(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 743 382 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
20.11.1996 Bulletin 1996/47

(51) Int. Cl.[6]: **D02H 1/00**, B65H 67/06

(21) Application number: **96107830.0**

(22) Date of filing: **16.05.1996**

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IE IT LI NL PT SE

(30) Priority: **18.05.1995 DK 566/95**

(71) Applicant: **FLETCO TAEPPER A/S**
7430 Ikast (DK)

(72) Inventor: **Jensen, Bent**
7400 Herning (DK)

(74) Representative: **Nielsen, Leif**
c/o Patrade A/S
Store Torv 1
8000 Aarhus C (DK)

(54) A plant and a method for supplying yarn to a loom

(57) A plant (1) for supplying yarn to a loom (2) comprises a yarn rack (3). The loom (2) is supplied with yarn from yarn spools (5) in a number of carriers (4) arranged in a rail arrangement (9).

The yarn rack (3) comprises a feeding station (6) having first rail lengths (10) and a storage station (7) having corresponding second rail lengths (11). Replacement of carriers (4) is accomplished easily and fast by transfer of a row of carriers (4) via the rails from the first rail length (10) to an empty second rail length (11). Then carriers (4) with full yarn spools are transferred from a second rail length (11), which is also attached to said first rail length (10). As the storage station comprises at least two second rail lengths (11) corresponding to each rail length (10) in the feeding station, the risk of misplacing carriers is avoided. As the carriers are transferred in a ceiling rail arrangement, it is possible to obtain easy transfer of a whole row of carriers at the same time. Furthermore, the risk is avoided that carriers might overturn even if there are full yarn spools on only one side of the carrier (4).

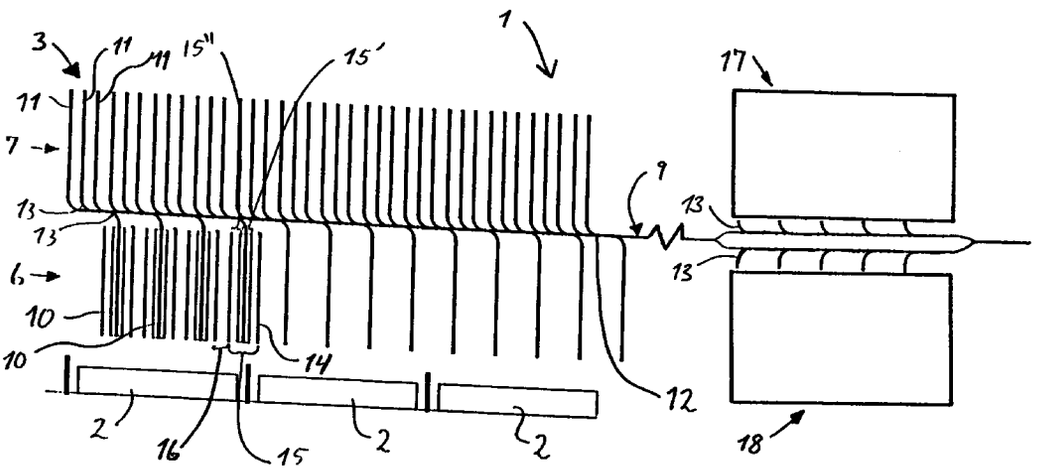

Fig. 1

EP 0 743 382 A2

(Cont. next page)

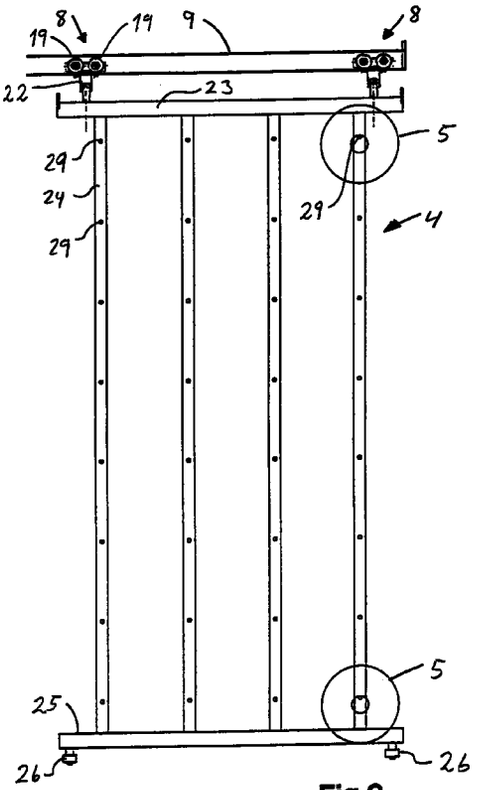

Fig.2

Description

The present invention relates to a plant for supplying yarn to a loom and comprising a yarn rack, which is placed next to the loom and which comprises a number of juxtaposed, replaceable carriers that are suspended by means of carrier rolls in a ceiling rail arrangement and on which yarn spools are suspended.

The invention further relates to a method for supplying yarn to a loom from a yarn rack, which comprises a number of juxtaposed, replaceable carriers that are suspended by means of carrier rolls in a ceiling rail arrangement and on which yarn spools are placed.

The present description discusses the supply of yarn to a loom. However, the plant may also be used for supplying yarn to other machines, e.g. knitting machines.

Plants are known in which a loom is supplied with yarn from a large number of yarn spools suspended in a yarn rack. Yarn racks may be fixed installations in which the yarn spools are placed on a fixedly mounted yarn rack and in which the replacement of the yarn spools is effected directly in the yarn rack, which is positioned in immediate vicinity of the loom. Between the different rows of yarn spools in the yarn rack it will be necessary to have sufficient distance for a person to be able to enter with a trolley and replace the yarn spools when they have been emptied or almost emptied. Therefore, such a plant is disadvantageous since the yarn rack requires much space. Furthermore, a replacement of the yarn spools in the yarn rack will require the loom to be idle for a long time. This is disadvantageous since the shortest possible idle periods of the loom are desirable. It is further a hard job for an operator who has to lift the yarn spools from the trolley and place them on the pins of the yarn rack. The job is also difficult because the space in the yarn rack is narrow.

In order to reduce the time in which the loom is idle, it has been suggested to construct a plant with a yarn rack consisting of replaceable carriers on which the yarn spools are placed. When the yarn spools have been emptied, the carriers are pushed out individually from the yarn rack and other carriers with full yarn spools are driven individually into the yarn rack. This system reduces the time in which the loom is idle. In this situation the loom must only be idle for the time in which the yarns from the almost empty yarn spools are cut, the carriers are replaced, and the yarn ends of the loom are spliced with the yarn ends of the new yarn spools.

However, a plant of this type also involves disadvantages. The yarn spools are normally mounted in the yarn carriers on pins projecting on either side. A large number of pins are mounted one over the other which means that the carrier will have an elevated centre of gravity. This leads to a risk that the carrier may overturn. This risk is particularly distinct if the carrier is only provided with yarn spools on one side. Furthermore, the actual handling of the carriers is hard work, and when replacement of the carriers is done, there will be a risk that a carrier is placed in a wrong position in the yarn rack. Then the goods formed on the loom will be useless.

So-called double racks are known as well. These are yarn racks having two receiver pins/yarn spools for each yarn to be fed to the loom. In these racks an operator will transfer around in the very yarn rack removing the empty yarn spools and inserting the full ones. This leads to wind transfers, which may cause the yarns in the rack to become entangled with each other. Due to this a situation arises in which the loom has to be stopped.

US patent No. 3,602,456 discloses a plant having a ceiling rail arrangement by means of which replaceable yarn carriers may be moved into a number of branch rails via a main rail. The carriers with yarn spools are entered into the main rail via the branch of the main rail. However, the storage station is located at a long distance from the feeding station or the yarn rack, and when the carriers are moved along the main rail, there will be a risk of misplacing carriers on wrong branch rails.

In US patent No. 4,988,252 a yarn carrier is described which moves along a guide rail on the floor of a supplying station in which yarn spools are supplied to the yarn carrier.

However, this publication does not disclose any means of fast and secure replacement of yarn carriers.

US patent No. 4,783,021 discloses yarn carriers that are suspended in ceiling rails. However, this publication does not disclose any means of fast and secure replacement of yarn carriers.

It is the object of the present invention to remedy the disadvantages of the known plants and the known methods and to provide a mechanically simple plant and a method that makes it possible to accomplish a fast and secure replacement, which at the same time results in an improved working environment for the operator.

According to the present invention this is achieved by a plant characterised in that the yarn rack comprises a feeding station having a number of juxtaposed rails, each of which is able to carry one or more carriers, said feeding station being placed in immediate vicinity of the loom, as well as an adjacent storage station, which is connected with the feeding station via the rail arrangement and which comprises at least two related rails for each rail in the feeding station.

The method according to the invention is characterised in in that the yarns are unwound from the spools while each carrier is located on a rail of its own in a feeding station in immediate vicinity of the loom, that when the yarn spools have been emptied, the carriers are transferred via the ceiling rail arrangement from the rail in the feeding station to a first related rail in a storage station, that a carrier with full yarn spools is transferred from a second related rail in the storage station onto said related rail in the feeding station for subsequent supply to the loom.

As the carriers are hanging in a ceiling rail arrangement by means of the carrier rolls, the risk of overturning will be totally eliminated, even in those cases when a carrier is provided with yarn spools only on one side.

The ceiling rail arrangement further makes it possible to ensure that carriers are always placed in their correct positions in the feeding station of the yarn rack. As there are at least two rails in the storage station for each rail in the feeding station, it will be possible during replacement of the carriers to enter the empty carriers on one of these at least two rails. The second one of these at least two related rails will then hold the carriers that are subsequently to be transferred into the feeding station. Thus, it will be possible to ensure beforehand, possibly by means of supervision by a central computer unit, that the carriers positioned on the rail of the storage station for subsequent transfer onto the rail in the feeding station are the right ones.

Owing to the rail system, a replacement will be made very quickly as an operator may transfer 4 to 6 carriers or more simultaneously from the feeding station to the storage station as well as from the storage station to the feeding station. This may result in considerable time and work savings compared to individual replacement of carriers.

The operator work of replacing yarn spools is eased considerably since in may be done in the separate emptying/filling stations. In these stations the operator may have ample space, and at the same time the full yarn spools may be lifted to an adequate working height by means of a forklift, a lifting truck or similar equipment, for which there will be room outside the yarn rack. As replacement of the spools is done outside the yarn rack, there is no risk of wind transfers and wind gusts in the yarn rack, and consequently the risk of yarn entanglement has been eliminated.

With the ceiling rail arrangement it is possible in a simple manner to construct a mechanically simple plant. This is possible since the rail arrangement may be constructed from rail units known per se and having switches for guiding carriers correctly between the different stations of the plant. Such switch points may be operated manually by the operator who replaces the carriers in the yarn rack. Alternatively, it is possible to operate the switch points by means of a central computer unit. The switch points may be traditional type ones activated mechanically, electrically or pneumatically.

As the rail arrangement always connects a yarn rack feeding station with the corresponding nearby storage station, there will be no risk of misplacing carriers in the feeding station. Since the feeding station and the storage station are close to each other, the replacement may take place very quickly.

Consequently, the loom only has to be stopped for the time in which the yarns are cut, the row of carriers is transferred from the feeding station to the storage station, and during the subsequent introduction of new carriers and splicing of yarn ends of the loom with yarn ends of the full spools.

The invention will now be explained in detail with reference to the accompanying schematic drawing, in which

- Fig. 1 shows a view illustrating a plant according to the invention;
- Fig. 2 shows a view illustrating a carrier that forms part of a yarn rack in the plant according to the invention;
- Fig. 3 shows a view of a part of the carrier shown in fig. 3,
- Fig. 4 shows a partial section view illustrating the connection between the carrier and a ceiling rail that forms part of the plant according to the invention; and
- Fig. 5 shows a partial view illustrating a floor rail that forms part of the plant according to the invention.

Fig. 1 shows a schematic view of a plant 1 according to the invention. Fig. 1 illustrates schematically the structure of the plant. Thus, a number of details that will be within the skilled person's option in the light of the description have not been included in the figure.

A number of looms 2 are shown in Fig. 1, which are supplied with yarn from the yarn rack 3 of the plant 1. The yarn rack 3 comprises a number of juxtaposed carriers 4 (see Fig. 2), on which yarn spools 5 are suspended. The yarn rack has a feeding station 6 positioned in immediate vicinity of the looms 2, and an adjacent storage station 7. The carriers 4 are suspended by means of carrier rolls 8 (see Fig. 2) in a ceiling rail arrangement 9.

The rail arrangement 9 may be mounted on a number of posts or be suspended in the ceiling. The ceiling rail arrangement 9 in the feeding station 6 comprises a number of first rail lengths 10 for each loom 2. In the embodiment shown there are four first rail lengths 10 for each loom 2. For each of the juxtaposed first rail lengths 10 in the feeding station 6 there are at least two second rail lengths 11 in the storage station 7. In the embodiment shown there are three second rail lengths 11 for each first rail length 10. The rail arrangement further comprises a central rail length 12. Each of the second rail lengths 11 is connected by means of switch points 13 and the central rail length 12 with the corresponding first rail length 10. It is thus possible to transfer the carriers 4 between different stations in the rail arrangement.

In Fig. 1 a row of carriers 4 is indicated by 14, which carriers 4 are suspended in a first rail length 10. Each row 14 comprises preferably four to six carriers of the type shown in Fig. 2. These carriers occupy a width 15 when supplied with yarn spools 5. The width 15 comprises the width of the full yarn carrier 15' itself which is approximately 700 mm, and a free space 15" of approximately 400 mm on either side of it in order to ensure unhampered unwinding of the yarns, which are fed to

the loom in traditional manner via a pipe system (not shown) on either side of the row 14 of yarn carriers 4.

Between each carrier 4 there will be a distance or a passage area 16, which only has to be wide enough for an operator to be placed between the yarn carriers in order to perform the necessary operations of cutting and splicing yarns in a manner known per se during replacement of the yarn spools. This distance will preferably be between 700 and 800 mm, preferably around 800 mm. This is a space saving of about 20% compared to traditional plants in which an operator must also be able to bring a trolley for replacement of yarn spools.

The rail arrangement 9 connects the yarn rack 3 via the central rail length 12 with a filling station 17, in which full yarn spools are placed in the carriers. The yarn rack 3 is likewise connected with an emptying station 18, in which spools with any remaining yarn are removed from the carriers 4. The plant 1 is optionally connected with a computer unit (not shown) controlling the transfer of the carriers 4 between the different stations as well as the settings of the different switch points 13 when the carriers are transferred on the rail arrangement 9. Alternatively, the plant may be supervised manually, and the transfer of carriers 4 between the different stations will then be accomplished by the operator setting the switch points 13 according to requirements. The switch points may be set by means of electric, pneumatic or mechanical actuators, which will be known to a person skilled in the art.

Figs. 2 to 5 show different details of the plant 1 as well as the carrier 4. The carrier rolls 8 comprise wheels 19 rotating around substantially horizontal axles 20. It is seen in Fig. 4 that the rail arrangement comprises a substantially C-shaped profile having an opening 21 at its downward side. A connection flange 22 for the carrier roll 8 passes through the opening 21. The connection flange 22 is connected with an upper carrier profile 23 forming part of the carrier 4.

Each carrier profile 23 in the embodiment shown is provided with four vertical posts 24. Alternatively, a larger number of posts may be used, e.g. up to eight. At their bottoms the posts 24 are connected by means of a lower support profile 25. Mounted at the underside of the lower support profile 25 are guiding rolls 26 rotating around substantially vertical axles.

The guiding rolls 26 co-operate with a floor rail 27, which is intended to be placed at least in the feeding station 6 of the yarn rack 3 under a corresponding first rail length 10. This provides secure vertical orientation of the carriers when they are placed in the feeding station. This is important in respect to correct unwinding of the yarns from the yarn spools 5.

At the entrance of the feeding station 6 the floor rail 27 has the shape of a funnel 28 so that the guiding rolls 26 will easily get into correct engagement with the guiding rail 27.

Each of the vertical posts 24 is provided with a number of pins 29 arranged one over the other. The pins 29 project to either side of the carrier, as appears from Fig. 3. In the embodiment shown eight pins 29 are arranged one over the other on each vertical post 24. As the spools 5 are placed on the pins 29 (see Fig. 2), a total number of sixteen yarn spools 5 may be placed on each post. Alternatively, it is possible to use a different number of pins 29. In the embodiment shown the pins 23 extend perpendicularly to the vertical posts 24. Alternatively, it is possible to arrange the pins 29 with an upwardly slanting orientation.

The plant shown in the figure will function in the following manner.

When the yarn spools 5 in the feeding station of the yarn rack 3 are substantially empty, the loom 2 is stopped. Then the yarn ends are cut, so that loose yarns ends are hanging from each of the pipes supplying the loom 2 with yarn from the feeding station 6. When all yarns have been cut, the switch point 13 is set so that a first rail length 10 in the feeding station 6 is connected with one of the corresponding second rail lengths 11 in the storage station 7. Then the row of carriers 4 with empty yarn spools 5 is transferred onto said corresponding second rail length 11. Then the switch point 13 is shifted so that one of the other two of the second rail lengths 11 in the storage station 7 is connected with the corresponding first rail length 10 in the feeding station 6. The operator repeats this for de four first rail lengths belonging to the loom 2. Then the yarn ends of the full yarn spools 5 are spliced with the yarn ends of the loom. Then the loom may be restarted.

As every first rail length 10 is connected with three second rail lengths 11, the risk of conducting a wrong row 14 of carriers 4 into the feeding station 6 is avoided. In order to ensure correct transfer of the carriers 4 between the feeding station 6 and the storage station 7, the second rail lengths 11 may be provided with colour codes.

When the loom has been restarted, the operator may transfer the carriers 4 via the central rail length 12 to the emptying station 18 where yarn spools 15 with any remaining yarn are removed from the carriers 4. Then the carriers are transferred to the filling station 17 where new yarn spools are placed in the carriers. When this has been done, the carriers may again be transferred via the central rail length 12 into the storage station 7 of the yarn rack 3 on a correct second rail length 11.

As the operator can transfer the carriers on the central rail length 12 arranged in a position behind the feeding station 6, and as the replacement of the yarn spools 5 takes place in the separate emptying/filling stations 18, 17, no wind transfers or wind gusts will occur in the feeding station 6 of the yarn rack such as in the traditional double racks with two pins for each yarn end. This is important since even relatively small wind transfers will be able to make yarns being unwound from the yarn spools 5 become entangled, which may mean that the loom 2 has to be stopped or that the product formed is useless.

Claims

1. A plant for supplying yarn to a loom and comprising a yarn rack, which is placed next to the loom and which comprises a number of juxtaposed, replaceable carriers that are suspended by means of carrier rolls in a ceiling rail arrangement and on which yarn spools are suspended, **characterised** in that the yarn rack comprises a feeding station having a number of juxtaposed rails, each of which is able to carry one or more carriers, said feeding station being placed in immediate vicinity of the loom, as well as an adjacent storage station, which is connected with the feeding station via the rail arrangement and which comprises at least two related rails for each rail in the feeding station.

2. A plant according to claim 1, **characterised** in that the ceiling rail arrangement connects the yarn rack with a filling station, in which full yarn spools are placed in the carriers.

3. A plant according to claim 1 or 2, **characterised** in that the ceiling rail arrangement connects the yarn rack with an emptying station, in which spools with or without remaining yarns are removed from the carriers.

4. A plant according to any one of the preceding claims, **characterised** in that at least the rail arrangement in the feeding station comprises a floor rail located under the ceiling rail and co-operating with guiding rolls at the carrier bottom.

5. A plant according to claim 4, **characterised** in that the floor rail at the entrance of a station is funnel-shaped.

6. A plant according to any one of the preceding claims, **characterised** in that each carrier comprises an upper carrier profile, that said carrier rolls are mounted on the upper carrier profile for rotation around substantially horizontal axes within C-shaped downward open ceiling rails, that each carrier profile is connected with 4 to 8 vertical posts which are connected at their bottoms with a lower support profile and each of which is provided with an outwardly to either side oriented row of pins arranged one over the other, on which pins the spools are placed.

7. A plant according to any one of the preceding claims, **characterised** in that the distance between the juxtaposed carriers in the feeding station is between 700 and 900 mm, preferably approximately 800 mm.

8. A method for supplying yarn to a loom from a yarn rack, which comprises a number of juxtaposed, replaceable carriers that are suspended by means of carrier rolls in a ceiling rail arrangement and on which yarn spools are placed, **characterised** in that the yarns are unwound from the spools while each carrier is located on a rail of its own in a feeding station in immediate vicinity of the loom, that when the yarn spools have been emptied, the carriers are transferred via the ceiling rail arrangement from the rail in the feeding station to a first related rail in a storage station, that a carrier with full yarn spools is transferred from a second related rail in the storage station onto said related rail in the feeding station for subsequent supply to the loom.

9. A method according to claim 8, **characterised** in that the emptied carriers are transferred via the ceiling rail arrangement into an emptying station in which the spools are removed, and that the carriers are subsequently transferred into a filling station in which yarn spools are placed in the carriers, and that the carriers are subsequently transferred into the storage station ready for subsequent transfer into the feeding station.

10. A method according to claim 8 or 9, **characterised** in that the transfer of the carriers between different stations is supervised and controlled by a computer unit.

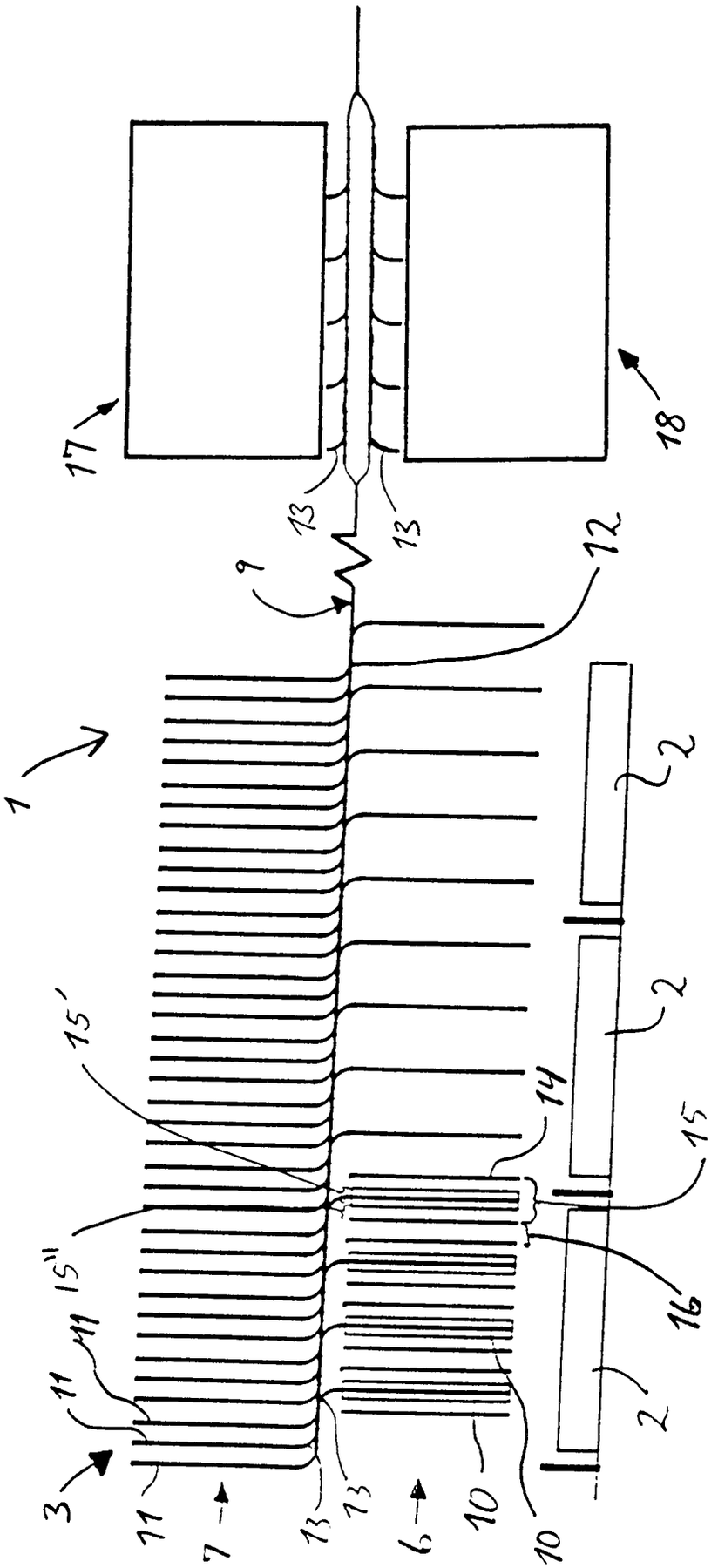

Fig. 1

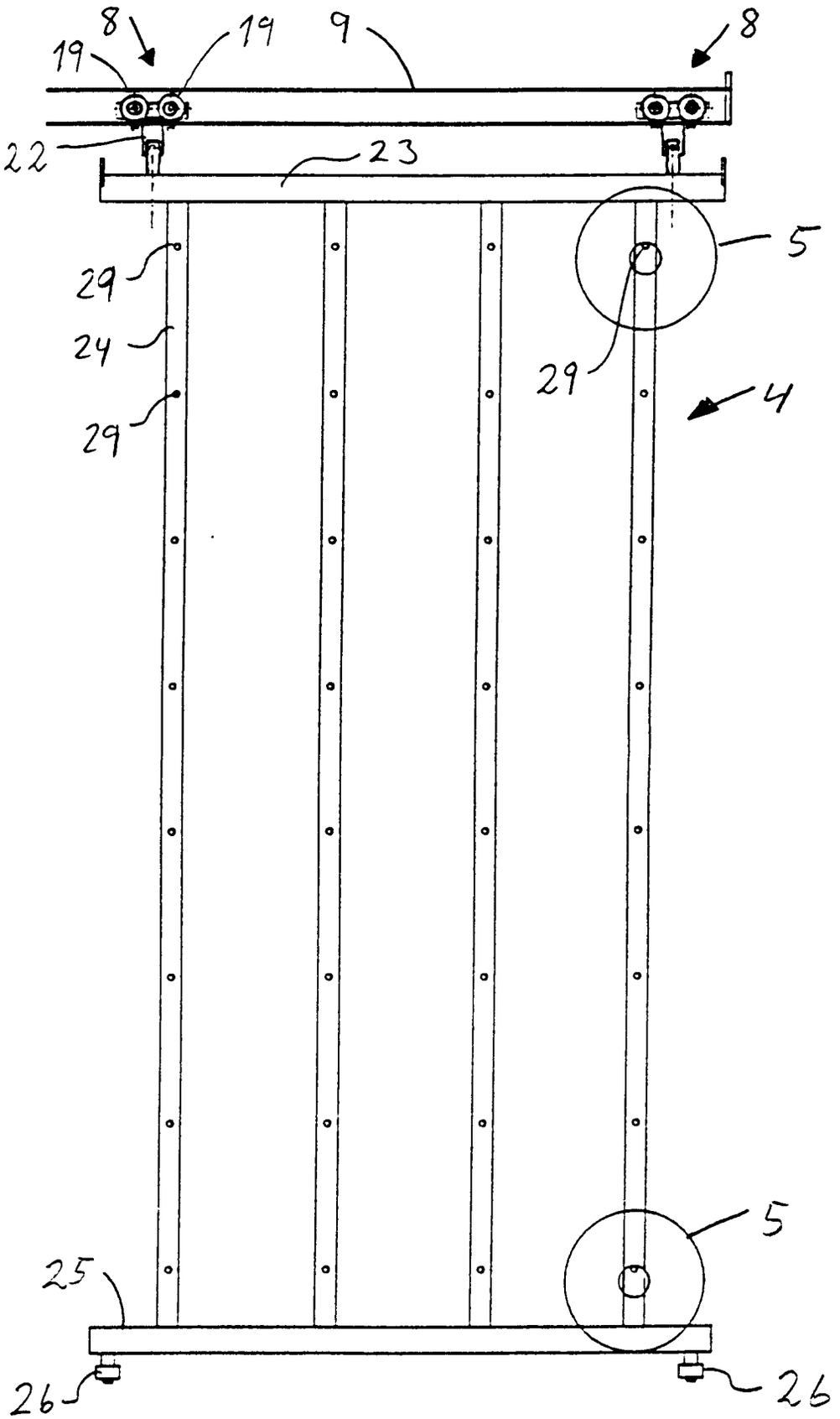

Fig.2

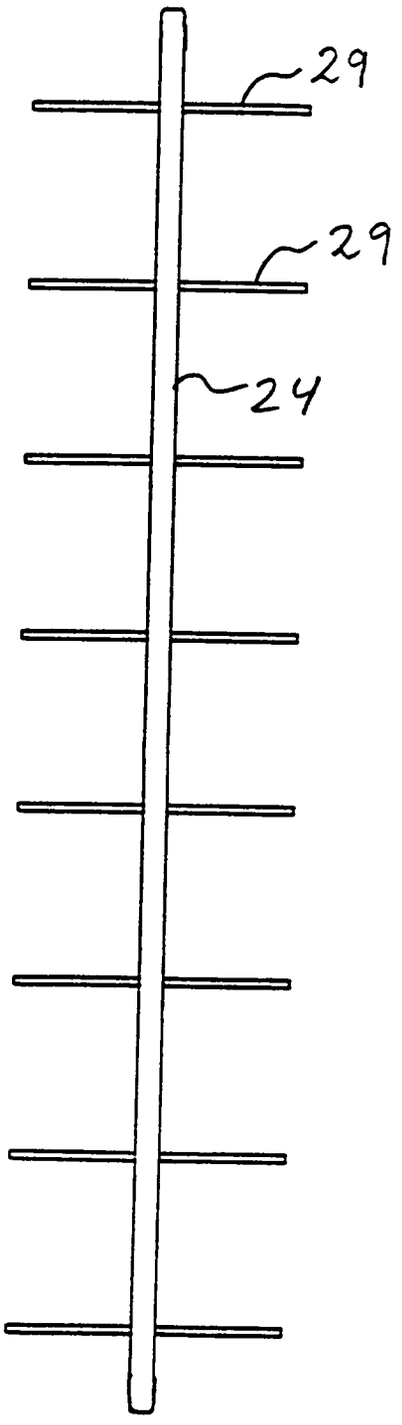

Fig.3

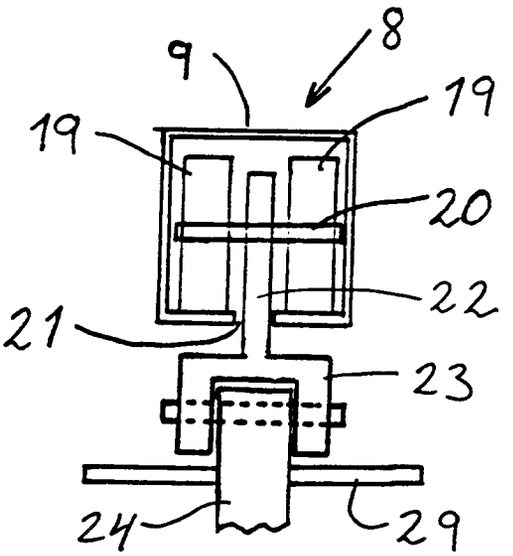

Fig. 4

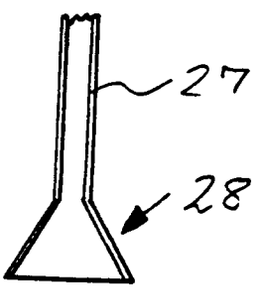

Fig. 5