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Europäisches Patentamt
European Patent Office
Office européen des brevets

⑪ Publication number:

**0 149 295
B1**

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EUROPEAN PATENT SPECIFICATION

④⑤ Date of publication of patent specification: **19.10.88**

⑤① Int. Cl.⁴: **D 04 B 19/00**

②① Application number: **84300330.2**

②② Date of filing: **19.01.84**

⑤④ **Apparatus for processing circular knit hosiery.**

④③ Date of publication of application:
24.07.85 Bulletin 85/30

④⑤ Publication of the grant of the patent:
19.10.88 Bulletin 88/42

②④ Designated Contracting States:
DE FR GB IT

⑤③ References cited:
FR-A-2 216 820
FR-A-2 256 276
FR-A-2 435 553
US-A-3 949 913
US-A-4 157 651

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EP 0 149 295 B1

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Courier Press, Leamington Spa, England.

Description

The invention relates to apparatus for processing circular knit hosiery.

In the production of hosiery, such as stockings and socks, a commonly called "rib knitter" or a double cylinder knitting machine is employed to knit a long continuous circular hose. The long continuous hose band must then be sectioned into unit hoses with waste portions interposed between adjacent unit hoses. The stitches around the sectioned part are picked up by the operator's fingers. This is an extremely time-consuming operation, which of course reflects in the price of the product.

In addition, to effect the subsequent linking operation on each toe, it is necessary first to turn each hose inside out. After the linking operation is finished, the normal side must be turned back outside again to enable the unit hose to be vapour set. This is also very time-consuming.

According to the invention, there is provided apparatus for processing a circular knit hose, characterised by an air suction pipe through which a long knit hose can be pulled by air suction to turn the long knit hose inside out; a cutter unit mounted on a movable carrier and having means to stretch the knit hose at successive positions along the hose at which cutting is desired and to effect cutting to section the long knit hose into unit hose; an apron conveyor having transverse slats with each of the slats at one end mounting a hollow cylinder on which one of the unit hose can be supported and at the other end mounting a clamp unit, which clamp unit can clamp a toe portion of the unit hose and is pivoted so that it can be tilted toward the cylinder thereby presenting the toe portion of the unit hose to a linking device which is located adjacent the conveyor and which can link each toe portion with stitches; means for returning the clamp unit to an untilted position and for releasing the knit hose; and a suction duct, successively communicatable with the rear end of each of the cylinders at a position at which the conveyor changes direction, for extracting the unit hose by suction through the respective hollow cylinder thereby turning the unit hose rightwards out.

Such apparatus can facilitate turning of a circular knit hose inside out, sectioning it into a required number of unit hoses, closing each toe thereof, and turning the normal side out again in an automatic manner.

The invention is diagrammatically illustrated by way of example in the accompanying drawings, in which:

Figure 1 is a plan view showing apparatus according to the invention;

Figure 2 is a plan view on an enlarged scale of the portion of Figure 1 indicated at II, at which knit hose is stretched for cutting;

Figure 3 is a front view on an enlarged scale of a cutter unit of apparatus according to the invention;

Figure 4 is a fragmentary left side view of the cutter unit of Figure 3;

Figure 5 is a front view on an enlarged scale of a guide unit;

Figure 6 is a left side view of the guide unit of Figure 5;

5 Figure 7 is a plan view showing one section of an apron conveyor of apparatus according to the invention in which a slat is provided to support a hollow cylinder and a clamp unit;

10 Figure 8 is a right side view of the section shown in Figure 7;

Figure 9 is a front view, partly omitted, of the section shown in Figure 7;

15 Figure 10 is a schematic view showing the relationship between a guide unit and a clamp unit of apparatus according to the invention;

Figure 11 is a schematic view showing knit hose stretched by engagers of apparatus according to the invention;

20 Figure 12 is a schematic view showing the clamp unit of Figure 11 holding a sectioned unit hose;

Figure 13 is a schematic view showing the clamp unit of Figure 12 is tilted at 90° thereby to cause the toe portion of the hose to stand upright for stitching;

25 Figure 14 is a plan view corresponding to Figure 13;

Figure 15 is a schematic view showing the operation of the clamp unit of Figure 11; and

30 Figure 16 is a schematic view showing the relationship of the clamp unit of Figure 11 and a pushing rod.

Referring to Figure 1, a long continuous knit hose band 1 is fed from a double cylinder knitting machine (not shown) to an air suction pipe 2. The forward end of the knit hose 1 is placed around a 'tail' end of the pipe 2 by an operator as shown in Figure 1. The reference numeral 3 designates a pair of contact rollers, which are capable of rolling on the air suction pipe 2 while keeping contact with the surface thereof, whereby the knit hose 1 is caused to slide over the surface of the air suction pipe 2 towards a 'top end' thereof until the forward end of the knit hose reaches the depth of the air suction pipe 2. At this stage the free end of the knit hose 1 projects slightly beyond the tail end of the air suction pipe 2. When vacuum is applied to the pipe 2, the knit hose 1 is sucked into the air suction pipe 2. The air suction device is of known kind and further description thereof is thus not required. The knit hose 1 which is turned inside out is taken out at an outlet 4 by an operator. The apparatus described so far constitutes a knit hose turning section 5.

55 Referring to Figures 1 and 2, there is provided a bed 6 on which a crank disc 7 coupled to a driving shaft of an electric motor M₁ is mounted.

The crank disc 7 has one end of a rod 8 connected thereto with the other end of the rod 8 connected to a carrier 10 so as to be capable of moving it along a pair of rails 9 provided on the bed 6.

60 The free end of the knit hose band 1 is provided with a toe portion 1' and a welt portion 1'' between which the knit hose is additionally provided with a separating section 11 (Figure 11). The separating

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section 11 is sufficiently thin to produce steps at the transition positions to the toe portion 1' and the welt portion 1''. The steps are engaged by an upper engager 12 having an upper cutter 12', and a lower engager 13 having a lower cutter 13'. As shown in Figures 2 and 3, the upper engager 12 and the lower engager 13 are mounted on the carrier 10, with the upper engager 12 supported on a bracket 14 such that the height of the upper engager 12 is adjustable with respect to the knit hose 1, whereas the lower engager 13 is fixed to the carrier 10. A cutting blade 15 (Figure 3) is pivotally supported on the carrier 10. The cutting blade 15 is connected by means of a connecting rod 15' to a crank rod 17 of a crank disc 16 driven by an electric motor M₂.

In a guide unit shown in Figures 5 and 6, an upper guide 18 is provided alongside the upper engager 12, the guide 18 being supported on a bracket 20 perpendicular to the bed 6 such that the height thereof is adjustable with respect to the knit hose 1. Likewise, there is provided a lower guide 19 slightly spaced from the upper guide 18, the lower guide 19 being fixed to the bed 6. The positional relationship of the engagers 12 and 13, the guide members 18 and 19, and the knit hose 1 is best illustrated in Figure 11. As shown in Figure 10, the separating section 11 of the knit hose 1 is located between the upper and the lower cutters 12' and 13', and between the upper and the lower guides 18 and 19. After the knit hose 1 has been engaged in the guides 18 and 19, both engagers 12 and 13 are moved, by energizing the motor M₁, in the direction indicated by the arrows in Figure 10. Thus the separating section 11 is stretched as shown in Figure 11, and is then cut at a position adjacent to the welt portion 1'' by means of the cutting blade 15.

An apron conveyor 21 comprises a series of slats 22 and, as best shown in Figure 8, each slat 22 is provided with a pair of brackets 23 at the end thereof forming the inner side of the conveyor, the brackets 23 pivotally supporting a first plate member 26 to which a second plate member 25 is pivotally coupled. The two plate members 25, 26 are capable of pivotal movement in the direction indicated by the arrow in Figure 8, so that they take-up a position indicated by dotted lines therein. Figure 8 is a side view whereas Figure 9 is a front view in which, unlike Figure 8 the raised position is shown in dotted lines. The second plate member 25 is provided with a recess 25' at its top end as shown in Figure 9, which recess 25' is engaged by a metal piece 27 fixed to an end face of the first plate member 26 so as to secure the union of the two plate members 25 and 26. The second plate member 25 is additionally provided with a projecting part 25'' at the opposite end, which is engaged by a spring member 28 fixed to the opposite end face of the first plate member 25. Due to the engagement by the spring member 28 the second plate member 25 is biased upwardly. The contacting faces of the two plate members 25, 26 have a co-operating sawtooth form so as to enable the two plates, when in

engagement, to form a clamp unit which can clamp and hold the knit hose.

In addition to one of the clamp units 30, each slat 22 is provided with a short cylinder 24 at the end of the slat opposite to that at which the brackets 23 are provided, that is at the outer side of the apron conveyor 21, the short cylinder 24 extending parallel to the top surface of the respective slat 22 but spaced therefrom as best shown in Figure 8. The short cylinder 24 is used to support a unit knit hose 1 which is placed around it. The short cylinder 24 can be supported by a suitable bracket or other known means.

At the position indicated II in Figure 1, an electric motor M₃ is supported on a stand on the carrier 10 as shown in Figure 15, and a cam plate 29 is coupled to the shaft of the motor M₃. The cam plate 29 comes into contact with the second plate member 25 during rotation, thereby bringing the second plate member 25 into engagement with the first plate member 26. In this way the two plate members 25 and 26 are engaged with the toe portion 1' clamped between the indented faces. Thus the knit hose 1 is fed in a continuous band to the position II where it is sectioned into unit hoses, and each of the unit hoses is then clamped by a respective one of the clamp units 30 and transported to a position III (Figure 1). At the position III an angled rail 31 is provided on the bed 6, at a position adjacent to the path along which the clamp units 30 pass. The rail 31 is effective to push each clamp unit 30 toward its respective short cylinder 24 causing it to tilt inwardly as shown in Figure 16. When the clamp unit 30 has been half tilted, gravity acts to tilt it the remainder. The toe portion 1' is then upwardly directed which is a suitable posture for the toe portion to be in while it is linked with stitches.

Figures 8 and 9 show carriers 40 linked to each other so as to support the slats 22. Cams 41 are located at opposite sides of the conveyor 21, whereby the toe portion 1' of a knit hose passing beneath the linking device 32 can be raised so as to facilitate the linking operation.

A linking device 32 located above the apron conveyor 21 stitches the toe portion 1'. The linking device 32 includes a crank disc 33 located at the position IV of Figure 1 and a push rod 34 reciprocally moved in association with the rotation of the crank disc 33 while keeping contact with the periphery of the crank disc 33, the push rod 34 passing through the bed 6 at a diagonally upward inclination as shown in Figure 8. The push rod 34 causes the clamp unit 30 to return to the upright position when the clamp unit 30 reaches the position IV and the toe portion 1' clamped therein had had its open end stitched. The push rod 34 further advances, and raises the second plate member 25 so as to disengage it from the first plate member 26. In this way the knit hose 1 is released from the clamp unit 30 but is still supported on the short cylinder 24 and reaches the position V.

At the position V there is provided a suction duct 37 to turn the knit hose 1 inside out such that

its outer side again comes outside. The reference numeral 37' designates a catcher reciprocally moved by means of a crank rod 36 pivoted on a crank disc 35, the catcher 37' being connected to the suction duct 37. The catcher 37' comes successively into engagement with the rear end of each short cylinder 24 as shown in Figure 1.

At the position V where, as a result of the movement of the conveyor 21, the plane of each slat 22 changes in orientation from horizontal to vertical, there is provided a rotor 38 driven by a motor M_4 , the rotor causing, by friction, knit hose supported on the respective short cylinder 24 to advance toward the free end of the cylinder. At this stage the short cylinder 24 is in communication with the suction duct 37 via the catcher 37'. The knit hose 1 overhanging the open inner end of the cylinder 24 is ready to be sucked into the suction duct 37 under vacuum. A bracket 39 on which the motor M_4 is mounted is movable by a motor M_5 so that the rotor 38 can be engaged with the knit hose on the short cylinder 24 or disengaged therefrom.

In operation, the forward end of a long continuous knit hose band 1 is placed around the 'tail end' of the suction pipe 2 by hand. The contact rollers 3 are energised to rotate them and thereby advance them to the 'tail end' of the suction pipe 2, before returning along the length of the suction pipe 2 pulling the knit hose band by friction as they do so. At this stage the free end of the knit hose band 1 slightly projects beyond the 'tail end' of the suction pipe 2. Then the pipe 2 is evacuated, thereby causing the free end of the knit hose band to be sucked into the suction pipe 2. In this way the knit hose is turned inside out. The contact rollers 3 are reversely rotated and advanced so as to facilitate the long knit hose band 1 being sucked into the pipe 2. The inside out turned knit hose band 1 is taken out of the outlet 4 by the operator and at the position I (Figure 1) is engaged on one of the short cylinders 24. At the position II the separating section 11 of the knit hose 1 engages between the upper and the lower cutters 12', 13', and between the upper and the lower guides 18, 19. The motor M_1 is switched on, and the carrier 10 is moved, thereby causing the engagers 12, 13 to separate from the guides 18, 19. Thus the separating section 11 is stretched as shown in Figure 11. At this moment the motor M_3 is switched on, and the cam plate 29 is rotated, thereby pressing the second plate member 25 against the first plate member 26 so as to hold the toe portion 1' of the knit hose therebetween. Then motor M_2 is switched on, and the cutting blade 15 cuts the knit hose in its separating section 11 at the position III. The clamp unit 30 continues to hold the knit hose 1, and at the position IV the clamp unit 30 comes into engagement with the rail 31, whereby the clamp unit 30 is tilted through 90° to cause the toe portion 1' to be directed upwards. At this moment the relevant slat 22 is raised toward the linking device 32 by the action of the cams 41 and the linking operation effected on the toe portion 1'. When the clamp unit 30

comes into engagement with the push rod 34 at the position IV, the clamp unit 30 is returned to the upright position, and the push rod 34 raises the second plate member 25 thereby to release the toe portion 1' from the clamp unit 30.

When the knit hose 1 held on the short cylinder 24 reaches the position V, the motor M_5 is switched on, and the rotor 38 is moved above the short cylinder 24. Simultaneously, the catcher 37' is engaged with the rear end of the short cylinder 24 so as to secure internal communication therebetween. When the suction duct 37 is connected to the short cylinder 24 through the catcher 37', the motor M_4 is switched on, and the rotor 38 is rotated in the direction in which the toe portion 1' is displaced toward the forward opening of the short cylinder by friction. The suction is started through the suction duct 37 and the knit hose 1 is turned inside out again so that its normal outer side comes outside.

Claims

Apparatus for processing a circular knit hose, characterised by an air suction pipe (2) through which a long knit hose (1) can be pulled by air suction to turn the long knit hose (1) inside out; a cutter unit (12', 13', 15) mounted on a movable carrier and having means (12, 13) to stretch the knit hose (1) at successive positions along the hose (1) at which cutting is desired and to effect cutting to section the long knit hose into unit hose; an apron conveyor (21) having transverse slats (22) with each of the slats (22) at one end mounting a hollow cylinder (24) on which one of the unit hose can be supported and at the other end mounting a clamp unit (30), which clamp unit (30) can clamp a toe portion (1') of the unit hose and is pivoted so that it can be tilted toward the cylinder (24) thereby presenting the toe portion (1') of the unit hose to a linking device (32) which is located adjacent the conveyor (21) and which can link each toe portion with stitches; means (34) for returning the clamp unit (30) to an untitled position and for releasing the knit hose; and a suction duct (37), successively communicatable with the rear end of each of the cylinders (24) at a position at which the conveyor (21) changes direction, for extracting the unit hose by suction through the respective hollow cylinder (24) thereby turning the unit hose rightwards out.

Patentanspruch

Vorrichtung zum Verarbeiten eines rundgestrickten Strumpfes, gekennzeichnet durch ein Luftsaugrohr (2), durch welches ein langer gestrickter Strumpf (1) durch Luftsaugung gezogen werden kann, um den langen gestrickten strumpf (1) von innen nach außen zu drehen; eine Schneideeinheit (12', 13', 15), die auf einem bewegbaren Träger angebracht ist und Mittel (12, 13) hat, um den gestrickten Strumpf (1) an aufeinanderfolgenden Stellen längs des Strumpfes (1) zu strecken, an welchen ein Schneiden erwünscht

ist, und zum Schneiden, um den langen gestrickten Strumpf in Einheitsstrumpf zu unterteilen; einen Gliederbandförderer (21) mit Querstäben (22), deren jeder an einem Ende einen Hohlzylinder (24) befestigt, auf dem ein Einheitsstrumpf gehalten werden kann, und am anderen Ende eine Klemmeinheit (30) befestigt, die ein Spitzenteil (1') des Einheitsstrumpfes einklemmt und so geschwenkt wird, daß sie zu dem Zylinder (24) gekippt werden kann, wodurch das Spitzenteil (1') des Einheitsstrumpfes einer Kettelvorrichtung (32) dargeboten wird, die neben dem Förderer (21) angeordnet ist und die jeden Spitzenteil mit Maschen anketteln kann; Mittel (34) zum Rückführen der Klemmeinheit (30) in eine ungekippte Position und zum Freigeben des gestrickten Strumpfes; und eine Saugleitung (37), die aufeinanderfolgend mit dem rückwärtigen Ende jedes der Zylinder (24) an einer Position in Verbindung bringbar ist, bei welcher der Förderer (21) die Richtung ändert um den Einheitsstrumpf durch Saugung durch den entsprechenden Hohlzylinder (24) herauszuziehen und dadurch den Einheitsstrumpf nach rechts herauszudrehen.

Revendication

Appareil pour traiter un bas tricoté en rond, caractérisé par un tuyau d'aspiration d'air (2) à travers lequel un long bas tricoté (1) peut être

attiré par la succion pour se trouver retourné à l'envers; un groupe de coupe (12', 13', 15) monté sur un support mobile et comportant un moyen (12, 13) pour tendre le bas tricoté (1) en des emplacements successifs de sa longueur auquel un sectionnement est souhaité et pour tronçonner le long bas tricoté en bas unitaires; un transporteur à tablier (21) comportant des lattes transversales (22), chacune des lattes (22) portant à une extrémité un cylindre creux (24) sur lequel un des bas unitaires peut être supporté et portant à son autre extrémité un ensemble de serrage (30), lequel ensemble de serrage (30) peut enserrer un tronçon de bout de pied (1') du bas unitaire et est articulé de façon à pouvoir basculer vers le cylindre (24) présentant par là le tronçon de bout de pied (1') du bas unitaire à un dispositif de liaison (32) qui est situé près du transporteur (21) et qui peut lier chaque tronçon de bout de pied par des points; un moyen (34) pour ramener l'ensemble de serrage (30) en position non basculée et pour libérer le bas tricoté; et un conduit d'aspiration (37), pouvant entrer successivement en communication avec l'extrémité arrière de chacun des cylindres (24) à un emplacement auquel le transporteur (21) change de direction, pour extraire par aspiration le bas unitaire à travers le cylindre creux (24) respectif retournant ainsi le bas unitaire à l'endroit.

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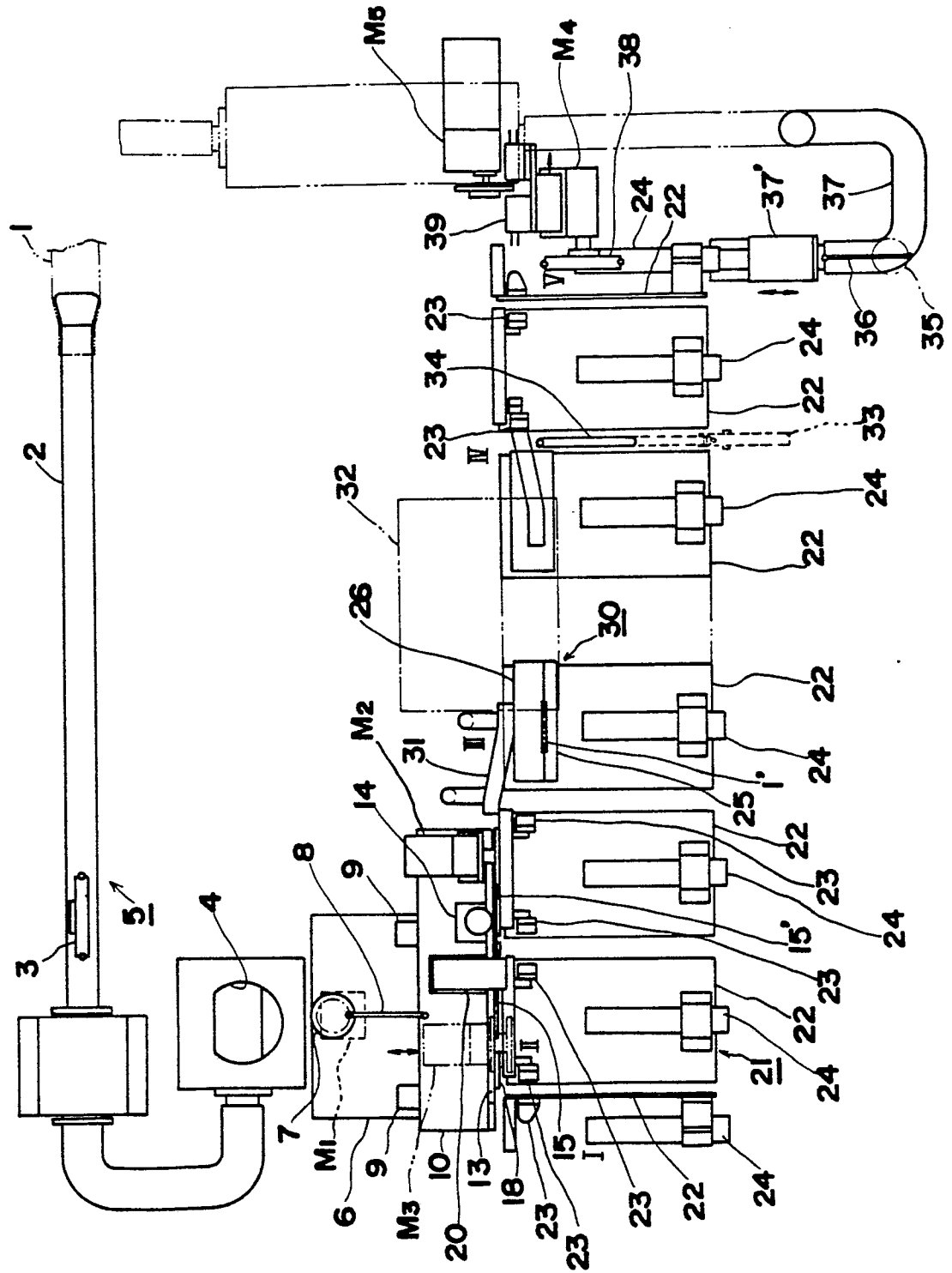
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FIG.1



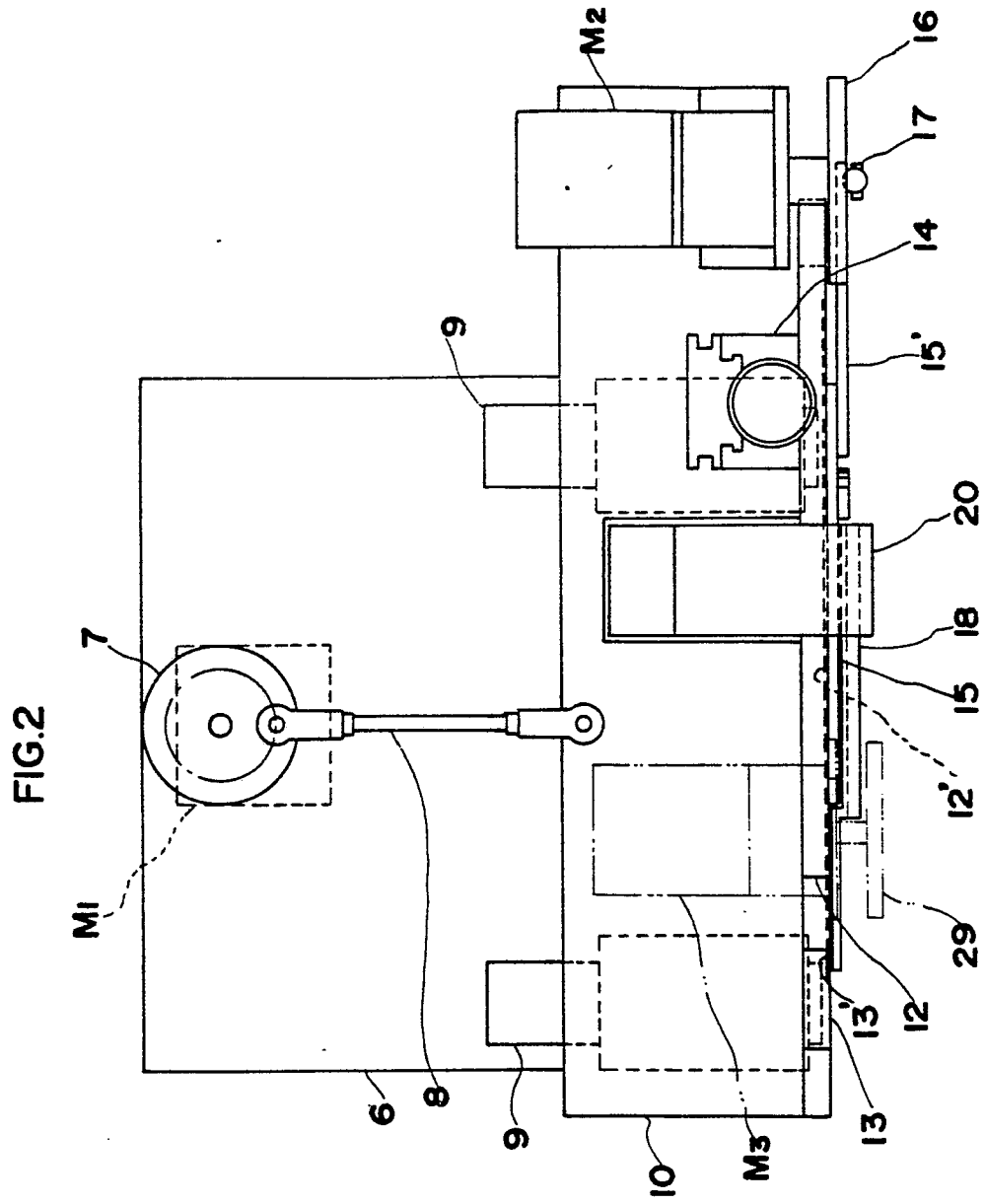


FIG.3

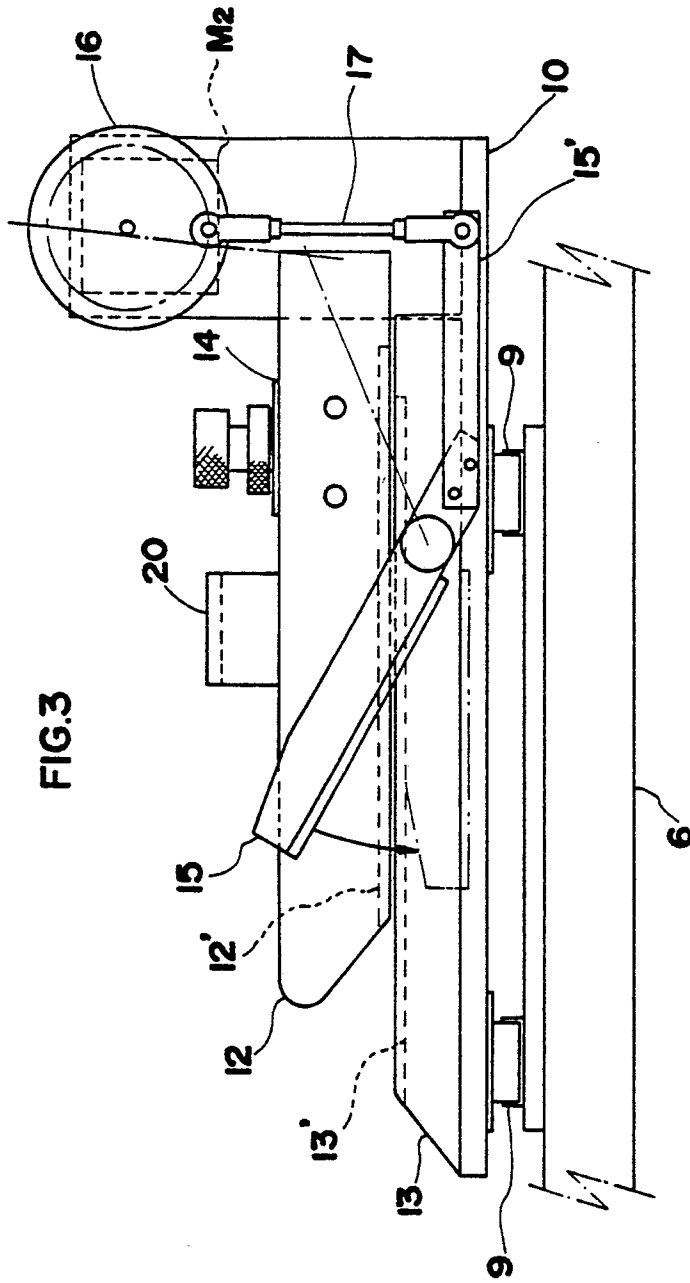


FIG.5

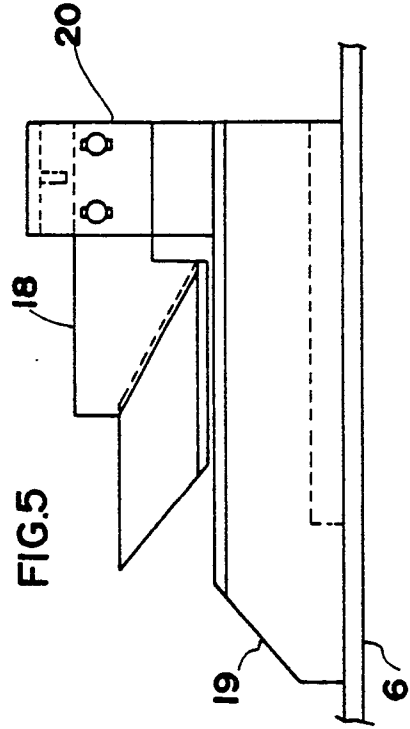


FIG.6

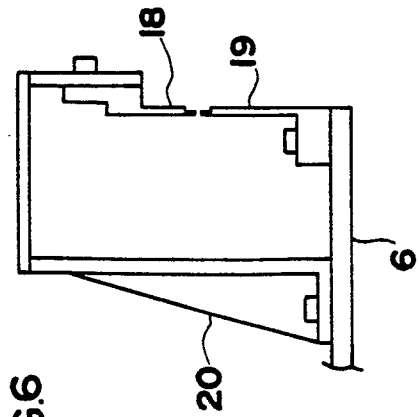


FIG.4

