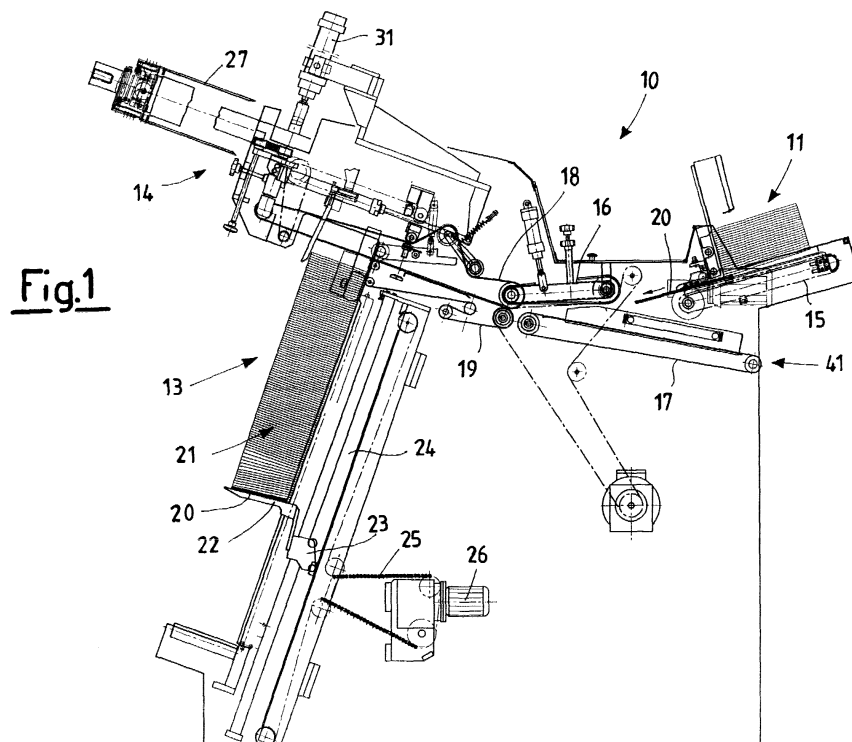
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(54) **Machine for stacking paper products in sheets**

(57) A machine (10) for stacking paper products in sheets includes at least one signature insertion station (41), at least one insertion station (11) for the boards (20) that complete the signature packs (21) and at least one paper product stacking station (13); the signature insertion station (41) features an initial conveyor belt (17) which conveys the signatures to the subsequent

conveyor belts (16, 18, 19) which in their turn convey them to the stacking station (13). The machine (10) has the boards (20) insertion station (11) on the same side of the machine (10) as the signature insertion station (41). The machine (10) also features at least one device (14) for stacking the wads (28) of signatures, the latter located on the opposite side with respect to the signature insertion station (41).



**Fig.1**

## Description

**[0001]** The present invention relates to a machine for stacking paper products in sheets.

**[0002]** As is known, various machines exist for stacking paper products in sheets such as, for example, signatures arranged herringbone fashion or wads of signatures.

**[0003]** An example of said machines for stacking paper products in sheets is described in the patent for industrial invention no. IT 1.265.109, in the name of the same applicant.

**[0004]** In said machines, a number of signatures arranged herringbone fashion are fed, via pairs of conveyor belts, into a stacking station where the signatures are supported by a fork loader that gradually moves down in synchronism with feeding of the signatures.

**[0005]** When the pack of signatures reaches the preset number of elements, it is conveyed to subsequent work stations such as, for example, a signature binding station or other.

**[0006]** Although able to perform the function for which they were designed, machines for stacking paper products of the type described can be perfected in a number of important ways.

**[0007]** The packs of signatures are generally formed between end boards to ensure better support and to facilitate movement of the packs towards the stations downstream of the stacking machine.

**[0008]** For said purpose, a board feed or automatic introduction device is provided, located frontally with respect to the direction in which the signatures arrive.

**[0009]** Basically said device operates in synchronism with feeding of the signatures, placing, by means of its forks, a first board on the forks of the stacking station, in an appropriate position for receiving and supporting a number of signatures, and a second board above the pile of signatures after it has been formed in order to complete the signature pack.

**[0010]** This cycle is repeated for all the following piles of signatures.

**[0011]** Although these operations are performed in synchronism with feeding of the signatures, thanks also to the co-operation of sensors provided for the purpose, the high or very high speeds today reached with said stacking machines make the above system inadequate.

**[0012]** In fact, due to the very high working speeds mentioned above, it is necessary to considerably accelerate the board insertion operations, resulting in the boards entering crooked or even bouncing, with the danger of jamming the machine and therefore the risk of possible damage in addition to the cost of machine down time.

**[0013]** A second limitation of the current stacking machines is the fact that the known machines can operate only with the signatures arranged herringbone fashion but not with wads of signatures such as, for example, those used to form leaflets or similar articles.

**[0014]** The purpose of the present invention is, therefore, to produce a machine for stacking paper products in sheets which will solve the above problems, optimising the use of space and resources.

**[0015]** A further purpose of the present invention is to produce a machine for stacking paper products in sheets with improved operating characteristics and greater overall efficiency, at the same time reducing the risk of jamming.

**[0016]** Last but not least, the purpose of the present invention is also to create a machine for stacking paper products in sheets with a high level of versatility and flexibility at competitive costs.

**[0017]** This and other purposes are achieved by a machine for stacking paper products in sheets according to claim 1, to which the reader is referred for the sake of brevity.

**[0018]** Further characteristics of the present invention are defined in the subsequent claims.

**[0019]** Further purposes and advantages of the present invention will become clear from the following description and from the attached drawings, provided as illustrative and non-restrictive examples, in which:

- figure 1 shows a schematic side view of the machine for stacking paper products in sheets, according to the present invention;
- figure 2 shows a schematic side view of a detail of the machine of figure 1, in which a device for stacking wads of signatures can be seen;
- figure 3 shows a schematic side view of a detail of the machine of figure 2, in a second operating position;
- figure 4 shows a schematic side view of a detail of the machine of figure 2, in a third operating position;
- figure 5 shows a schematic side view of a detail of the machine of figure 2, in a fourth operating position;
- figure 6 shows a further side view of a detail of the machine of the previous figures;
- figure 7 shows a front view of the machine of the invention; and
- figure 8 shows an overhead view of the machine of the invention.

**[0020]** With particular reference to the figures mentioned, the machine for stacking paper products in sheets is indicated overall by reference number 10.

**[0021]** The general structure of the machine for stacking paper products in sheets is not described here in detail as it is technically well-known and illustrated in particular by the patent for industrial invention no. IT 1.265.109; only the functional elements useful for the interpretation and implementation of the invention are therefore referred to here.

**[0022]** Basically, the machine 10 consists of two stations 41 for insertion of the signatures (which can form packs or wads as required), two stacking stations 13,

two stations 11 for insertion of the boards 20 (which complete the signature packs 21) and two devices 14 for stacking the wads of sheets. Said work stations operate alternatively.

**[0023]** The insertion station 41 features an initial conveyor belt 17 which conveys the signatures to the subsequent conveyor belts 16, 18 and 19.

**[0024]** The station 11 for insertion of the boards 20 is located on the same side of the machine 10 as the station 41 for insertion of the signatures.

**[0025]** The station 11 for insertion of the boards 20 is located above the station 41 for insertion of the signatures and features its own conveyor belt 15.

**[0026]** A signature pack 21, completing its formation, can be seen in the stacking station 13.

**[0027]** The pack 21 is supported by a fork loader 22 in its turn provided with a swivel support 23 sliding along a support and guide body 24 by means of a chain 25 driven by a gearmotor 26, passing between transmission pulleys.

**[0028]** As can be seen in figure 1, a board 20 is positioned on the fork loader 22 and supports the signature pack 21 while another board 20 is about to arrive to complete the pack 21.

**[0029]** It is important to note that, in the machine 10 of the invention, the boards 20 are inserted in the packs 21 from the same side as the side from which the signatures arrive.

**[0030]** The machine 10 also includes a pair of devices 14 to stack the wads of signatures, the latter positioned on the opposite side with respect to the signature insertion stations 41.

**[0031]** A device 14 can be seen in figure 1 in non-operating position while in figures 2-5 it is shown in different operating phases.

**[0032]** The device 14 features a basket 27, designed to contain the signature wads 28 and provided with apertures to permit insertion of the fork loader 22.

**[0033]** The basket 27 is supported by a rod 29 which can rotate around a pin 30 by means of cylinders 31, operating a cross member 32, in order to move from the initial non-operating position to a second working position and vice versa.

**[0034]** There is also a cylinder 40 which serves to detach the basket 27 from the support and guide body 24 to permit subsequent rotation of 180° around an axis which is basically parallel to the supporting rod 29.

**[0035]** In fact, due to the folds of the signatures which make up the wads 28, after a certain number of sheets it is necessary to stack the subsequent signatures in the opposite direction to compensate for the increase in the wad 28 due to the folds of the signatures that make up the wad.

**[0036]** The device 14 also features cylinders 33 which serve to bring the basket 27 to a basically vertical position; a further cylinder 34 operates a gear 35 for 180° rotation of the basket 27.

**[0037]** The lower part of the basket 27 also features

conveyor rollers 36 which serve to convey the wads 28 to a conveyor belt 37 outside the machine 10 for subsequent processing.

**[0038]** Figures 7-8 show views of the machine 10, in which the pair of devices 14 can be seen, side by side; said devices are able to operate independently, each one acting in co-operation with the respective loader 22.

**[0039]** Operation of the machine 10 for stacking paper products in sheets, according to the present invention, is now illustrated in greater detail.

**[0040]** If signatures have to be stacked, said signatures are inserted in the respective insertion stations 41 where they are conveyed by the conveyor belt 17 towards the subsequent conveyor belts 16, 18 and 19. At the beginning of the cycle for forming a signature pack 21, a board 20 is conveyed by the conveyor belts 15, 16, 17 and 18, 19 towards the stacking station 13 where it is positioned on the station's fork loader 22.

**[0041]** A certain number of signatures are then stacked above the board 20 until the pre-set number of signatures is reached; at this point another board 20 is conveyed via the same path and is positioned on top of the signatures to complete the pack 21.

**[0042]** During formation of the pack 21, the fork loader 22 moves down along the support and guide body 24, via the chain 25, driven by gearmotor 26, to create the space to receive the following signatures.

**[0043]** Once the signature pack 21 has been formed, it is taken, via well-known methods, to another station (not shown for the sake of simplicity), for example a binding station.

**[0044]** If wads 28 of signatures have to be stacked, the device 14 can be used thanks to the invention.

**[0045]** In this case, via the cylinder 31, the device 14 is rotated around the pin 30, positioning it so that the basket 27, designed to contain the wads 28, is in the position indicated in figure 2, permitting insertion of the fork loader 22 in the apertures provided.

**[0046]** A first set of signatures is fed to the basket 27 until the basket 27 is moved away from the support and guide body 24 by intervention of the cylinder 40.

**[0047]** The basket 27 is then rotated 180° around an axis basically parallel to the supporting rod 29.

**[0048]** This 180° rotation can be obtained by means of the cylinder 34 which operates the gear 35, or by means of other known systems.

**[0049]** Simultaneously, the fork loader 22 is moved up, as shown in figure 3, and a certain number of signatures are subsequently stacked on it.

**[0050]** At this point the basket 27 is moved near the support and guide body 24 to receive the new wad 28 of signatures.

**[0051]** Finally the basket 27 is moved next to a conveyor belt 37 outside the machine 10; in said position, the cylinder 33 is operated to bring the wads 28 to a basically vertical position to facilitate conveying towards the conveyor belt 37.

**[0052]** The cycle described is then repeated to stack

new wads 28.

**[0053]** From the above description it is evident that the machine 10 can stack signatures both in packs 21 and in wads 28, according to production requirements.

**[0054]** Incidentally it should be noted that said feature constitutes the particular and advantageous flexibility and versatility guaranteed by the machine 10 of the invention.

**[0055]** From the above description, the characteristics of the machine for stacking paper products in sheets, subject of the present invention, are clear, as are the resulting advantages.

**[0056]** Finally it is clear that numerous variations can be made to the machine for stacking paper products in sheets, subject of the present invention, without departing from the principles of novelty inherent in the inventive idea.

**[0057]** In practical implementation of the machine, the materials, forms and dimensions of the details illustrated can be as required and the same can be replaced by other technical equivalents.

### Claims

1. Machine (10) for stacking paper products in sheets, of the type including at least one signature insertion station (41), at least one insertion station (11) for the boards (20) that complete the packs (21) of the above-mentioned signatures and at least one stacking station (13) for the above-mentioned paper products in which said signature insertion station (41) features an initial conveyor belt (17) which conveys said signatures to the subsequent conveyor belts (16, 18, 19) which, in their turn, convey them to the above-mentioned stacking station (13), **characterised in that** the insertion station (11) of the boards (20) is positioned on the same side of the machine (10) as the signature insertion station (41).
2. Machine (10), according to claim 1, **characterised in that** the above-mentioned insertion station (11) of the boards (20) is positioned above the above-mentioned signature insertion station (41) and features its own conveyor belt (15).
3. Machine (10), according to claim 1, **characterised in that** each of the above-mentioned signature packs (21) is supported by a fork loader (22), sliding along a support and guide body (24), by means of a chain (25), driven by a gearmotor (26), passing between transmission pulleys.
4. Machine (10), according to claim 1, **characterised in that** the above-mentioned fork loaders (22) are provided with a swivel support (23).
5. Machine (10) for stacking paper products in sheets of the type including at least one insertion station (41) of signatures to form the wads (28) and at least one stacking station (13) where said insertion station (41) features an initial conveyor belt (17) which conveys the signatures to the subsequent conveyor belts (16, 18, 19) which, in their turn, convey them to the stacking station (13), **characterised in that** it includes at least one device (14) for stacking the wads (28) of signatures, in which the above-mentioned device (14) is positioned on the opposite side with respect to said insertion station (41).
6. Machine (10), according to claim 5, **characterised in that** the above-mentioned device (14) features a basket (27), designed to contain the above-mentioned wads (28) and provided with apertures to permit the insertion of a fork loader (22).
7. Machine (10), according to claim 6, **characterised in that** the above-mentioned basket (27) is supported by a rod (29) which can rotate around a pin (30) by means of cylinders (31), operating a cross member (32), in order to move from the initial non-operating position to a second working position and vice versa.
8. Machine (10), according to claim 6, **characterised in that** the above-mentioned basket (27) can be detached from the above-mentioned support and guide body (24) via the action of a cylinder (40), in such a way as to permit subsequent rotation of 180° around an axis basically parallel to a rod (29) supporting said basket (27).
9. Machine (10), according to claim 6, **characterised in that** the above-mentioned device (14) for stacking the wads (28) of sheets also features cylinders (33) which serve to bring the basket (27) to a basically vertical position.
10. Machine (10), according to claim 6, **characterised in that** the above-mentioned basket (27) also features a cylinder (34) that operates a gear (35) for rotating said basket (27) 180° around an axis basically parallel to the above-mentioned rod (29) supporting said basket (27).
11. Machine (10), according to claim 6, **characterised in that** the lower part of the basket (27) also features conveyor rollers (36) which serve to convey the wads (28) to a conveyor belt (37) outside the machine (10) for subsequent processing.
12. Machine (10), according to the previous claims, **characterised in that** it features a pair of devices (14) for stacking the wads (28), each of which operates in co-operation with a respective loader (22).

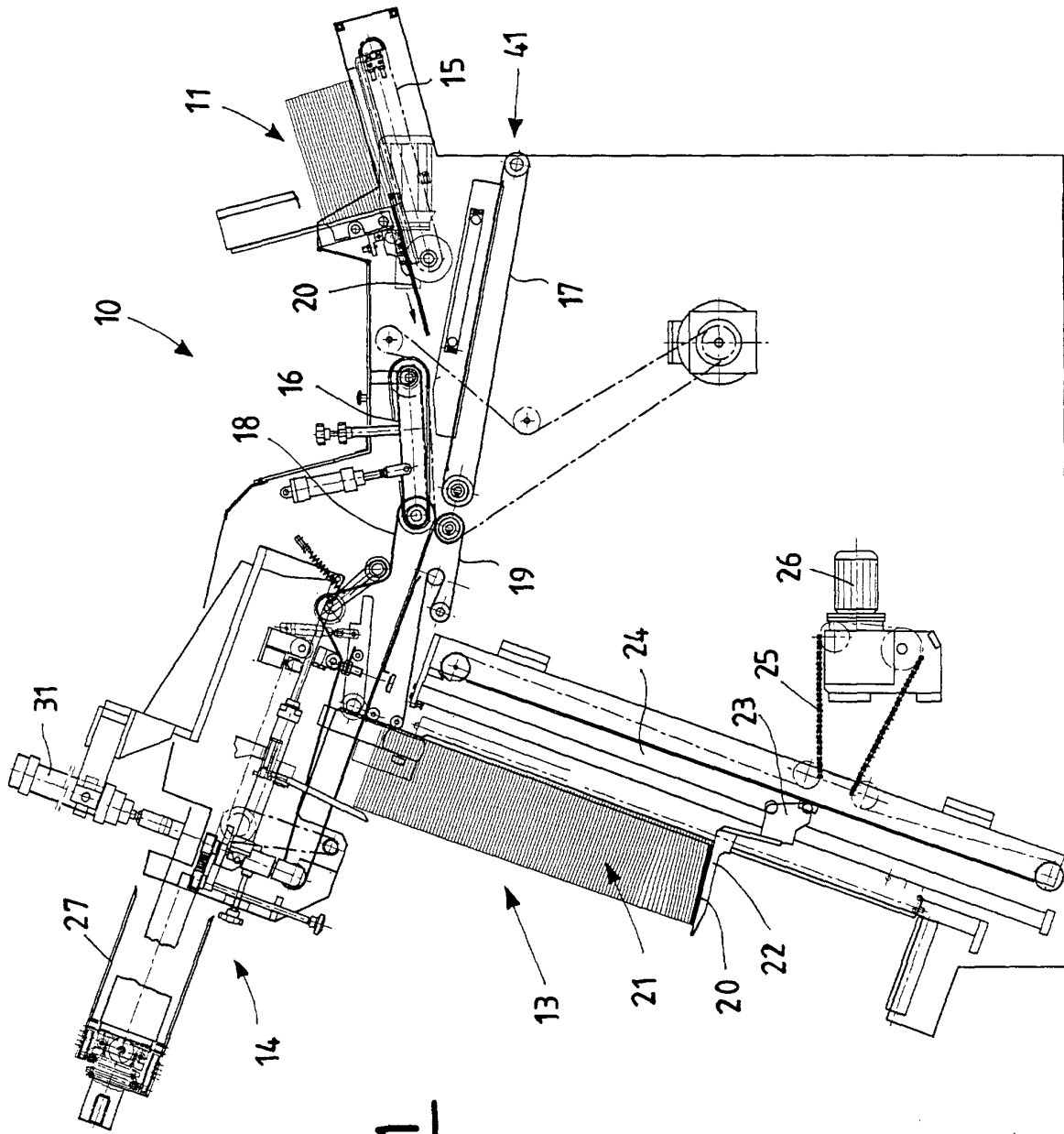


Fig.1

Fig.2

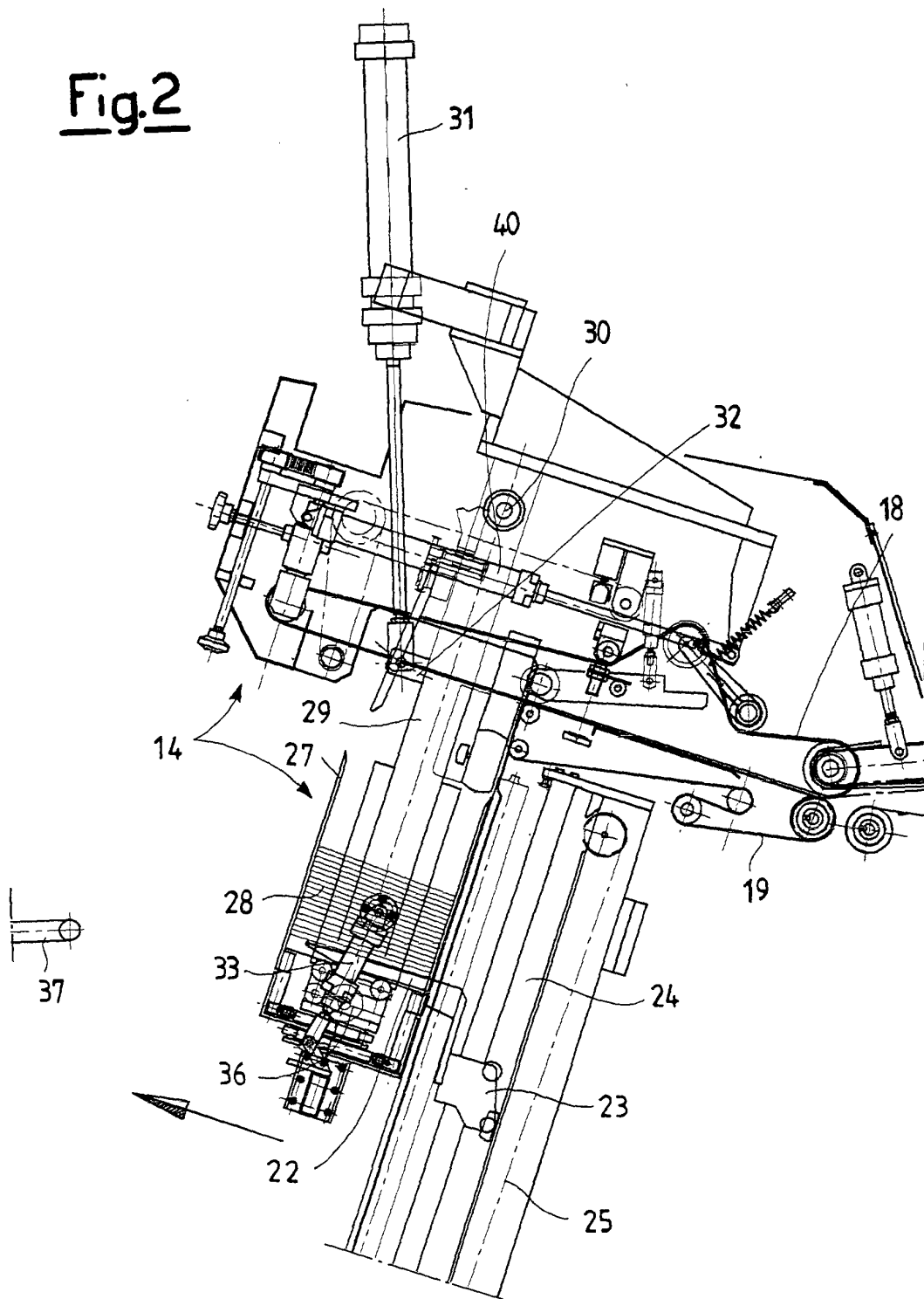


Fig.3

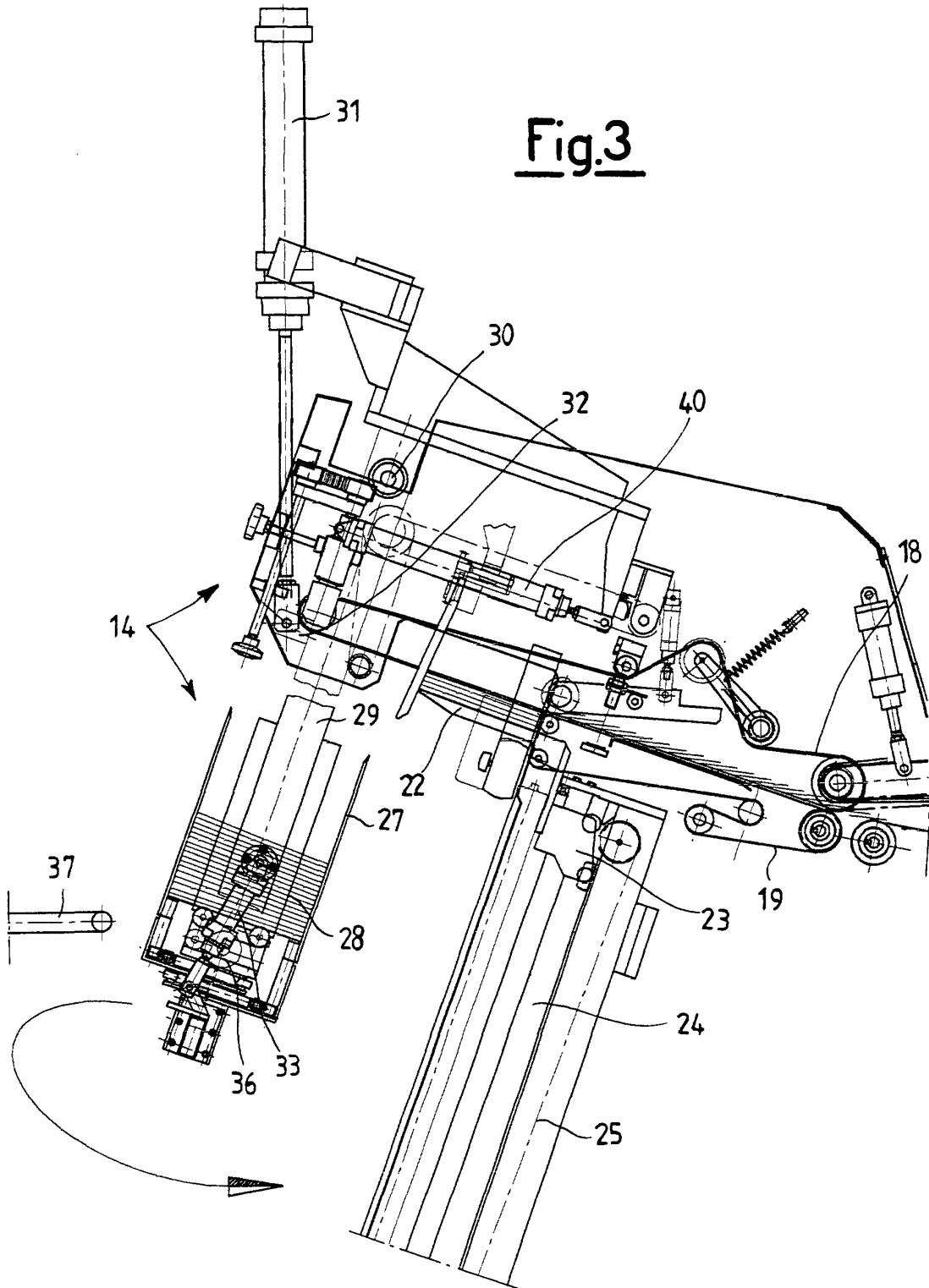


Fig.4

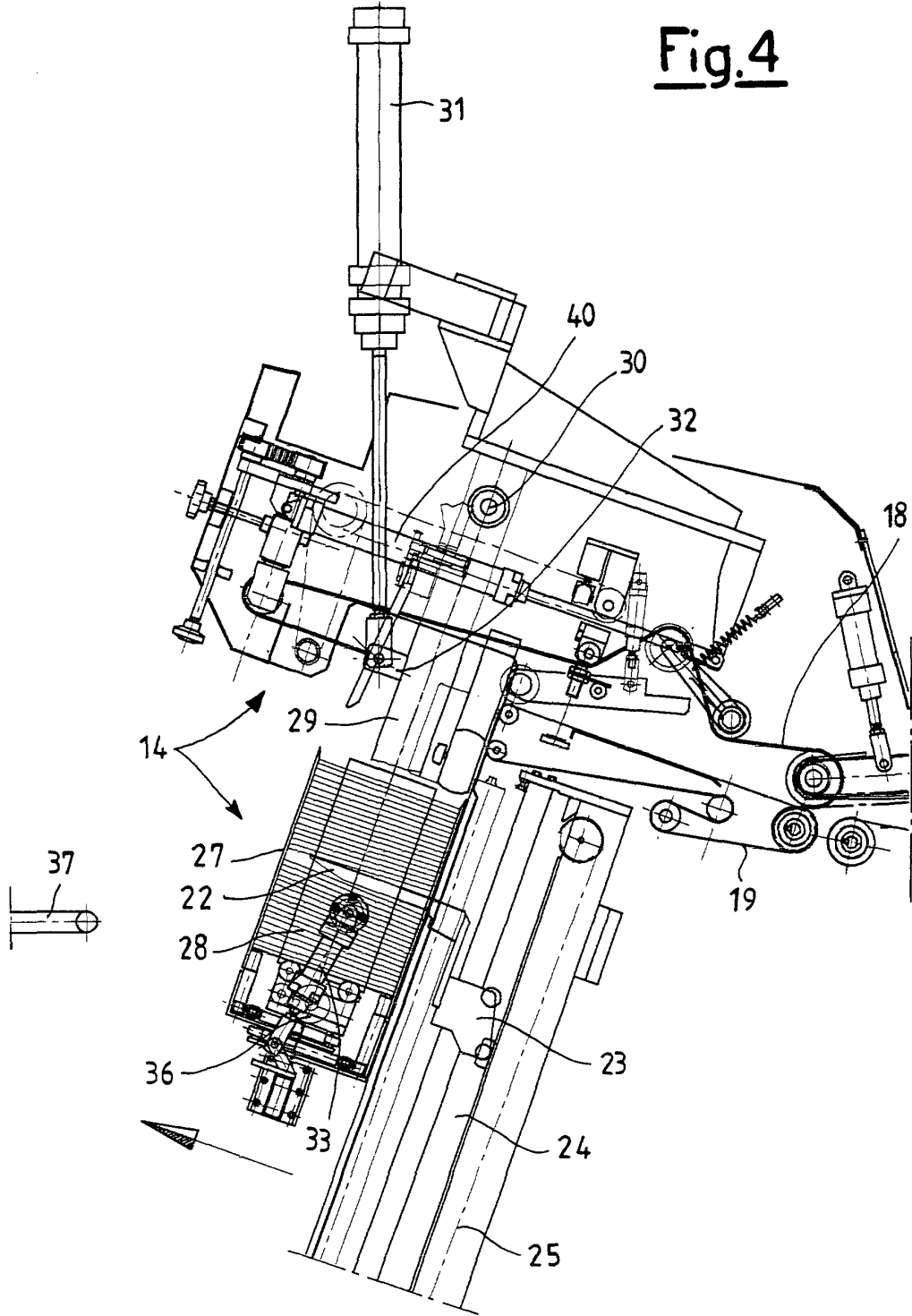


Fig.5

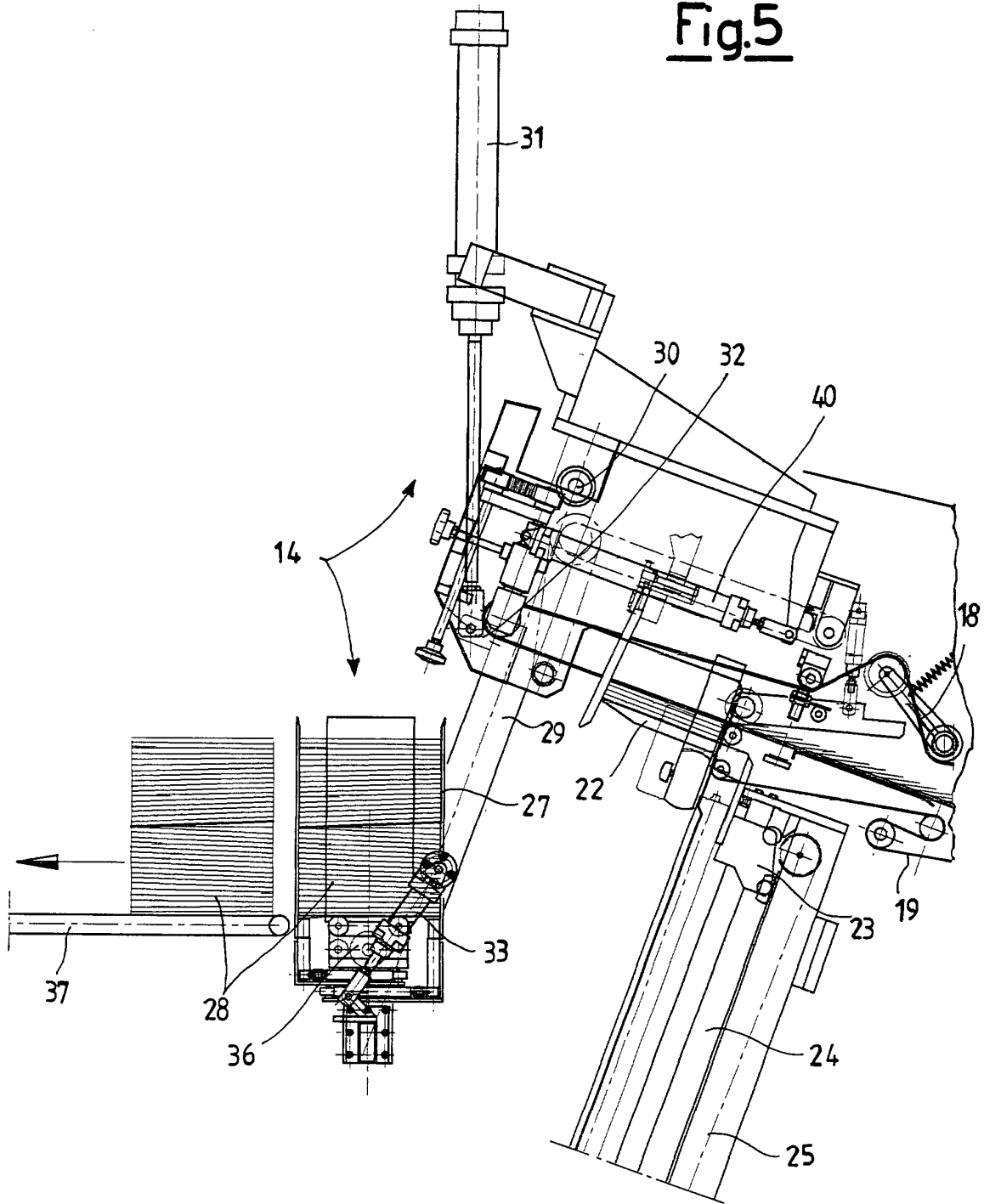
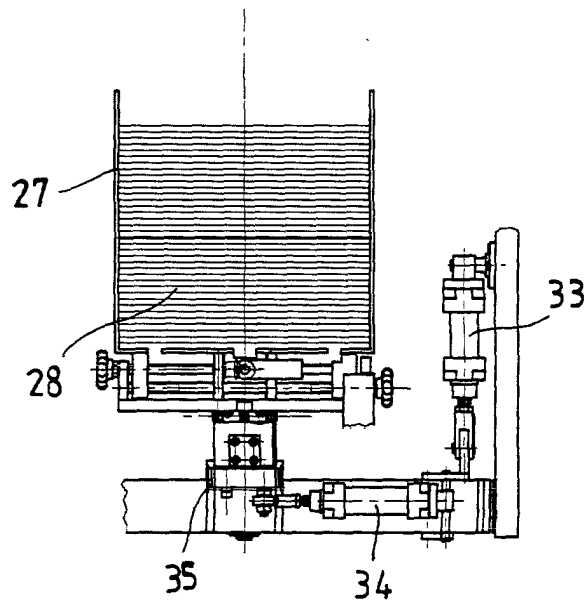


Fig.6



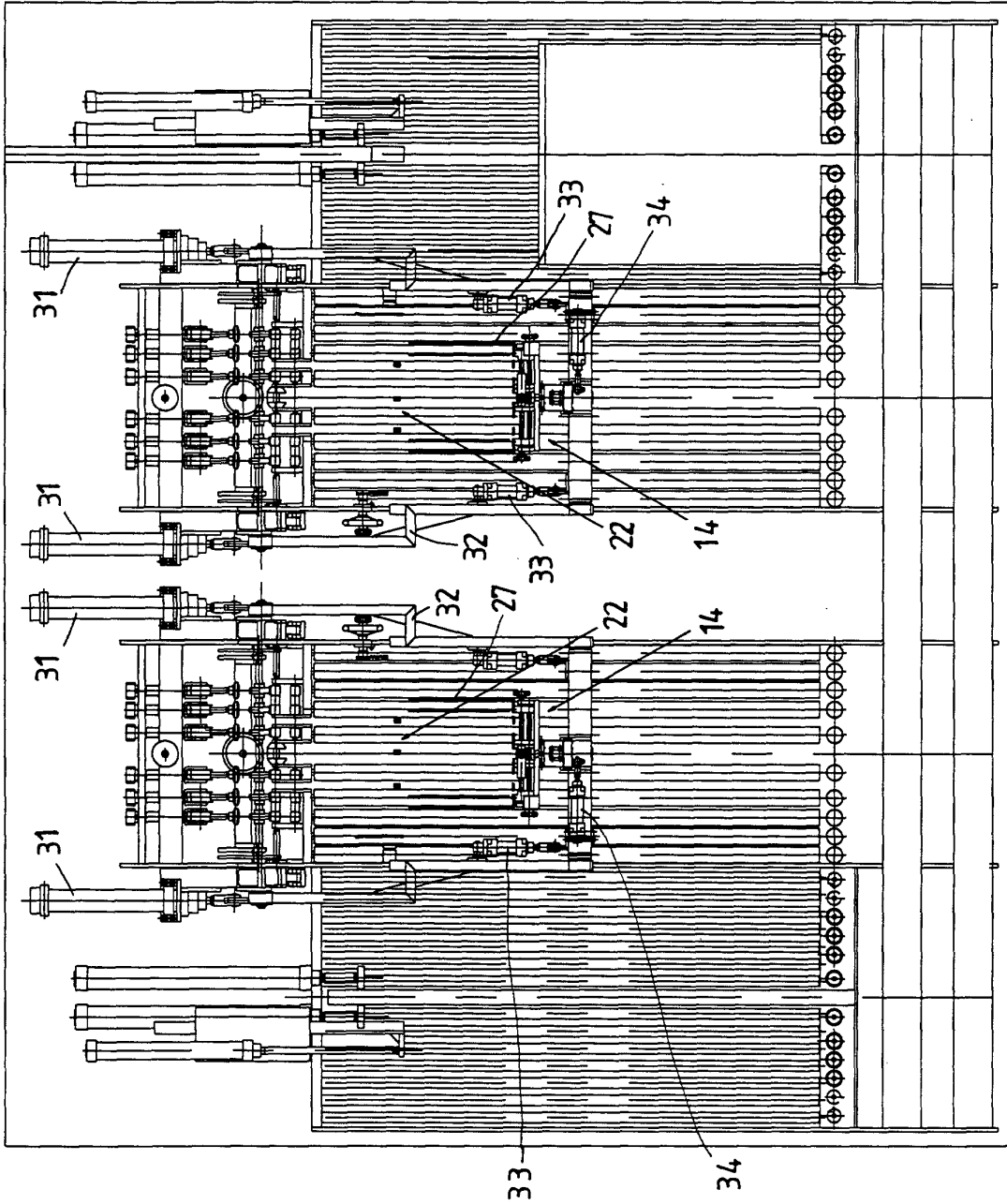


Fig. 7

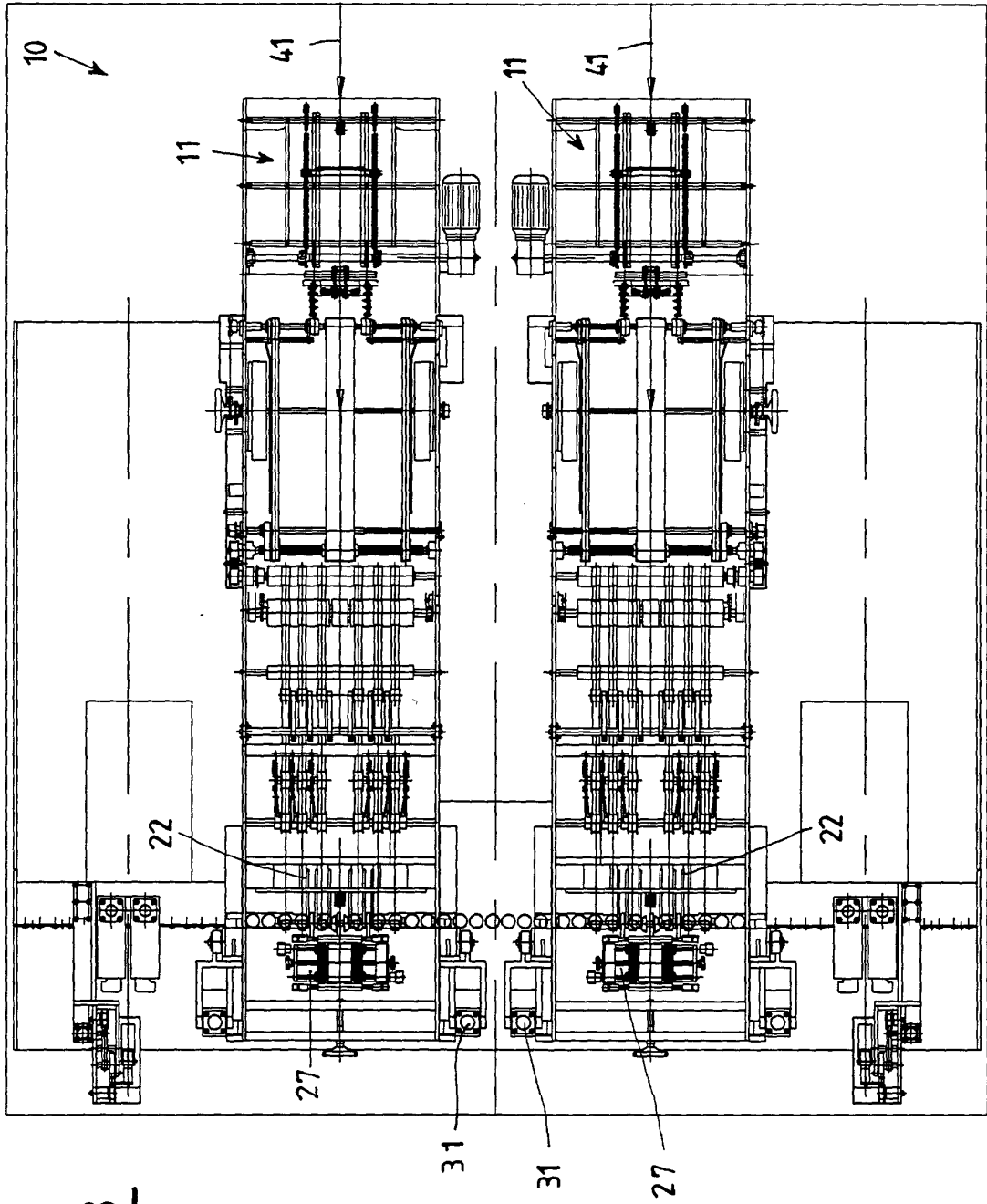


Fig. 8