Hosiery toe closer.

A looper line toe closer (10) has an upstanding indexable turret or carousel (20) mounting a plurality of hose carriers comprising horizontally extending slotted toe holders (11). Each holder (11) is mounted on a support block (36) for rotation about a horizontal axis so that, after loading a hose end in its slot (32), the holder can be inverted such that the hose is draped over one edge (48) of the holder (11) with its toe to be seamed supported by the holder. In this position, the hose is brought to a seaming station (B) by rotation of the turret or carousel (20), whereupon an endless belt (71) is pressed against the hose to slide the latter from the holder (11) and across a workplate (16) of a sewing machine (17).
The present invention relates to a hosiery toe closer for hose or socks of various gauges. More particularly, the invention relates to a looper line toe closer which operates to close the hose toe end along a so-called looper course or line. Hose such as socks are commonly machine knitted such that the main body of the knit for toe closing terminates in a band/or bead of material thicker than the main body. A toe closing seam is to be formed, e.g. by sewing, along the junction course or line between the thinner and the thicker knits. Alternatively, and perhaps less conveniently, the junction course or line may be a row or rows of knitting thinner than the knit to either side thereof.

Known sock closers have guide channels along which socks for closing are advanced to a sock manipulator, the latter being a rotary clamp, for instance. This is stationed before a sewing machine. In such a closer, further guide means besides the channel are needed to ensure the sock enters the manipulator properly, because the latter has to take hold of the main portion of the sock while its terminal portion is held by the channel. In practice it is not always easy for the operator to see to locate the sock correctly in the channel. Rejects may result either from mis-loading
the socks into the channel, or from the clamp or manipulator taking hold of the sock improperly. Another drawback with such a machine is that it is slow and is not adapted to perform operations such as everting and seam straightening.

In developing the present invention, we have sought to simplify the loading and transfer aspects, the latter in particular.

According to the present invention there is provided a hosiery toe closer for socks, comprising a seamer and an associated workplate over which a hose toe end is transported for seaming, a hose carrier movable from a loading station to a position in operative juxtaposition with the workplate, and means for conveying a hose toe end from the carrier and across the workplate, the hose carrier comprising a slotted holder into which a terminal part of the hose is inserted such that the remainder of the hose is suspended therefrom, the slotted holder being mounted to be invertible after loading whereby the hose becomes draped over the holder with the latter providing underlying support for a hose toe end portion in the vicinity of the terminal part of the hose, the holder when in juxtaposition with the workplate forming an extension thereof.

A toe closer according to the invention can include a plurality of hose carriers, each comprising
the slotted holder, mounted at spaced intervals around a rotatable turret or carousel for movement in turn from a loading station to a seaming station and back to the loading station.

A preferred turret machine according to the invention has its turret rotatable about a vertical turning axis. The or each slotted holder has the slot therein extending radially of the turning axis, and rotary drive means is provided for setting said holder in first one and then another predetermined attitude respectively for loading hose thereon and for conveying hose therefrom to the workplate. The seamer, workplate and hose conveying means are arranged for movement of hose at the seaming station in a direction, past the seamer, radially of the turning axis.

Preferably an edge of the holder, over which a hose becomes draped upon inversion of the holder, is in alignment with an edge of the workplate remote from the seamer when the holder is juxtaposed with the workplate. The said workplate edge is spaced from the seamer and during seaming the hose passing the seamer drapes over this edge; the toe portion extends from this edge across the workplate to the seamer. The arrangement assures troublefree feeding of the hose past the seamer.
The hose conveying means can conveniently comprise an endless belt mounted on a carrier for movement against the juxtaposed carrier and workplate, the belt being intermittently movable to displace the hose thereacross. Means for driving the belt is preferably adjustable to vary the speed of the belt across the workplate, to afford a simple control of the number of stitches per unit length of seam.

In the preferred embodiment, the slotted holder comprises two adjacent flat fingers forming the slot by a narrow gap therebetween, the positioning of the fingers relative to one another being adjustable to enlarge or diminish the width of the gap. Adjustment to suit the hose thickness is facile with this preferred form of holder.

The invention also provides a method of toe closing hosiery such as socks, wherein a hose for closing is inserted into a slotted holder so that waste knit is located above the holder and the rest of the hose including the toe area to be seamed is suspended beneath the holder, the holder is inverted to drape the hose over one edge thereof and to support at least the toe area upon the holder, the holder is moved into juxtaposition with a workplate of a seamer, and the hose is then transported from the holder and across
the workplate to generate a toe closing seam as it passes the seamer.

Further according to the invention there is provided apparatus for conveying fabric articles along a support, comprising a continuously-driven conveyor loop having a conveying flight operatively disposed adjacent the support by a plurality of guides, characterised in that an upstream portion of the conveying flight of the loop extending between two of said plurality of conveying flight guides is displaceable (a) away from the support to receive an article to be conveyed by the apparatus and (b) back towards the support to commence conveyance of said article while another article is being advanced along the support by a downstream portion of the flight, and in that displacements of the upstream portion are attained by movements of the furthest upstream conveying flight guide towards and away from the support, conveyor loop tension being substantially insensitive to the displacements of the upstream portion.

The invention will now be described in more detail by way of example with reference to the accompanying drawings, in which:

Fig. 1 diagrammatically illustrates certain principal elements of a toe closer which is the preferred embodiment of this invention;

Fig. 2 is a fragmentary perspective view of the preferred embodiment;
Fig. 3 is a fragmentary perspective view showing the manner in which a sock is loaded initially into a sock carrier of the toe closer;

Fig. 4 is a view similar to Fig. 3 and shows the sock carrier after inverting;

Fig. 5 is a fragmentary perspective view showing the sock located ready for its passage past a seamer, the latter being omitted for clarity of illustration, and

Fig. 6 is a diagrammatic side view of a preferred sock conveying means according to the invention.

The toe closer shown in the drawings operates simultaneously on a plurality of socks - in this example, four at a time being on the machine. The toe closer 10 has a stepwise rotatably mounted turret or carousel on which there are four sock carrier assemblies. Each sock carrier assembly comprises a slotted holder 11 for the toe portion. The holders 11 extend radially of the turret, and each in turn visits and pauses at a loading station and a seaming station as the turret or carousel indexes through 360°.

Operation of the toe closer will be described now with reference to Fig. 1.

At A an operator loads socks for closing. It is normal for the toe seam to be located inside the finished sock. Conventionally the socks reach the operator right side out. Accordingly, the socks will
ordinarily first be everted by the operator. Having everted the sock as may be necessary, the operator places the toe end portion into the slotted holder 11 and ensures it is properly positioned.

Having thus loaded the sock, the operator actuates a control, e.g. a foot switch, to index the turret about its upstanding turning axis 14. At the same time, the holder 11 is inverted and placed in a horizontal attitude. As the loaded holder indexes to B, an empty holder 11 arrives at A for loading.

At B, the sock is caused to slip off holder 11 and across a workplate 16 associated with a seamer 17 such as a sewing machine. A toe closing seam is formed and excess knit cut away as the sock toe end portion passes the seamer 17.

When the toe seam is completed, the sock is discharged from the toe closer 10, e.g. into a collection bin.

Constructional details of the toe closer 10 will now be described with particular reference to Fig. 2.

The turret or carousel 20 comprises a generally cylindrical frame composed of an upper plate 21, a lower plate (not shown) and upstanding connecting pillars 24. This structure is rotatable stepwise in suitable bearings about a stationary central column 25 fixedly mounted to an immovable part of the toe closer chassis. Stepwise rotation of the turret or carousel 20
is achieved by means of a Geneva drive mechanism or an equivalent drive (not shown). The drive is responsible for indexing the turret in steps of 90°. Connection between the drive and the turret can be via the said lower plate. Actuation of the drive is under the control of the operator e.g. by actuation of the foot switch already mentioned. If preferred, the drive could be actuated automatically at pre-set intervals, when the operator will have to keep pace with the machine.

The four slotted holders 11 are carried by brackets 28 atop upper plate 21. Each holder 11 is elongated and extends in a direction radially of the turret. The holders 11 are flat plates slotted longitudinally from their free outer ends, but preferably are formed by pairs of adjacent flat fingers 30, 31. A narrow gap 32 between the fingers 30, 31 forms a slot into which sock toe ends are to be drawn by the operator. As best seen in Figs. 3 and 4, one finger 30 is longer than the other and the inner edges 34 of the fingers are bevelled.

The holders 11 are cantilevered from rotary support blocks 36 journalled in the respective brackets 28 each for rotation about a horizontal, radially-directed axis. Conveniently these axes are aligned with the slots or gaps 32 of the holders. Means are provided for effecting controlled rotations of the
blocks 36 and the holders 11 projecting therefrom. For this purpose, in the present example, a pinion (not shown) is provided fast with each support block 36 and meshing with a rack 38 movable vertically in a channel 39 in the associated bracket 28. To move the rack there is a pneumatic actuator 40 attached to an anchorage 41 on the central pillar 25. The actuator is coupled to a lever (not shown) pivoted upon the pillar 25 to swing in a vertical plane. The lever has a bifurcated free end into which fits a first spur 42 attached to each rack 38. The lever is placed to engage the first spurs 42 only when their associated holders are at the loading station A.

Normally, the slotted holders are disposed horizontally both lengthways and widthways. However, at A they are rotated out of their normal attitudes temporarily. For example, the holders may be inclined widthways at an angle of $45^\circ$ to the horizontal, as shown in Fig. 2. This inclined position is adopted by the holders for loading, it being found that this attitude best enables operators to see that they are loading socks properly. Inclining the holders 11 in turn arriving at station A is gained by raising their racks 38 by the actuator 40, through the pivoted, bifurcated lever and spur 42. Viewed from in front of station A, the inclined position results from a
clockwise rotation through $135^\circ$. After loading, and as a precedent to indexing of the turret, the actuator lowers the rack 38 to return the holder at station A, through $135^\circ$ anti-clockwise, to a horizontal attitude. The turret is then arranged to index.

The angle of inclination of the holders may be greater or less than $45^\circ$ to the horizontal, and some operators may prefer them to be horizontal at station A. The holder inverting means, constituted by the
actuator 40, lever, rack 38 and pinion, is then arranged to rotate the block 36 through 180° clockwise and thereafter rotate it anti-clockwise 180°, thus fully inverting the holder 11 after loading.

The holders are kept horizontal widthways after loading, until they again reach station A, by second spurs 44 fast with their racks being engaged with a horizontal track 45. Track 45 is formed by a peripherally grooved disc, or between two appropriately spaced-apart discs, fixed to the stationary central pillar 25. A cut out is provided in the disc(s) at station A to allow the lower spurs 44 freely to exit and re-enter the track 45 when the pneumatic actuator 40 is energised to reciprocate the racks 38.

The socks are loaded on the holders 11 as shown in Fig. 3. At the loading station, part of the toe end T is introduced into the slot or gap 32 from the free end of the holder, the longer finger 30 being in the left hand position as viewed by the operator. The toe end part T is positioned such that the thicker knit to one side of the looper line or course is above the holder 11, the remainder of the sock S being suspended below the holder. Toe end part T is stretched out manually along the slot or gap. In practice, the operator will pull down on the sock after inserting
it into the holder to seat the thicker knit on
the top face of the holder. The slot or gap 32 is
obviously narrower than the thicker knit T.

Socks knitted with a looper line or course(s)

5 thinner than the remainder of the sock knit to either
side thereof have to be inserted such that the
thinner course(s) are in the gap. Loading is, of
course, less easy.

The holder 11 may, if desired, have guide lines

10 thereon between which the toe end is positioned.

Operation of the holder inverting means 40, 38 etc
rotates the holder anti-clockwise (as viewed from the
operator's position) into a horizontal attitude. This
causes the longer finger 30 to adopt a position to the
right of the finger 31. Moreover, the rotation brings
finger 30 into a sock-supporting position beneath a
portion of the knit. The sock is thus draped over the
finger 30. Its thicker toe end part T extends
downwardly from the slot or gap 32, and the rest of

20 the sock hangs over the side 48 of the finger 30. This
side 48 forms the leading edge of the holder 11 considered
in the direction of rotation of the turret 20.

It is particularly beneficial to arrange for the
sock to be so draped over the leading edge 48 of the

25 holder. The principal advantage is that the sock can
be passed across the workplate 16 without having to deflect or guide the main portion of the sock onto the workplate. At station B, the edge 48 will align with a corresponding edge of the workplate 16. Another advantage of the manner in which the sock is draped over finger 30 is that the weight of the main part of the sock S tends to pull the part T of the toe end towards the horizontal into a position adjacent the underside of finger 31 as viewed in Fig. 4. This attitude of the part T facilitates its later movement onto the workplate 16.

At station B, the longer finger 30 is in close juxtaposition with a receiving end of the workplate 16, and is coplanar therewith. Hose transfer means 70 is located at this station, directly above the finger 30 and workplate 16. The transfer means 70 in this illustrated embodiment comprises an intermittently operable endless conveying belt 71 trained around pulleys 72 on a carrier 73. The carrier 73 is movable downwardly from the position shown in Fig. 1 until the bottom flight of the belt presses against the sock S and workplate 16. The belt 71 and pulleys 72 are toothed to ensure positive driving of the belt. When the belt is driven in contact with the sock, the latter is slid longitudinally over finger 30 and along the workplate 16, the sock sliding along and out of the slot or gap 32.
in the process.

The belt can be driven by an electric motor continuously. Downward movement of the carrier 73 then is suitably controlled to transfer the sock from
the holder 11 and across the workplate 16 for seaming in timed relation to indexing of the turret 20.

Preferably, however, the belt is driven intermittently in timed relation to indexing of the turret and lowering of the belt.

A pressure plate 75, Fig. 5, mounted on the carrier 73 above the bottom flight of the belt 71 ensures that the belt is pressed appropriately to the sock and workplate 16.

The workplate 16 is of unique design and has, at its receiving end 76, a ramp 78 downwardly inclined toward the holder 11. The ramp 78 is aligned generally with the gap 32 and short finger 31, and at the end 76 is located below the path swept by the underside of the longer finger 30 as the turret 20 indexes to bring the holder 11 to the workplate. The ramp 78 provides a gentle incline leading to the top surface of the main portion of the workplate 16 which is level with the top of the fingers. The ramp is responsible for deflecting the depending part T of the toe end onto the workplate 16 as the sock S is transferred to the workplate by the belt 71.

The workplate has a cut out area in which the sewing needle(s) of the seamer 17 operate, and a thread cutter 80. The latter is a sharp blade moveable
horizontally and laterally in a channel in the underside of the workplate 16. The blade is located behind the needle(s) as seen from the ramp end of the workplate. Operation of the cutter is controlled by means known in the art to cut off excess seaming thread at both ends of the toe closing seam formed across the sock as it passes the seamer 17.

The seamer 17 has a further cutter, not shown, to trim away excess knit (in essence part T) immediately before the sock reaches the seamer needle(s). Excess knit detached from the sock is removed by a suction pipe, not shown.

To ensure that the sock toe end lies properly upon the workplate as it is trimmed and fed to the needle(s), a conventional air jet nozzle 83 is provided. Conventionally the jet nozzle is mounted on the carrier 75.

When the sock has been driven along its linear path of travel past the seamer 17, it is driven by the belt 71 off the workplate 16 and discharged e.g. into a collection bin.

The machine 10 as illustrated possesses four sock carriers 11, but could have more or fewer. For example, the invention is applicable to a toe closer having only one carrier 11 mounted for movement between the loading and seaming station.

The machine as disclosed is primarily meant for closing the toes of socks, but could be employed for
seaming full hose of heavier construction than normal sheer stockings.

Whilst the slotted holder 11 could be formed by slotting a plate, it is preferably formed by two contiguous fingers for then it is a simple matter to mount them adjustably on the support block 36. Adjustment of the slot or gap 32 may be necessary when different batches of socks, of differing thickness, are to be closed. If a slotted plate instead of fingers is used, alternative plates having slots of different widths may be necessary to cope with socks of differing thickness.

Although not shown in the drawings, the holder 11 may be formed such that the open end of the slot or gap 32 is flared to facilitate insertion of the sock.

The invention can be embodied in a machine in which the turret rotates about a horizontal axis, in which case the or each invertible slotted holder 11 may be disposed with its slot 32 extending parallel to the turret turning axis. At the seaming station, the hose transfer means 70, workplate 16 and seamer 17 will be arranged for motion of the hose in a direction substantially parallel to the turret turning axis during the hose transfer and seaming phase. Such a "horizontal" turret machine affords considerable simplification, because in principle it would be possible to dispense with the inverting means 38, 40, the turret itself being the means responsible.
for inverting the slotted holders 11 as it rotates. Thus, suppose the slotted holders 11 are fixedly mounted in radial planes on the turret, and are loaded when each is at a 9 o'clock position. Following a turret rotation of 180°, and a similar rotation of the loaded holder around the turret turning axis, this loaded holder 11 will automatically be inverted, at the 3 o'clock position. The hose will be draped over the holder then as shown in Fig. 4.

The embodiment described above demands that seaming of one sock be completed before the succeeding sock can be conveyed by transfer means 70 off its holder. This can be a disadvantage if the operator is capable of loading socks onto the holders 11 faster than the seamer 17 or transfer means 70 can handle them. We have therefore devised an improved transfer means 90 to overcome this disadvantage, see Fig. 6.

The transfer means 90 again comprises a driven conveyor loop 91 trained around a plurality of guides 92, in the form of pulleys, mounted on a carrier equivalent to carrier 73. Three of said guides 92a, b and c can provide a colinear guide path for the lower flight of the conveyor loop 91, so that two socks can be advanced along the coacting holder 11 and workplate 16. In practice, one sock will be moving between the positions of guides 92b and 92c, while the other sock is moving
between guides 92a and 92b from the holder 11 to the workplate 16.

In the previously described embodiment the whole transfer means 70 had to be lifted temporarily to allow a sock on holder 11 to be presented. Clearly, lifting of the entire transfer means 90 in order to receive a succeeding sock would perturb conveying of the preceding sock along the workplate 16. The conveying means 90 has therefore been devised so that an upstream portion 94 may be lifted from the sock support plane (defined by workplate 16 or the workplate in conjunction with the holder 11). A downstream portion 95 of the transfer means, however, always remains operatively associated with the workplate. The upstream portion 94 is displaceable thanks to raising and lowering of guide 92a at the upstream end of the conveyor loop. When guide 92a is raised, a holder 11 bearing a sock can be moved into position under the upstream portion 94 while the downstream portion 95 continues moving another sock unaffected along the workplate 16. Lowering the guide 92a leads to conveyance of the sock on holder 11 commencing. Then, both socks will be moving simultaneously to the right.

To avoid perturbing movement of a sock by the downstream portion 95, movements of guide 92a should not cause the tension in the conveyor loop 91 to change significantly. The guide 92a should therefore
move on the transfer means carrier along such a path
that the length of conveyor belt extending from pulley
92 around 92a to 92b remains invariant. This means
the path of movement of the guide 92a should be elliptical.

Non-elliptical movement (e.g. a linear up-and-down
movement) could be tolerated, however, if the transfer
means 90 includes a sprung jockey 96 to preclude
periodic slackening as the guide 92a moves.

Displacement of the guide 92a can be brought about
by intermittent operation of a pneumatic ram, a
solenoid, or by camming means, suitably synchronised
with rotations of the turret 10, and hence with movements
of holders 11 towards and away from the seaming station B.

The transfer means 90 will desirably employ a
toothed belt 91 and toothed pulleys 92.

It will be appreciated that the conveyor loop
91 of transfer means 90 can be driven continuously,
thus avoiding the complication of intermittently-
operable drive means.

As described, the transfer means 90 is capable
of conveying two socks at a time. Three or more socks
could be handled simultaneously if necessary by
appropriate lengthening of the conveyor loop and conveying
path.
Claims:

1. A hosiery toe closer for socks, comprising a seamer and an associated workplate over which a hose toe end is transported for seaming, a hose carrier movable from a loading station to a position in operative juxtaposition with the workplate, and means for conveying a hose toe end across the workplate and past the seamer, characterised in that the hose carrier comprises a slotted holder (11) into which a terminal part (T) of the hose is inserted such that the remainder of the hose is suspended therefrom, the slotted holder (11) being mounted to be invertible after loading whereby the hose becomes draped over the holder with the latter providing underlying support for a hose toe end portion in the vicinity of its terminal part (T), the holder (11) when in juxtaposition with the workplate (16) forming an extension thereof.

2. A toe closer according to claim 1, characterised in that the holder (11) is mounted on a support (36) for inverting rotation about an axis parallel to or coincident with the slot (32) of the holder.

3. A toe closer according to claim 1 or claim 2, characterised by including rotary drive means (38, 40) for setting the holder in first one and then another predetermined attitude respectively for loading hose
thereon and for conveying the hose therefrom to the workplate (16).

4. A toe closer according to claim 3 characterised in that the drive means for rotating the holder (11) includes a pinion fast with the holder (11), a rack (38) meshing therewith, and an actuator (40) for reciprocally moving the rack (38).

5. A toe closer according to claim 1, characterised in that the hose conveying means (70, 90) comprises an endless belt (71, 91) mounted on a carrier (73) for contact with the juxtaposed hose and holder (11) workplate (16), the belt being movable to displace the hose thereacross.

6. A toe closer according to claim 5, characterised in that the conveying means (70) is movable away from the plane of the workplate (16) for admitting the holder (11) and a hose thereon, and is movable thereafter into contact with the juxtaposed holder (11) and workplate (16) for its belt (71) to be set in motion and advance the hose from the holder (11) and across the workplate (16).

7. A toe closer according to claim 5, characterised in that the conveying means (90) has an upstream portion (94) contactable with the holder (11) and movable away from the plane of the workplate (16) for admitting the holder (11) and a hose thereon, the conveying means being so arranged that movements of the upstream portion
relative to said plane result in no significant change in belt tension.

8. A toe closer according to claim 7, characterised in that a downstream portion (95) of the conveying means (90) is mounted fixedly in contact with the workplate (16) and the belt (91) is continuously driven, whereby in use one hose is conveyed by the downstream portion (95) across the workplate (16) while another, holder-mounted, hose is admitted when the upstream portion (94) moved out of the said plane.

9. A toe closer according to any of claims 5 to 8, characterised by adjustable drive means for the belt (71, 91) to vary its speed of movement relative to the workplate (16) and thereby to vary the number of stitches per unit length in the toe closing seam.

10. A toe closer according to any of claims 5 to 9, characterised by a plurality of slotted hose carriers (11) mounted at spaced intervals around a rotatable turret or carousel (20) for movement in turn from a loading station (A) to a seaming station (B) and back to the loading station.

11. A toe closer according to claim 10, characterised in that the turret (20) is rotatable about a horizontal turning axis and each slotted holder (11) has the slot (32) therein disposed substantially parallel to the turning axis, the turret (20) being
rotatable through half a turn to move each holder from the loading station (A) to the seaming station (B) and the holders (11) being fixedly mounted on the turret (20) so as to be inverted, by the turret as the latter rotates, upon arrival at the seaming station (B).

12. A toe closer according to claim 10, characterised in that the turret (20) is rotatable about a vertical turning axis and each slotted holder (11) has the slot (32) therein extending radially of the turning axis, the holders (11) being mounted rotatably on the turret (20) and rotary drive means (38, 40) being provided for inverting the holders (11) from one to another predetermined attitude respectively for loading hose thereon and for conveying hose therefrom to the workplate (16).

13. A toe closer according to any of the preceding claims, characterised in that an edge (48) of the or each holder (11), over which a hose becomes draped upon inversion thereof, is in alignment with an edge of the workplate (16) remote from the seamer (17) when the holder (11) is juxtaposed with the workplate (16) at the seaming station.

14. A toe closer according to any of the preceding claims characterised in that the or each slotted holder (11) comprises two adjacent flat fingers (30, 31) forming the slot by a narrow gap (32)
therebetween, the lateral positioning of the fingers relative to one another being adjustable to enlarge or diminish the width of the gap.

15. A method of toe closing hosiery such as socks, characterised in that a hose for closing is inserted into a slotted holder (11) so that waste knit (T) is located above the holder and the rest of the hose including the toe area to be seamed is suspended beneath the holder, the holder (11) is inverted to drape the hose over one edge (48) thereof and to support at least the toe area upon the holder, the holder is moved into juxtaposition with a workplate (16) of a seamer (17), and the hose is then transported from the holder (11) and across the workplate (16) to generate a toe closing seam as it passes the seamer (17).

16. Apparatus for conveying fabric articles along a support, comprising a continuously-driven conveyor loop having a conveying flight operatively disposed adjacent the support by a plurality of guides, characterised in that an upstream portion (94) of the conveying flight of the loop (91) extending between two (92a, 92b) of said plurality of conveying flight guides (92a, b, c) is displaceable (a) away from the support (11, 16) to receive an article to be conveyed by the apparatus and (b) back towards the support to commence conveyance of said article while another
article is being advanced along the support by a downstream portion (95) of the flight, and in that displacements of the upstream portion (94) are attained by movements of the furthest upstream conveying flight guide (92a) towards and away from the support, conveyor loop tension being substantially insensitive to the displacements of the upstream portion (94).

17. Apparatus according to claim 16, characterised in that the furthest upstream conveying flight guide (92a) is movable relative to the support along an elliptical path arranged so that displacements of this guide (92a) cause no change in the conveyor loop tension.

18. Apparatus according to claim 16, characterised in that the furthest upstream conveying flight guide (92a) is movable linearly relative to the support and means (96) acts on the loop (91) to preclude slackening thereof during movements of the guide (92a).


### EUROPEAN SEARCH REPORT

#### DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Relevant to claim</th>
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The present search report has been drawn up for all claims

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**CATEGORY OF CITED DOCUMENTS**

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The present search report has been drawn up for all claims

Place of search: THE HAGUE
Date of completion of the search: 17-01-1983
Examiner: VUILLEMIN L.F.

CATEGORY OF CITED DOCUMENTS

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