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(54) Continuous-cycle painting booth, inclusive of the drying step.

(57) The present invention relates to painting booths in which several workpieces are mounted on a transport device consisting of an endless flexible chain (4) extending along parallel trajectories lying in turn on a plurality of parallel horizontal floors. The chain (4) is composed of a plurality of links provided with at least an idler roller (3) disposed outwardly of the link and carrying a pin (2) acting as a support for the product (7) to be painted. In the region of the painting station (13), provision is made for means (26,27) adapted to impart the idler rollers a rotatory movement about their own axes during the displacement of the chain in order to carry out a complete painting of the piece.

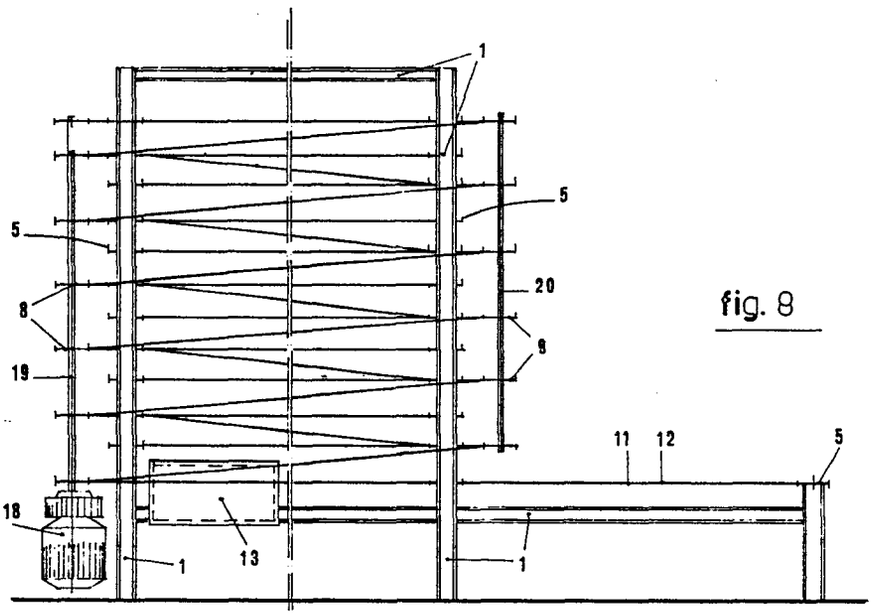

fig. 8

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Continuous-cycle painting booth, inclusive of the drying step

The present invention relates to a continuous-cycle painting booth inclusive of the drying step, suitable to mass-products or single articles made of wood or other materials which need to be spray painted.

The painting booths of known type which have the same object as the booth in reference are provided with a product transport device extending either in a horizontal plane on the floor or the ceiling or in a vertical plane on a wall. Along the path followed by said transport device provision is made for one or more painting stations, each of them comprising one nozzle or more adapted to spray the paint onto the product according to different angular inclinations in order to evenly coat said product with paint.

It is known that after the painting operation the product must remain fitted on the transport device over a certain time sufficient to ensure a perfect dryness to the paint before being removed from a painting booth inclusive of the drying step. With booths of the known type extending in a horizontal or vertical plane, very important overall spaces are necessary to enable the product to follow a path such that a perfect dryness may be ensure without interrupting the working cycle.

This important drawback becomes still more negative if we consider that usually the painting of each product comprises three steps such as, for example, a first tinting step followed by the application of an undercoat and finally the application of finish paint; all applications following the first one can take place only when the first coating is completely dry. It is therefore obvious that important overall spaces or separate painting booths are necessary for each application, which not only increases the overall dimensions of the painting equipment but also the costs for operating the same.

The object of the present invention is to remarkably reduce the overall spaces necessary to the installation of a booth without however reducing the total production capacity of the equipment, being eventually possible the installation of several painting stations along the path followed by the product to be painted without remarkably increasing the overall bulkiness.

A further object of the invention is to make the painting station much simplier, reducing the number of nozzles to the minimum while ensuring a perfect evenness of the paint coating.

The foregoing and still further objects are achieved by a continuous cycle painting booth according to the present invention, characterized in that it comprises: a product transport device consisting of an endless flexible chain extending along parallel trajectories, in turn lying on a plurality of parallel floors, said chain being composed of a number of links provided with idler rollers pivoted outwardly of the links through a pin acting as a support for the product to be painted; means adapted to impart said chain a uniform rectilinear movement; at least a spray painting station located on the path of said chain in which a powered belt is provided which is adapted to impart the number of idler rollers a rotatory movement about their own axes during the displacement of the chain.

The booth according to the present invention also has the advantage that, with respect to known booths, it allows to save about 90% of the surface that may be trampled.

A further advantage resides in that the booth can be assembled on a structure made of metal section members completely fitted together already in the workshop and therefore transportable in one block, unlike the known art booths which, being very bulky, are not transportable in one block and need to be assembled in situ.

Other features and advantages of the invention will become more apparent from the following description of a preferred embodiment given hereinafter by way of non-limiting example, with reference to the accompanying drawings, in which:

- Fig. 1 is a plan view of a detail of the flexible endless chain:

- Fig. 2 is an elevation, cross-sectional view of the chain seen in Fig. 1 taken along the line I-I in said figure;

- Fig. 3 is a side sectional view of the same chain taken along the line II-II in Fig. 2;

- Fig. 4 is a diagrammatic plan view of the booth, in which the path followed by the chain on the first floor is shown;

- Fig. 5 is a plan view of the booth, reference being particularly made to the path of the chain on a floor parallel to that seen in Fig 4

- Fig. 6 is a plan view of the booth, reference being particularly made to the path of the chain on a floor parallel and next to the one followed in Fig. 5;

- Fig. 7 is a plan view of the booth, reference being particularly made to the path of the chain on a floor parallel and next to the one followed in Fig. 6;

- Fig. 8 is a diagrammatic elevation view of the booth;

- Fig. 9 is a diagrammatic elevation view of the booth seen from the side opposite that shown in Fig. 8;

- Fig. 10 is a diagrammatic plan view of the painting station;

- Fig. 11 is an elevation view of the painting station seen in Fig. 10.

Referring to Figs. 4, 5, 6, 7, 8 and 9, the painting booth inclusive of the drying step substantially consists of a metal support structure 1 supporting a transport device for the products to be painted, globally identified at 4. The transport device 4 extends continuously according to horizontal storage levels that are mounted parallelly one above the other on the metal structure 1.

As best seen in Figs. 1, 2 and 3, the transport device substantially comprises a chain completed with idler rollers or disks made of nylon 3; the lower rollers perform the function of sliding shoes and are shaped so as to reduce the sliding friction on chain-holding guides 6, consisting of a metal channel whereas the upper idler rollers 3, coaxial with the lower ones, support respective pins 2 having the function of carrying the pieces to be painted 7.

Referring to Fig. 4, a loading area 11 for the work-pieces 7 is seen which is provided with an automatized or manual pneumatic system not shown, in which the work-pieces 7 are fitted on the support pins 2 of the transport

chain 4. The chain, through a system consisting of steel idler wheels 5, reaches a painting station 13 and at the outlet of said station it extends to a first upper storage and drying level 15 and, through an idler wheel 9 also performing the function of taking up the chain, enters the first storage level shown in Fig. 5. The chain, following its trajectory, travels over many parallel right lines and goes on through a series of idler wheels 5, as far as it ascends to the higher storage floor 15, but this time the ascent takes place on the side opposite the preceding one, that is on the side of the machine, as seen in Fig. 5. On reaching the last storage floor 14, as shown in Fig. 6, the transport chain 4, again travelling over many parallel right lines, forms a new store, till it comes to one of the driving wheels 8 from which it starts the ascent to the upper storage level 15" passing through the respective idler and takeup wheel 9.

By continuing alternatively in the same way, it is possible to create as many drying floors as the production needs require, so that a very high storage capacity can be achieved.

If we multiply the number and eventually the planimetric sizes of the storage floors, we can achieve any storage capacity in a relatively reduced space, all that being directly related to the time necessary to each product to dry. Anyway it is clear that, the storage capacities being equal, the greater the number of the storage levels or floors is, the smaller is the equipment surface taken up by the booth.

When the last level or floor is reached, see Fig. 7, the transport chain 4, after forming a store in the same manner as for the lower levels or floors, and immediately after passing the driving outlet wheel 8, begins the descent 17 up to the first painting level.

All the descents take place on the identical side of the machine, in this case on the side opposite that on which the painting is carried out, passing, from level to level, alternatively from the driving wheel 8 to the opposite idler and takeup wheel 9, as far as the first level shown in Fig. 4 is reached; on this level the chain 4 forms a further store and afterwards arrives at the unloading area identified at 12 and subsequently, through two idler wheels, returns to the loading area 11 in order to repeat the described path.

The painting stations may be more than one and located at different points, in order to carry out, for example, first an undercoating and then a finish painting. Should the workpieces, at the end of the drying time, need a further processing, they could pass again over the same painting station for the application of a further paint coat, without the manual intervention of an operator. The movement of the transport chain 4 is transmitted through the driving wheels 8 pivoted on, and made integral to each other, by a shaft 19 connected to a starter and geared motor unit 18 which directly transmits the motion to the ascent and indirectly, through the chain 10 provided with a takeup 50, transmits the motion to the drive shaft 20 on which the idler wheels 9 for the descent are pivoted.

Referring to Figs. 10 and 11, in the painting station 13 the transport chain 4 passes through a fixed chain-guide 25 holding it in line without allowing it to contact the nylon rollers 3 on which the pins 2 are integrally mounted, on said pins 2 being in turn fitted the products to be painted 7. A rotating movement is imparted to the nylon rollers 3 through a powered belt 26 made of rubberized canvas, which is kept in contact with the rollers 3 by a belt-pressing device 27. The belt 26 imparts the nylon rollers 3 a rotatory movement about their own axis and, as a result, a like movement to the pins 2 and to the workpiece 7 to be painted. The direction and speed of movement of the rotation belt 26 which movement takes place through nylon driving and idler pulleys 28, can be varied so as to allow the best exposure of the workpiece 7 to the painting nozzles 30.

The painting operation is governed by a pneumatic device 29 which, by means of an intermittence rod 32 detects the presence of the pins 2 and operates the nozzles 30 in automatic spray guns 30 controlled by a pneumatic system; said nozzles 30, parallelly and intermittently, send paint jets to the workpieces 7. The nozzles 30 of the automatic spray guns controlled by a pneumatic system can be connected, like a common gun, to a reservoir under pressure or to a pump.

Once they are positioned before starting the operation, depending upon the type and shape of the workpiece 7 to be painted, the nozzles 30 remain in a fixed position over the whole working cycle, since the exposure of the workpieces is adjustable and ensured by the above described exposure system.

Through the pneumatic device 29 and the rod 32 it is possible to adjust the moment and duration of the painting jet by merely moving the rod 32 away from or closer to the transport chain 4. The painting, according to the production requirements, can be made continuous if the pulses of the pneumatic control 29 are eliminated.

The painting station is provided with a conveyor 31 equipped with an appropriate exhauster adapted to suck the painting fumes and to convey them to the outside through vent stacks made of galvanized sheet iron, not shown. In the painting area provision is also made for a sloping wall 33 which has the function of protecting the chain from the jets of the nozzles 30.

In the embodiment shown the chain extends along a path comprising parallel trajectories lying in turn on a plurality of horizontal parallel levels or floors; it is however clear that the plurality of parallel levels might also be disposed in a vertical direction without departing from the spirit and scope of the invention, as defined in the appended claims.

Claims

1. A continuous-cycle painting booth, inclusive of the drying step, characterized in that it comprises: a product transport device consisting of an endless flexible chain (4) extending along trajectories lying on a plurality of parallel floors, said chain being composed of a number of links each of them being provided with idler rollers (3) pivoted outwardly of the links through a pin (2) acting as a support for the product to be painted, means (5,8,9,18,19 and 20) adapted to impart said chain a uniform movement and to keep it along said trajectories; at least a spray painting station (13) located on the path of said chain, in which a powered belt (26) is provided which is adapted to impart the number of idler rollers (3) comprised in said painting station(13) a rotatory movement about their own axes, during the displacement of the chain and during the painting step.

2. The painting booth according to claim 1, characterized in that said endless flexible chain (4) extends along parallel trajectories, lying in turn on a plurality of horizontal and parallel floors.

3. The painting booth according to claim 1, characterized in that said endless flexible chain (4) extends along parallel trajectories, lying in turn on a plurality of vertical parallel floors.

4. The painting booth according to claim 1, characterized in that the transport device comprises a first U-shaped guide for said idler rollers (3), the lower ones of them are shaped so as to reduce the sliding friction on the sliding guides(8 and 9); said idler rollers (3) being coaxial and integral to said support pin (2) for the products to be painted; said guide (6) extending over the whole rectilinear trajectory of said chain (4) apart from the region where said painting station (13) is located, in this region being disposed a second guide (25) for the only links of said chain (4) spaced apart from said idler rollers (3), which are in contact with said powered belt (26) on the side opposite said guide (25).

5. The painting booth according to claim 1, characterized in that in the region of said painting station provision is made for an intermittent-control device (29) designed to actuate the nozzles (30) related to said painting station (13), through a rod (32) capable of detecting the presence of said pins.

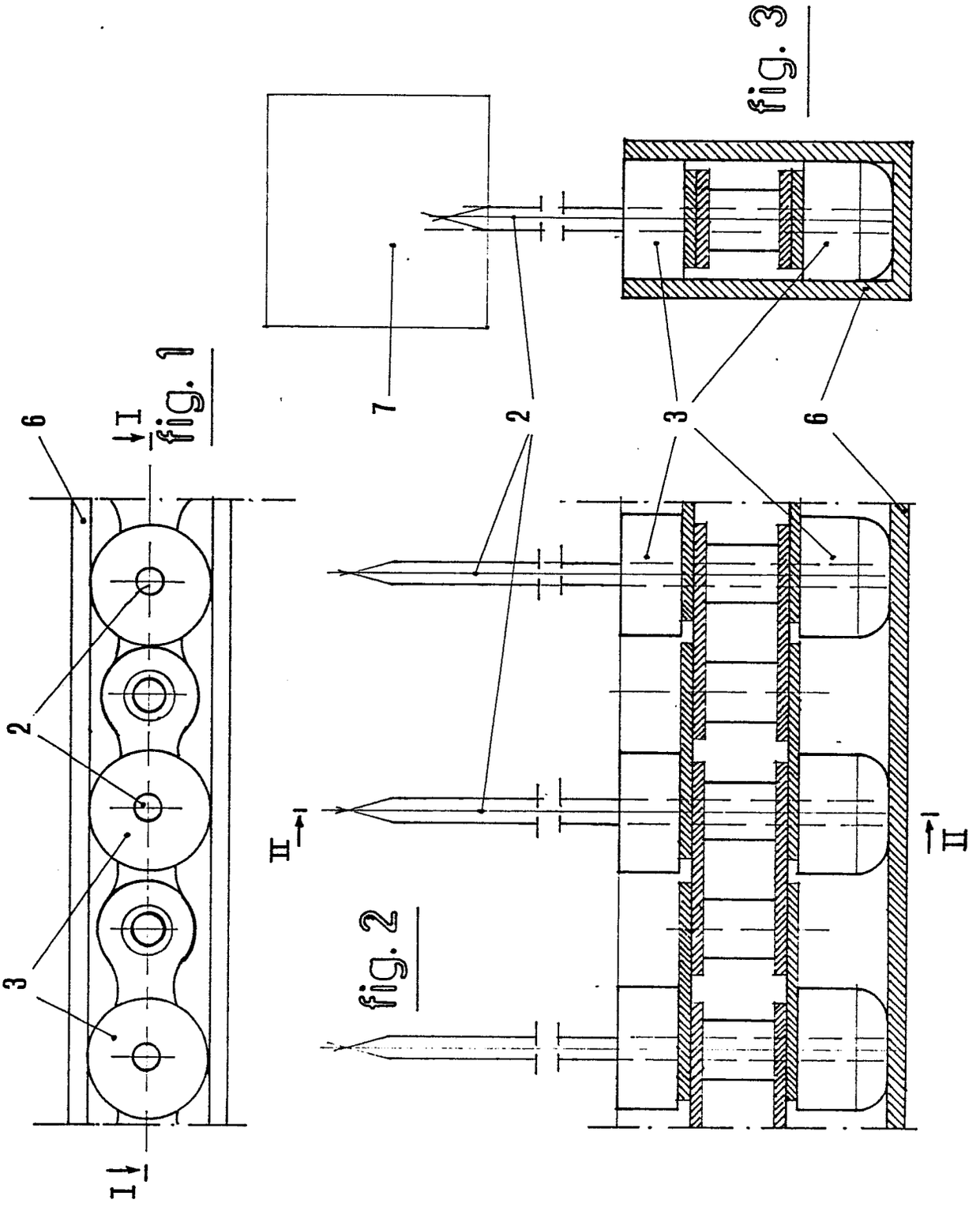


fig. 1

fig. 2

fig. 3

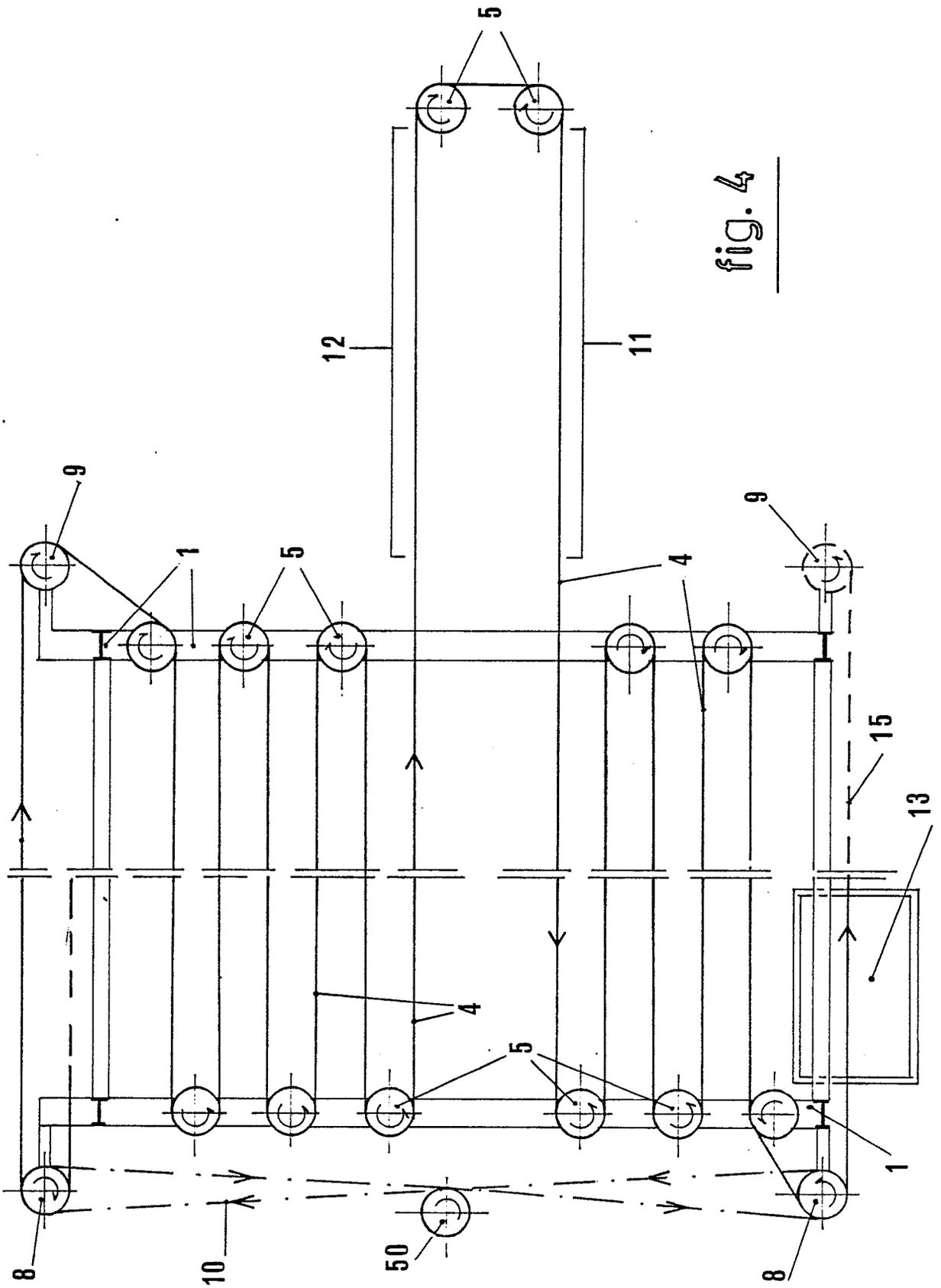


fig. 4

fig. 5

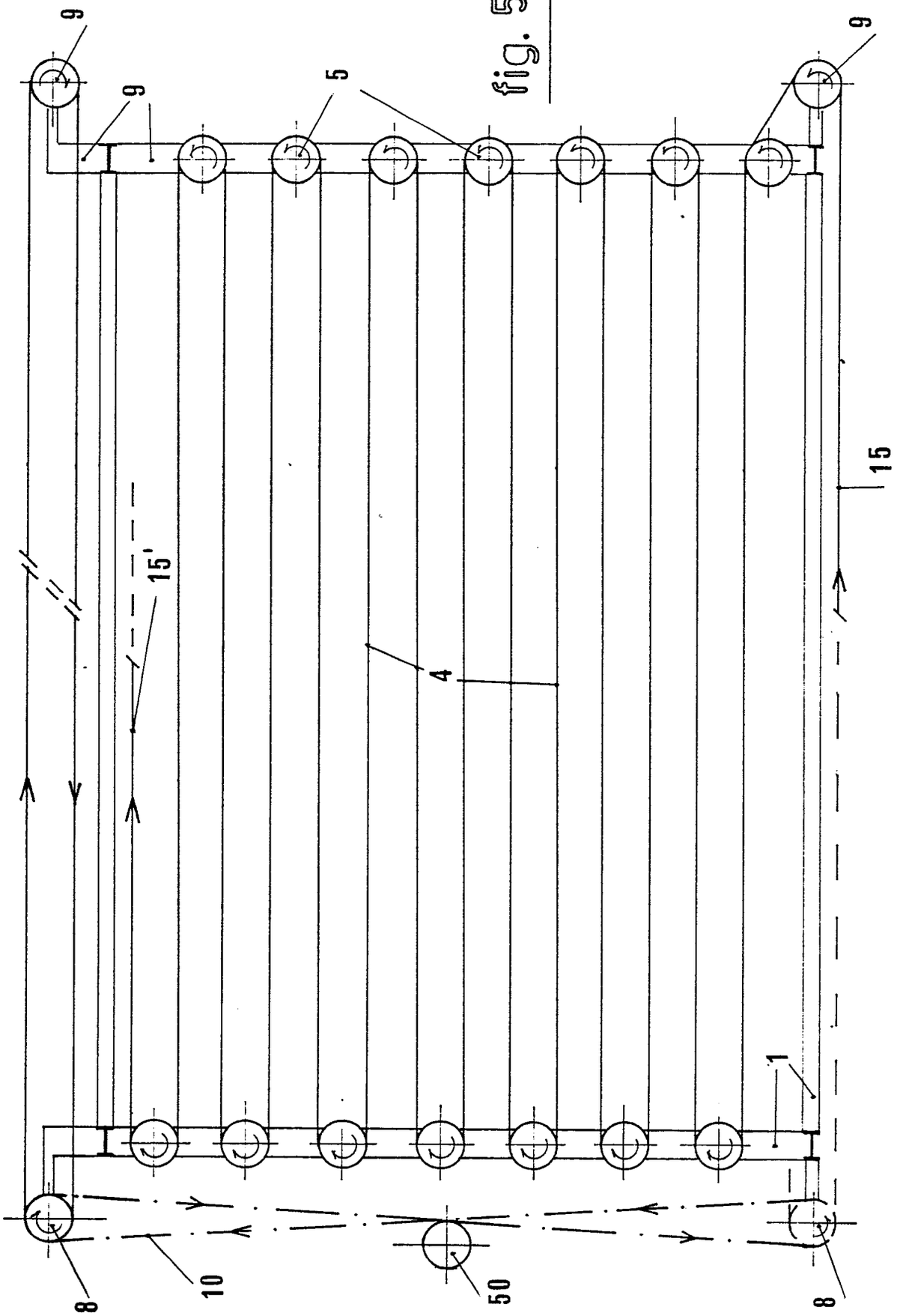


fig. 6

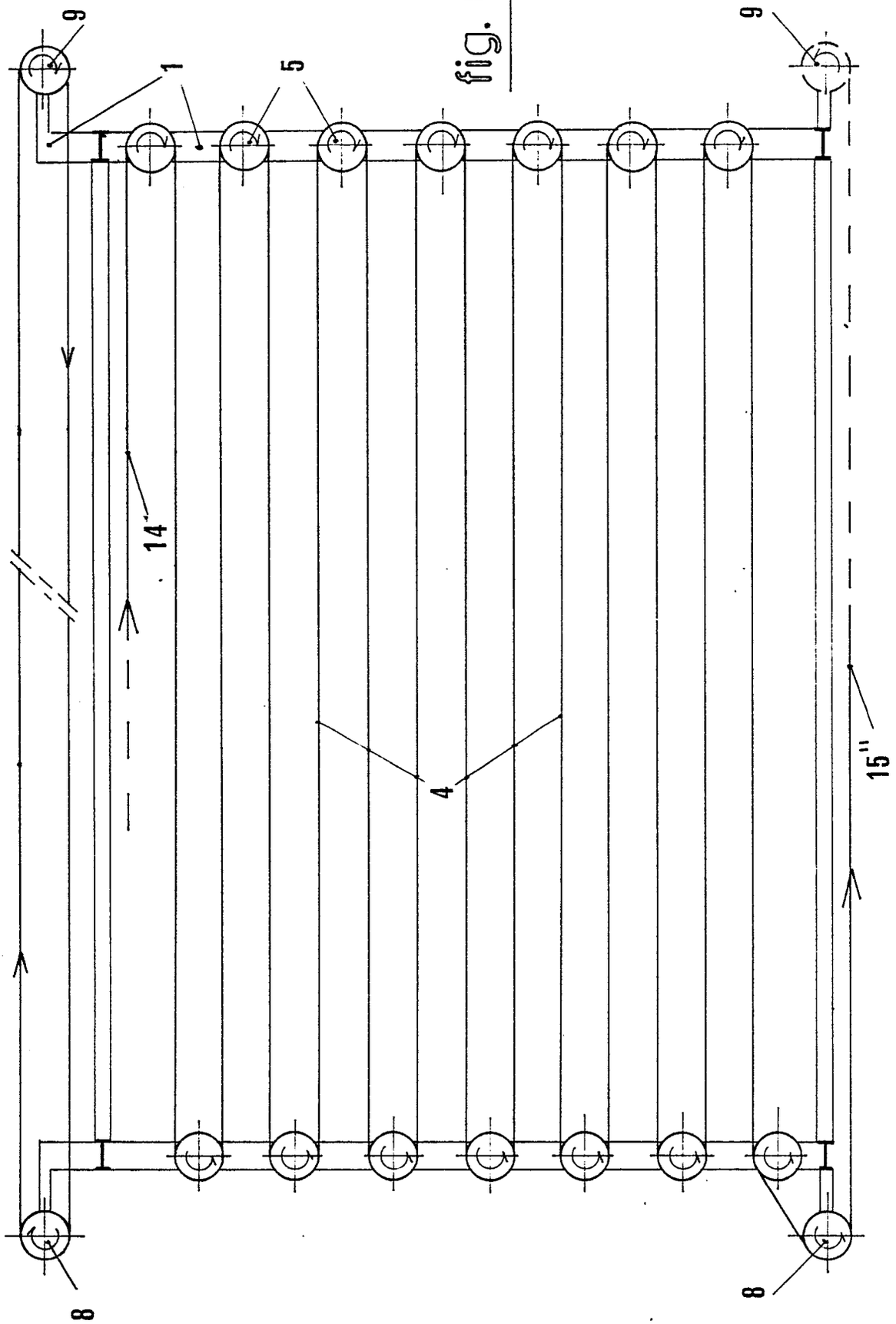


fig. 7

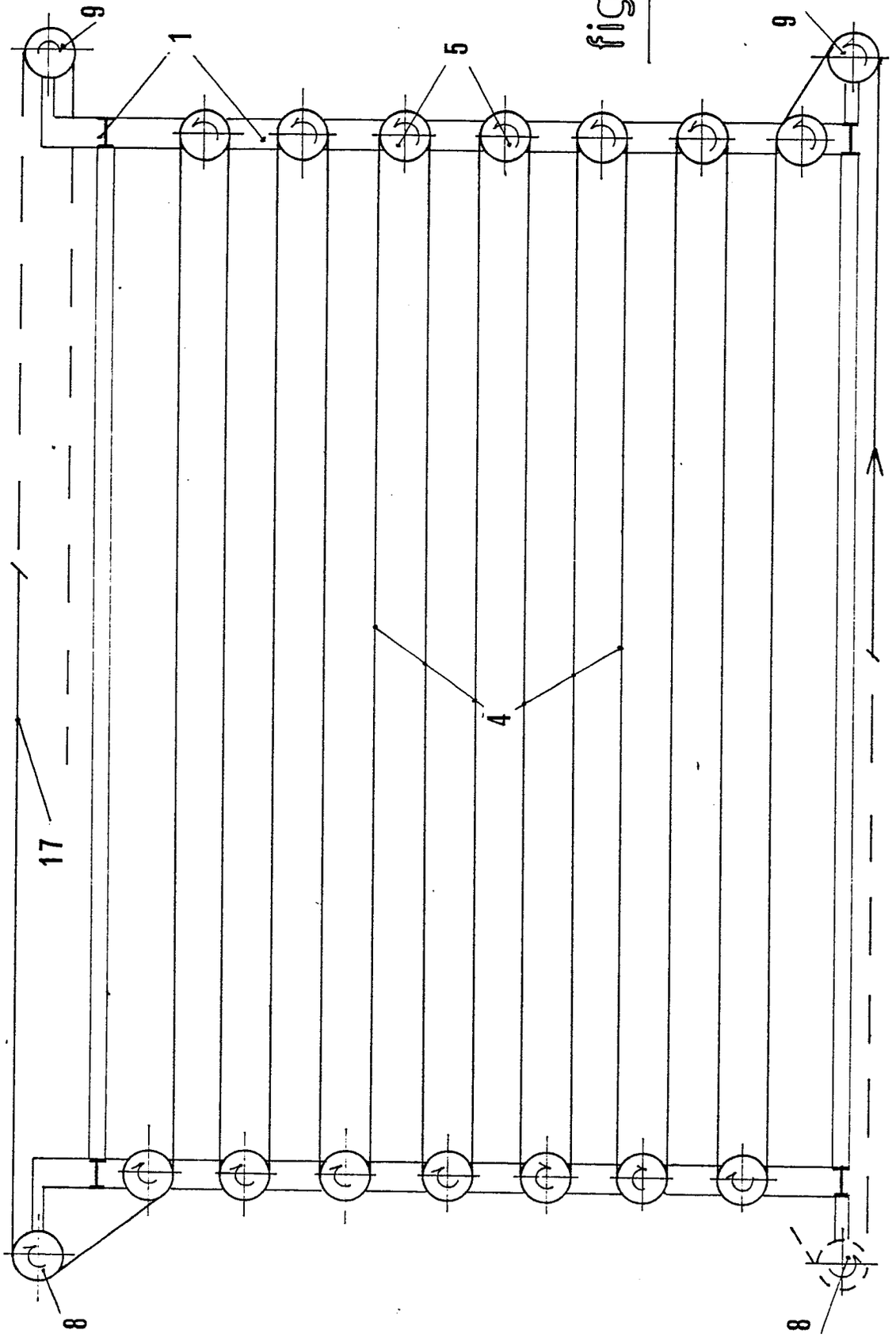
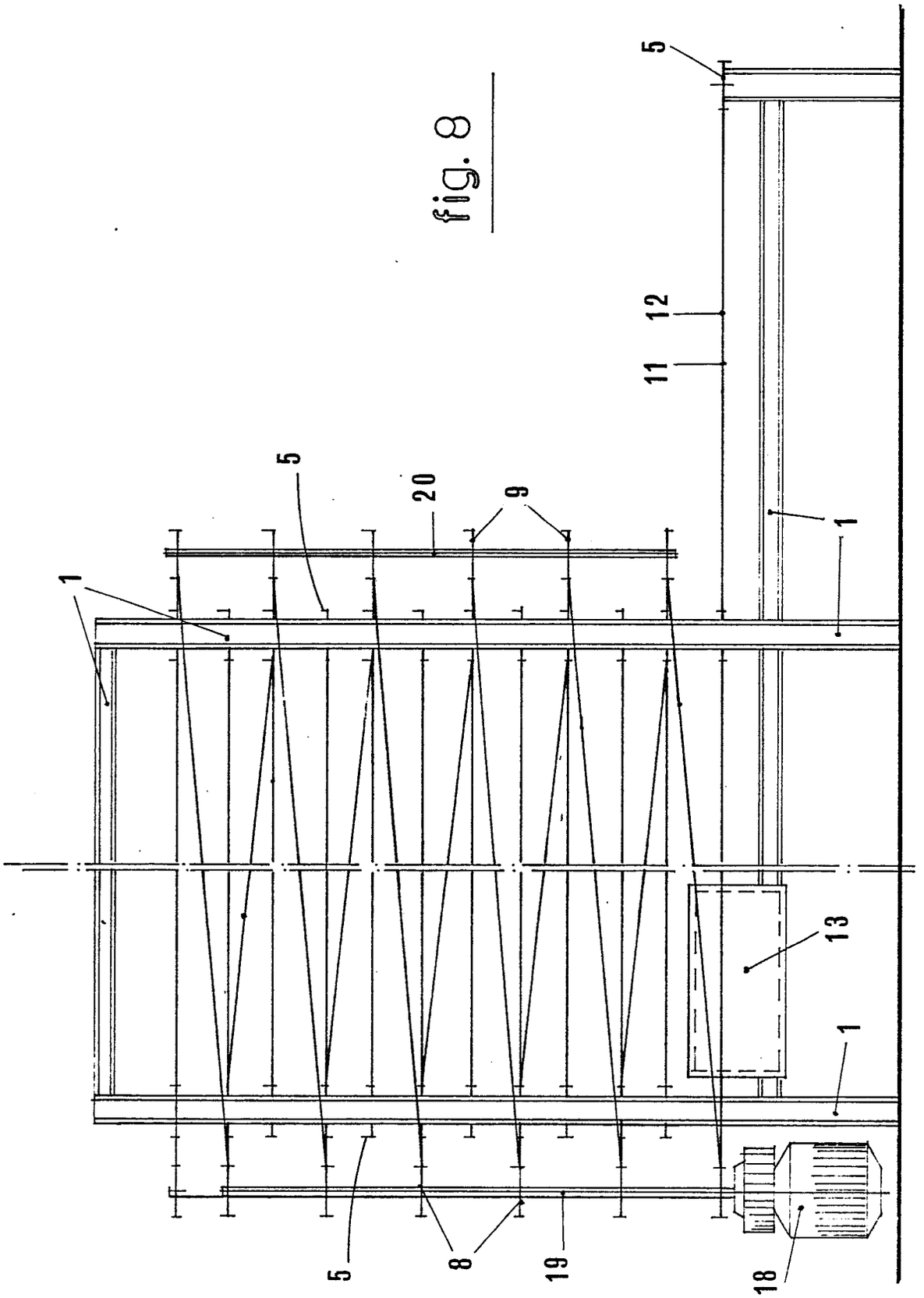


fig. 8



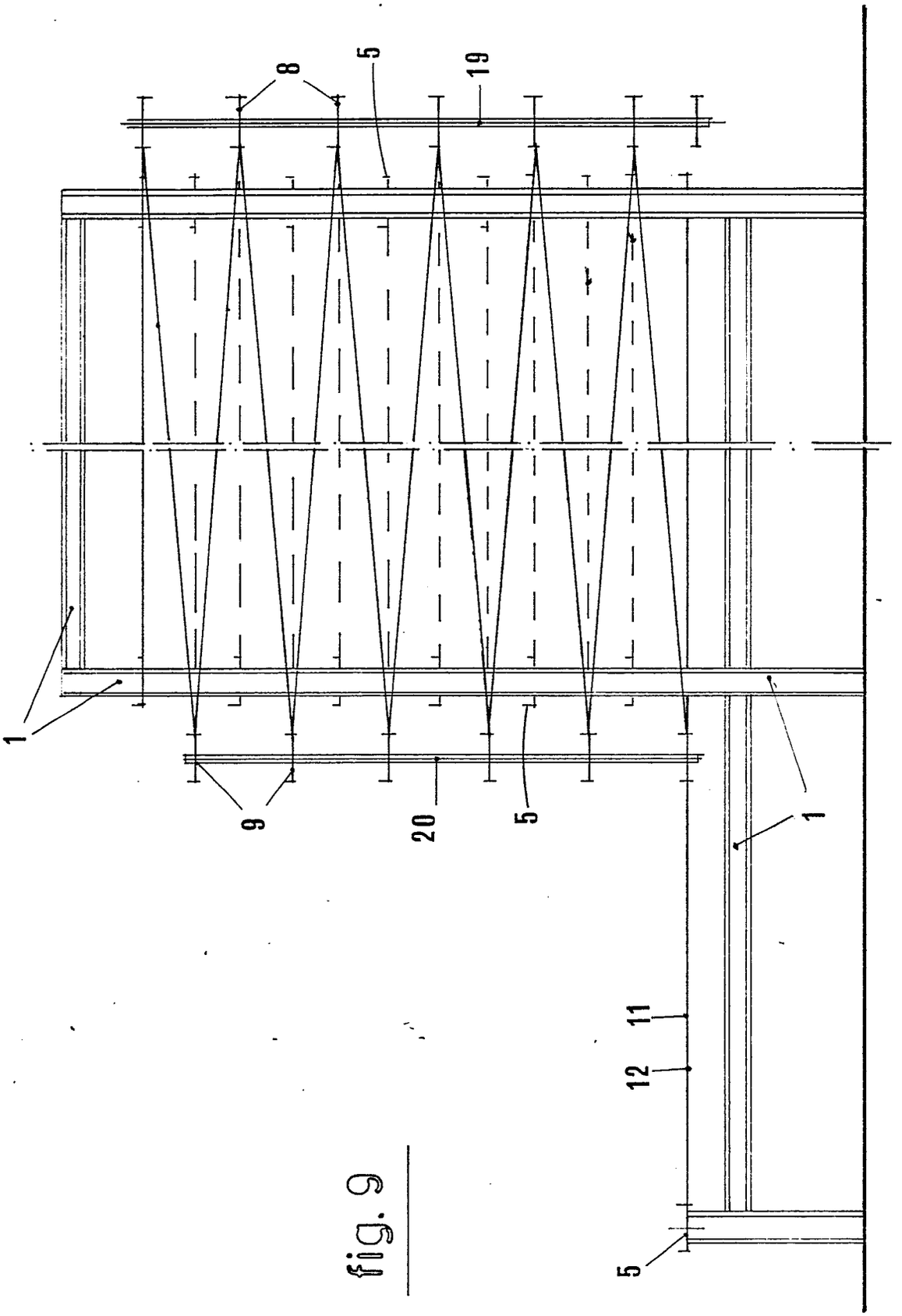


fig. 9

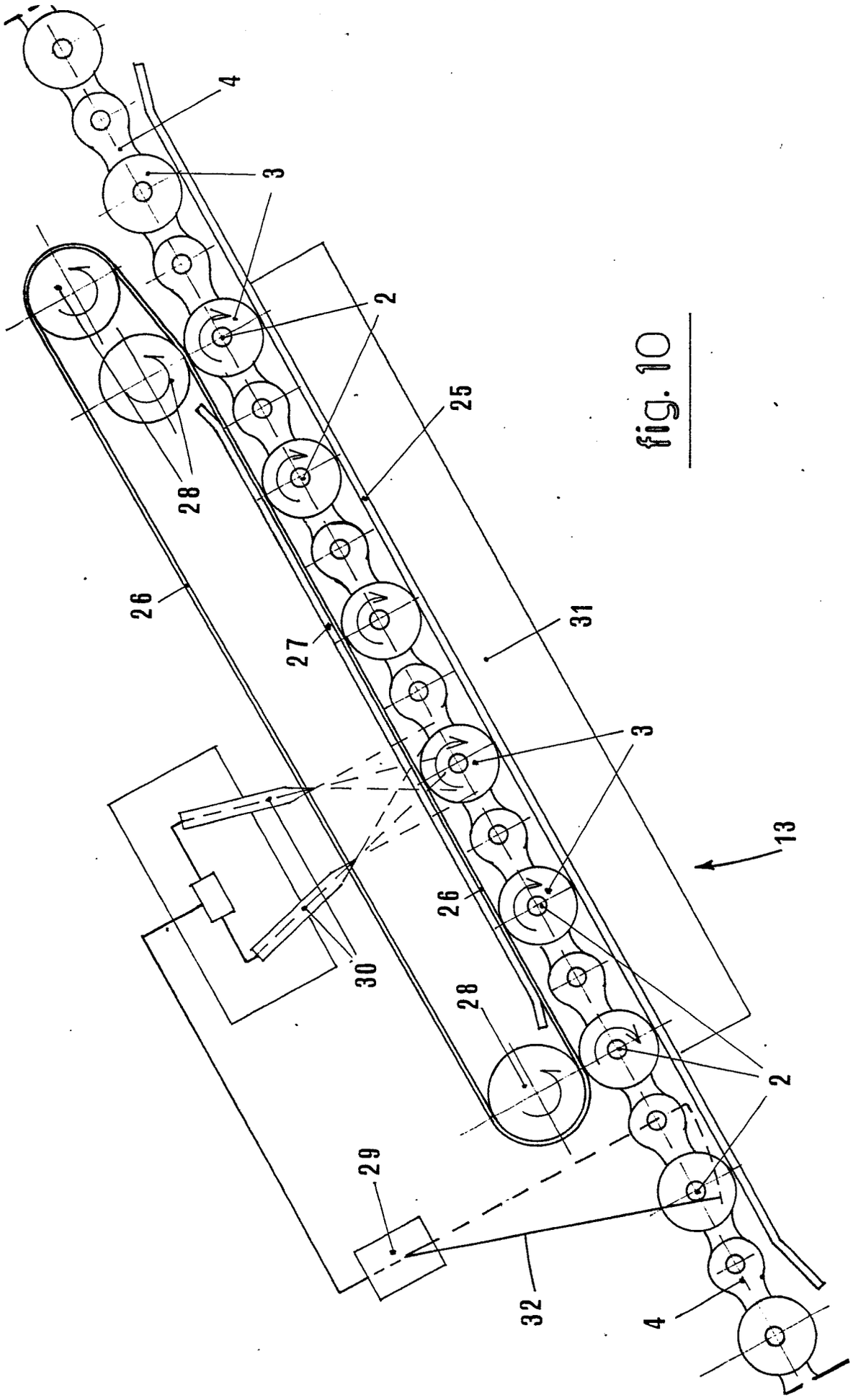


fig. 10

fig.11