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(54) **Transport system for workpieces**

(57) A system for transporting work pieces, preferably in the garment industry, includes a main conveyor 101 and a number of branch conveyors 1 each forming a loop from the main conveyor through a working station and back to the main conveyor. The main conveyor is provided with a pinion driver continuous corrugated belt running around a track and carrying dogs to force carriers 2 for the work pieces to move around the track. The branch conveyors are each provided with a downwardly sloping section 132 to let the carriers move from the main conveyor to the work station by means of gravity. From the working station the carriers 2 are moved back up to the main conveyor by means of a discontinuous drive comprising a piston-and-cylinder device reciprocating a chain carrying detents which engage and propel the carriers

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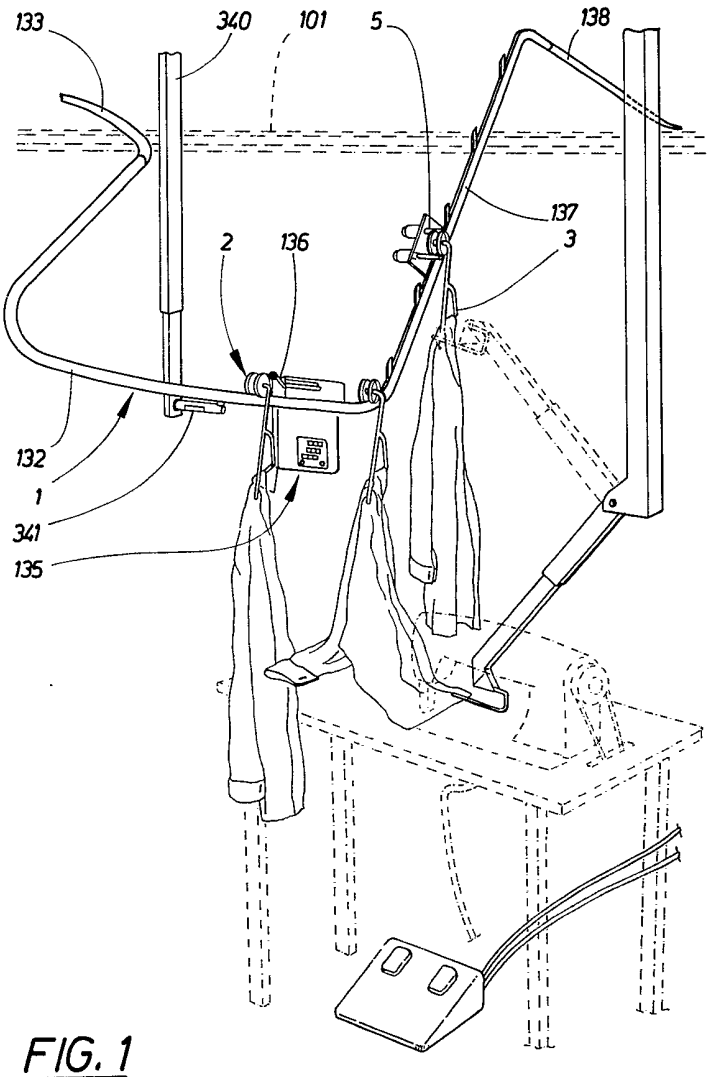

FIG. 1

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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.
This print takes account of replacement documents later filed to enable the application to comply with the formal requirements of the Patents Rules 1982.

on the drive stroke of the device but pivot so as not to entrain the carriers on the return stroke of the device. The carriers may be equipped with address elements which cooperate mechanically with sensing and track-setting apparatus to automatically route the carriers.

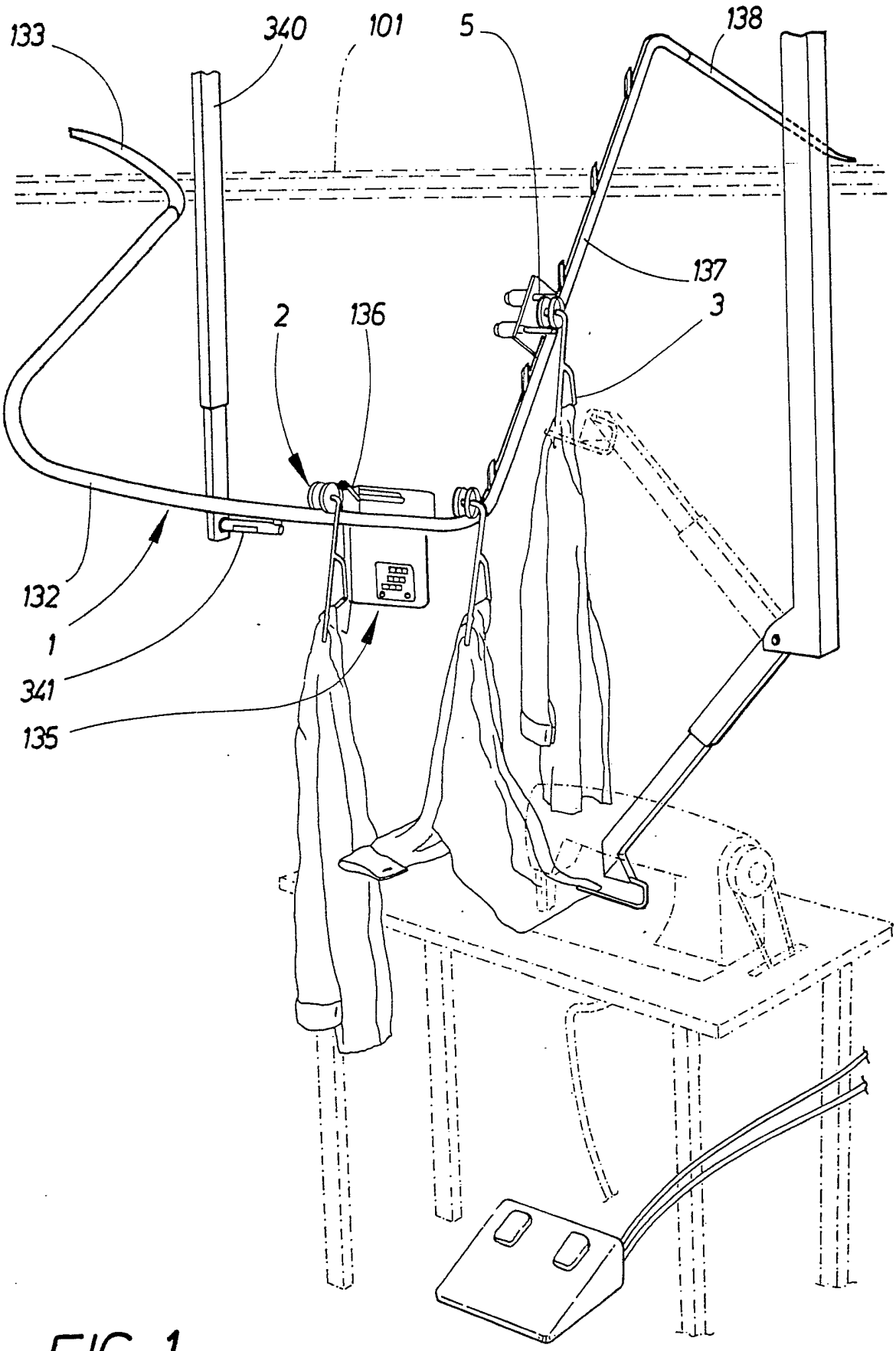

FIG. 1

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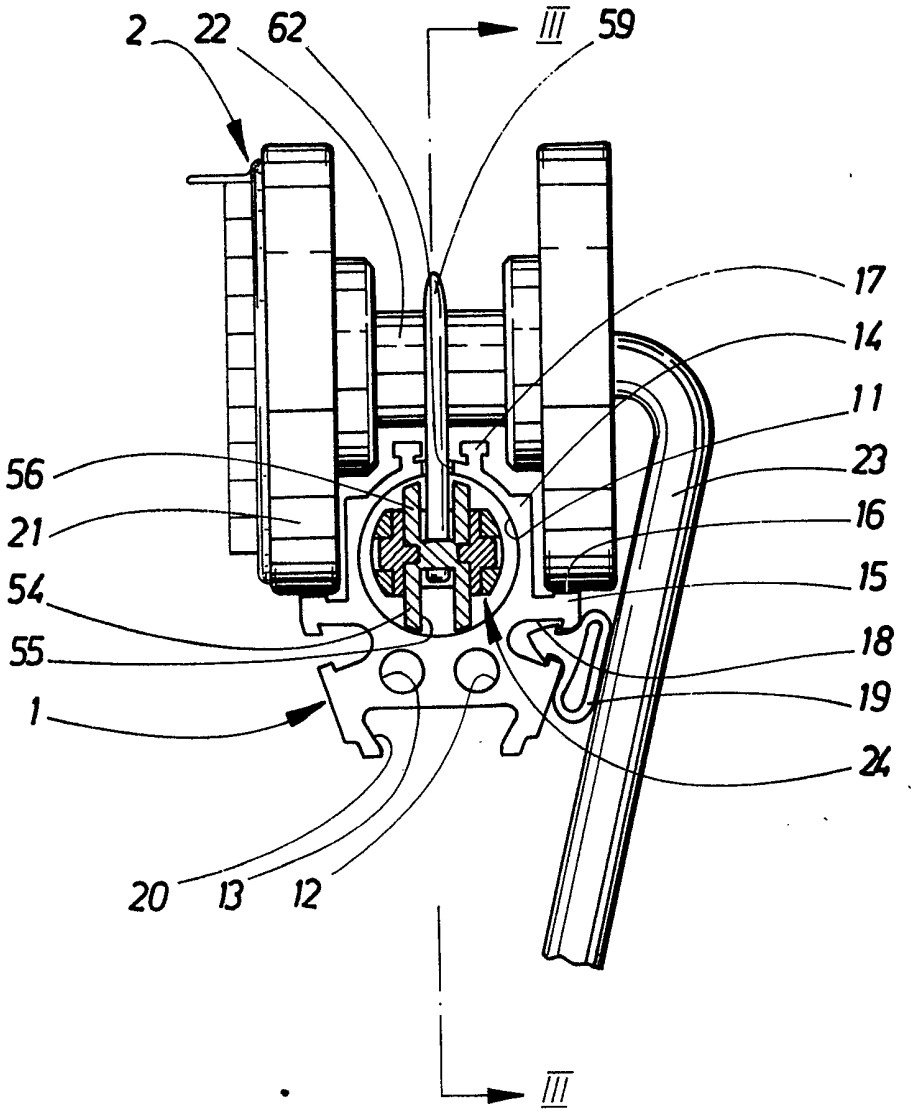

FIG. 2

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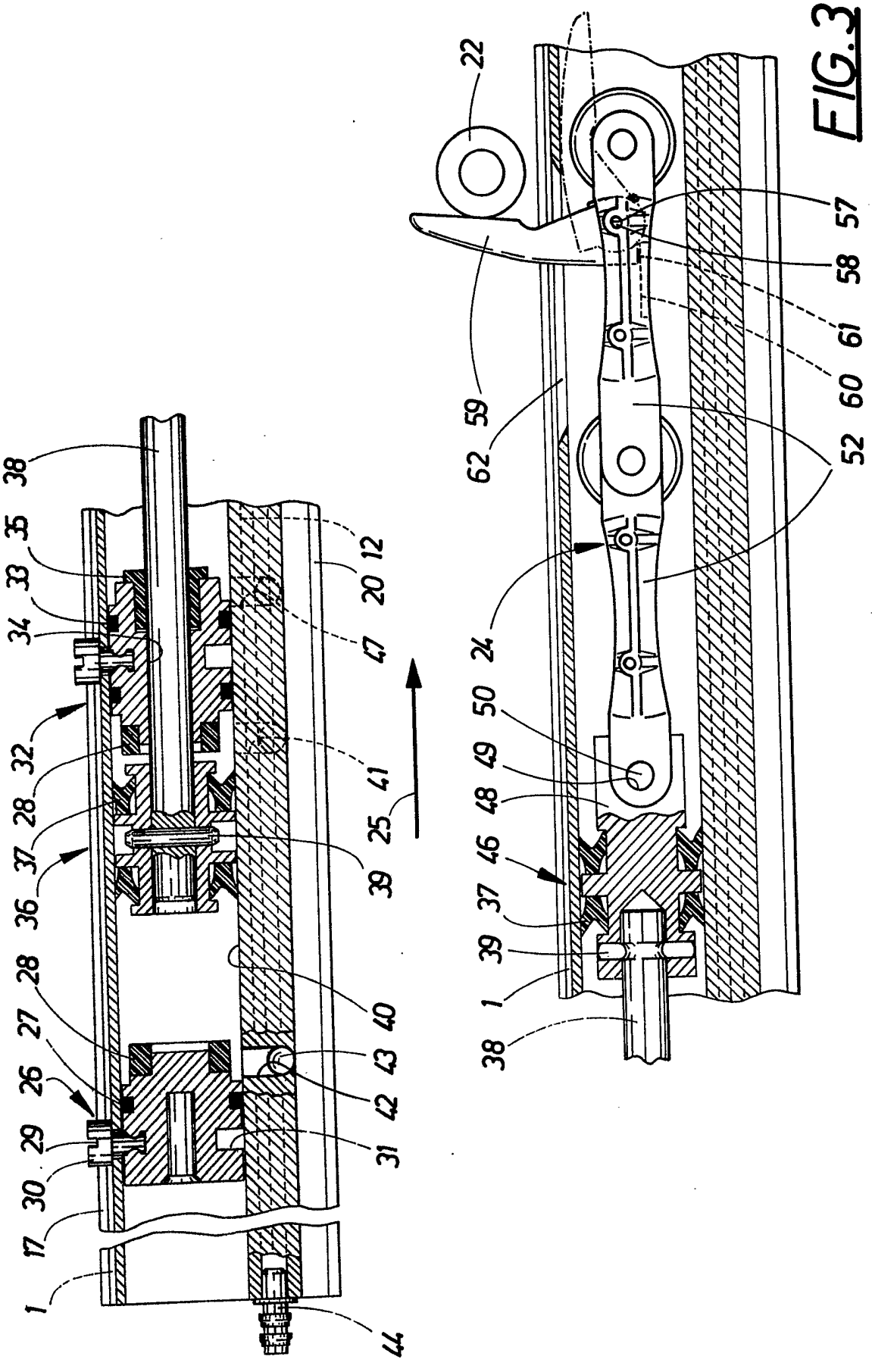

FIG.3

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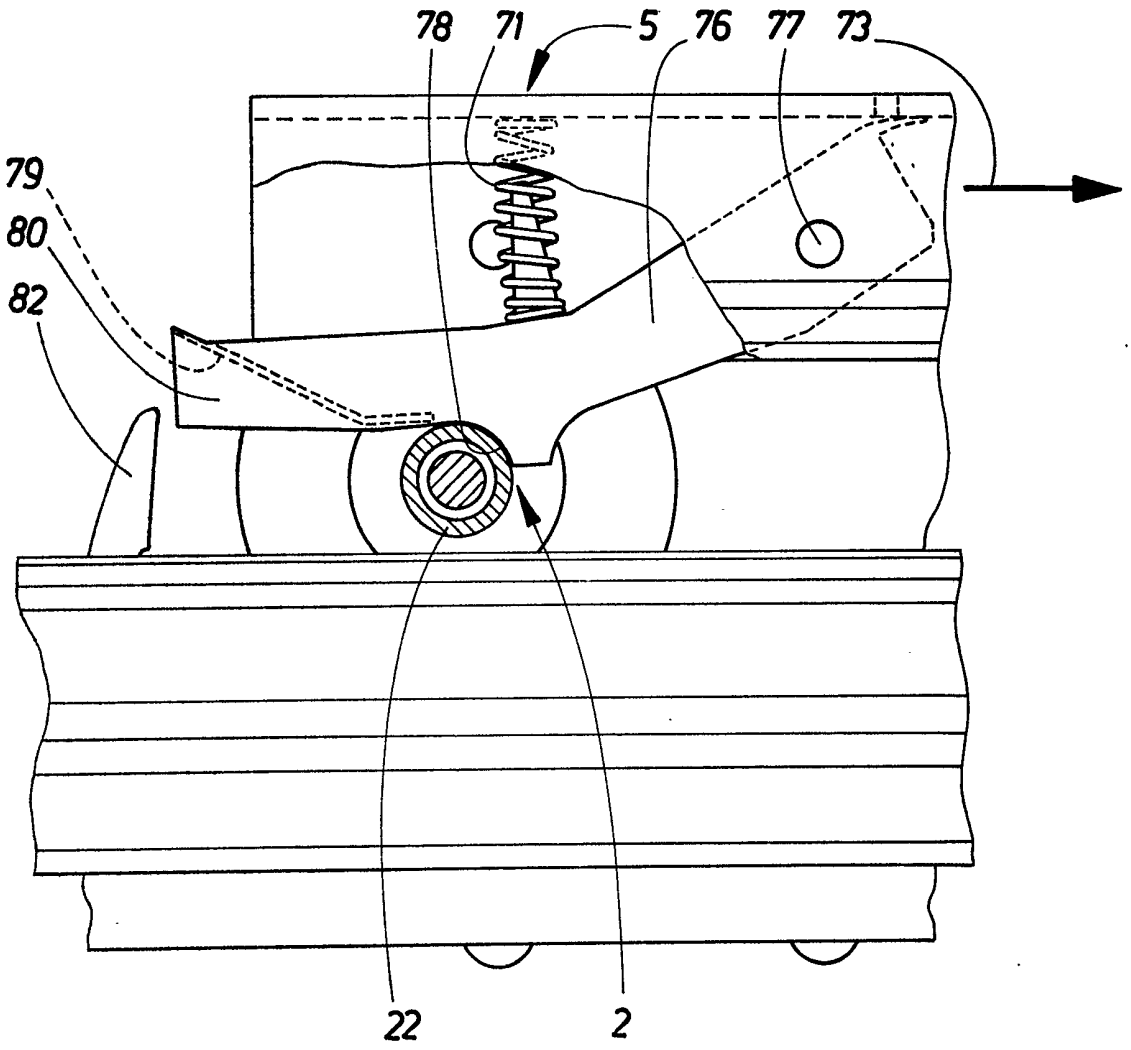

FIG.4

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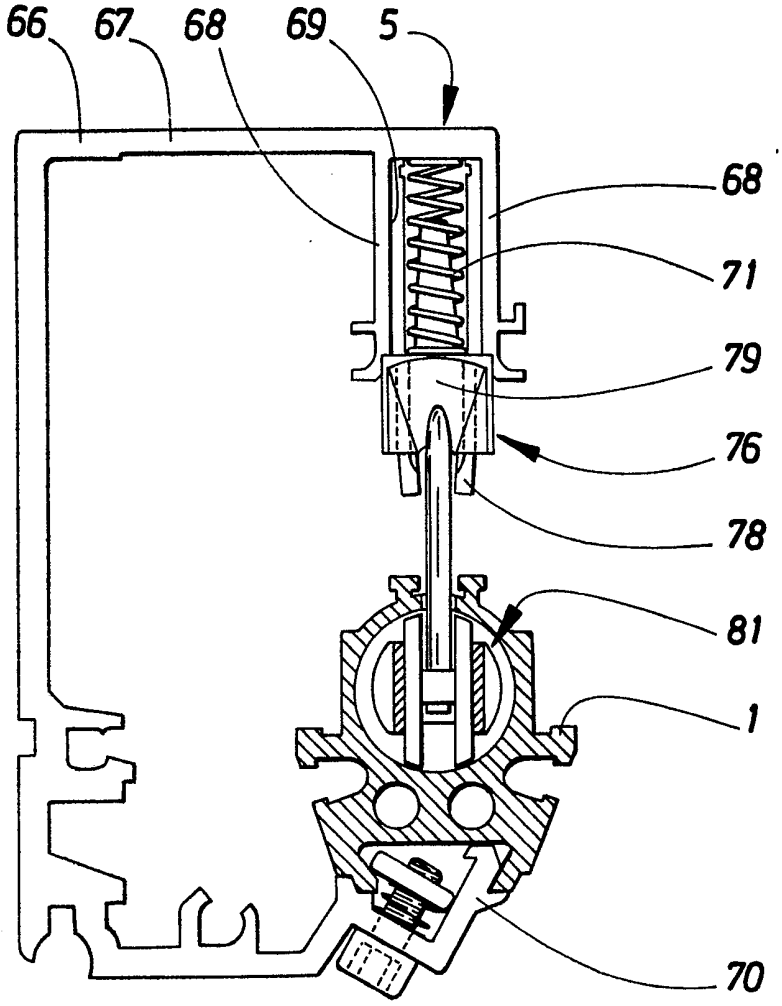

FIG. 5

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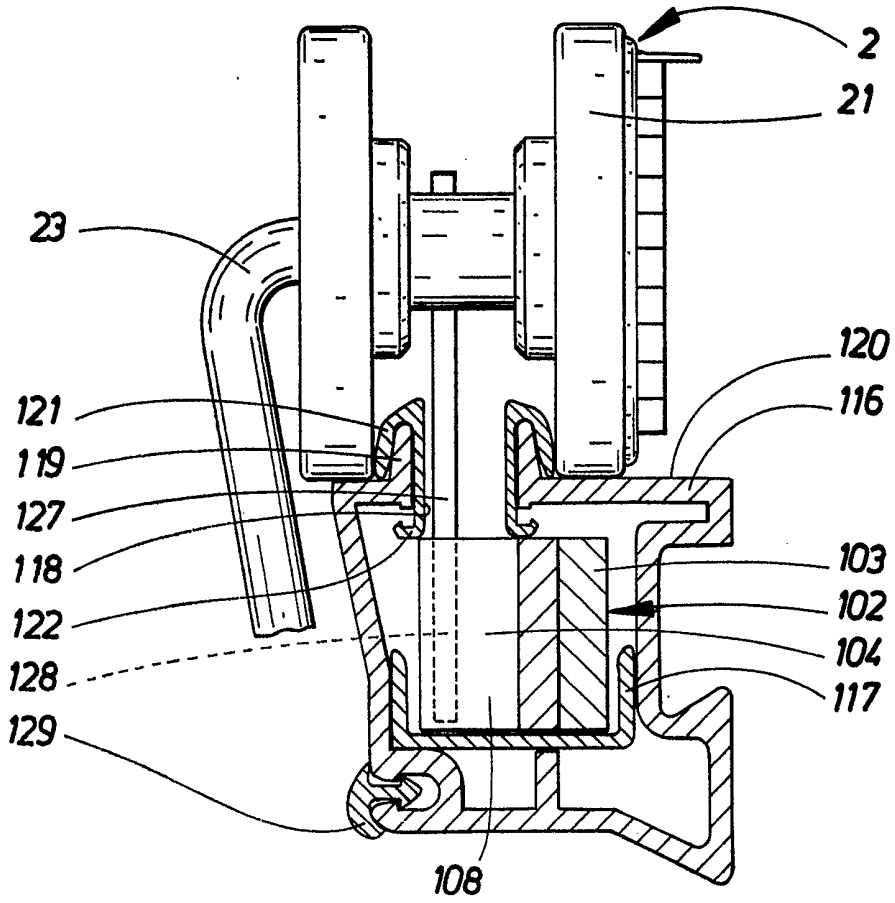

FIG. 6

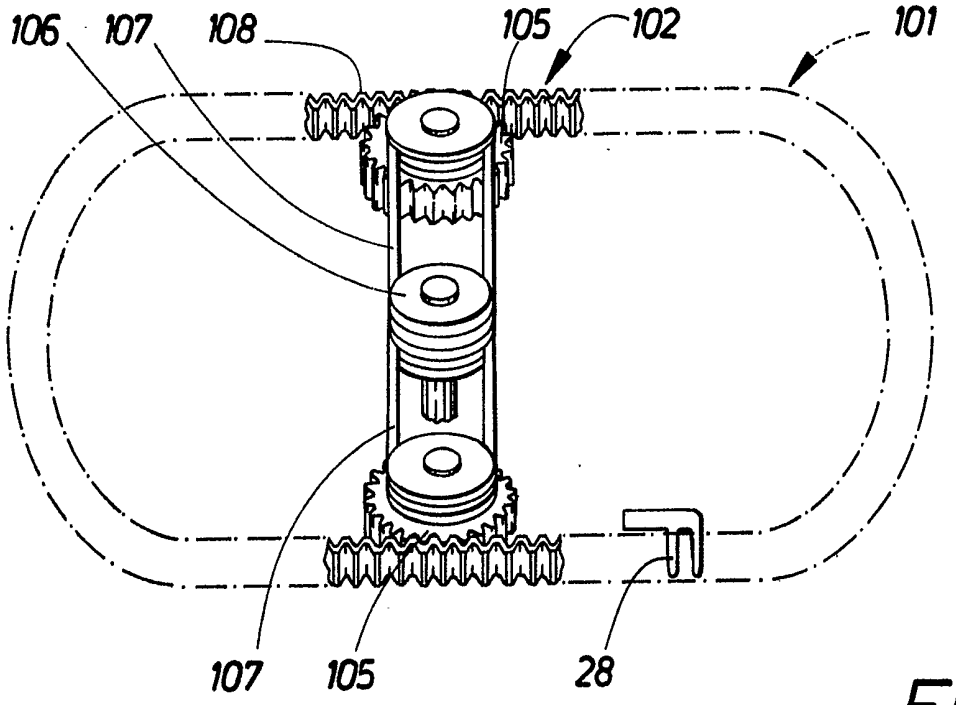

FIG. 7

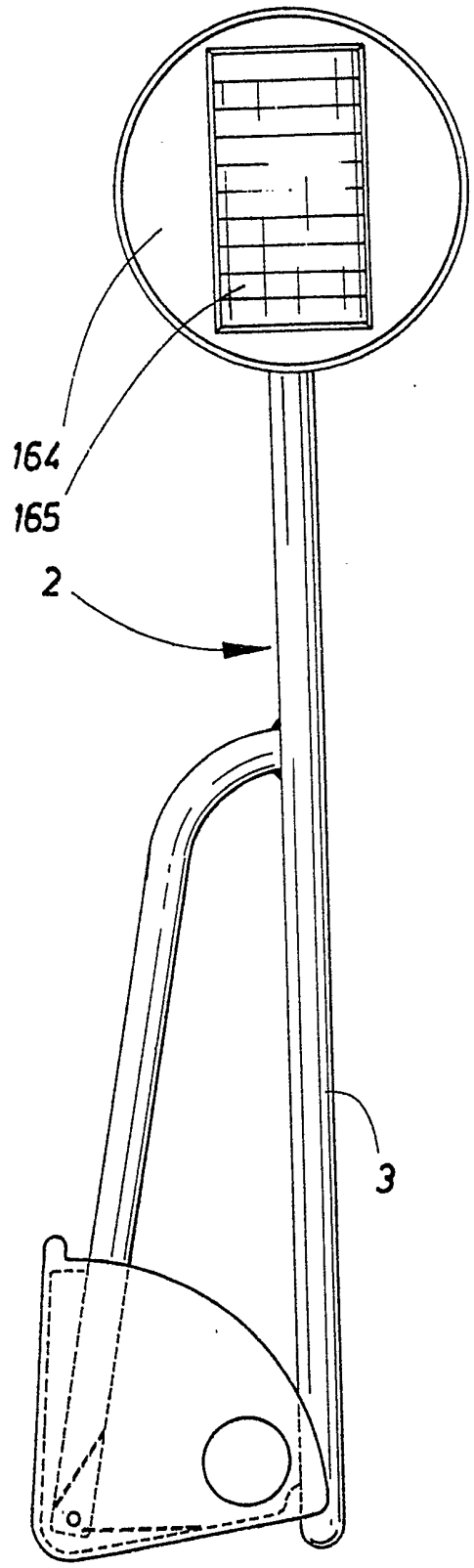

FIG. 8

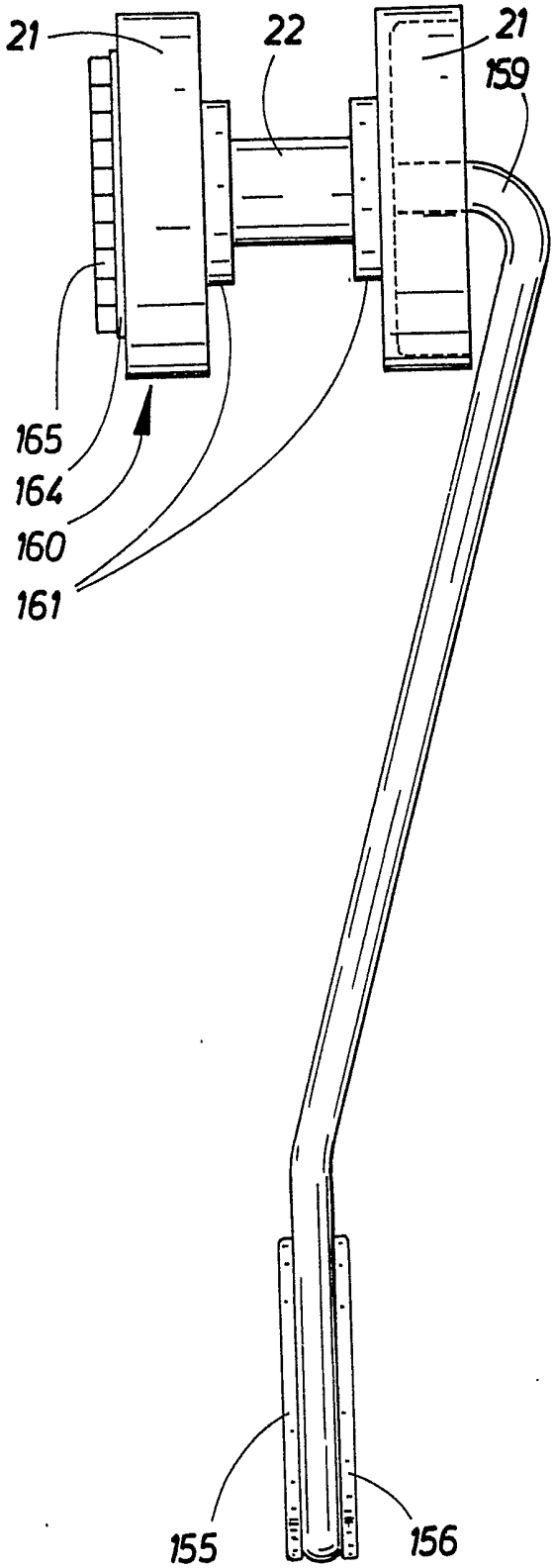

FIG. 9

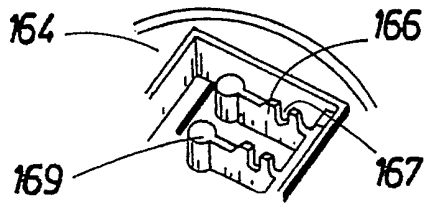

FIG. 10

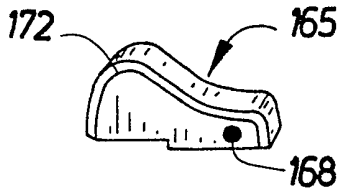

FIG. 11

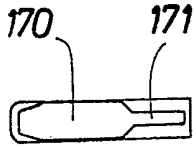

FIG. 12

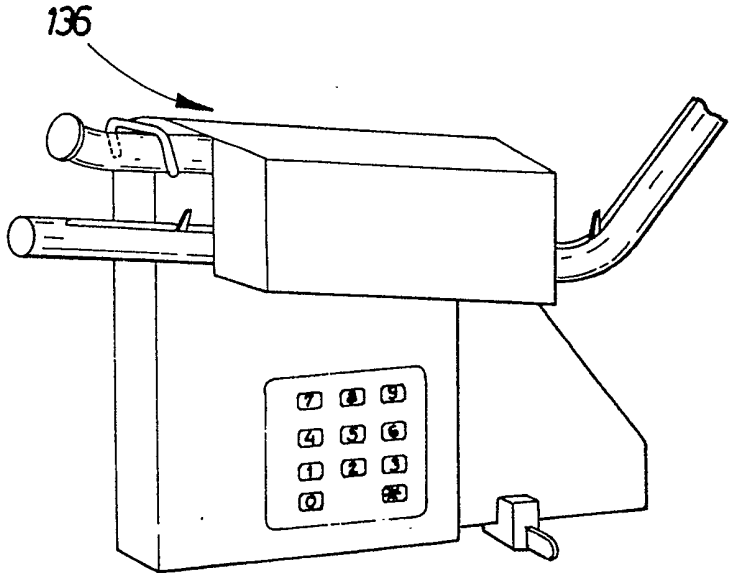

FIG. 13

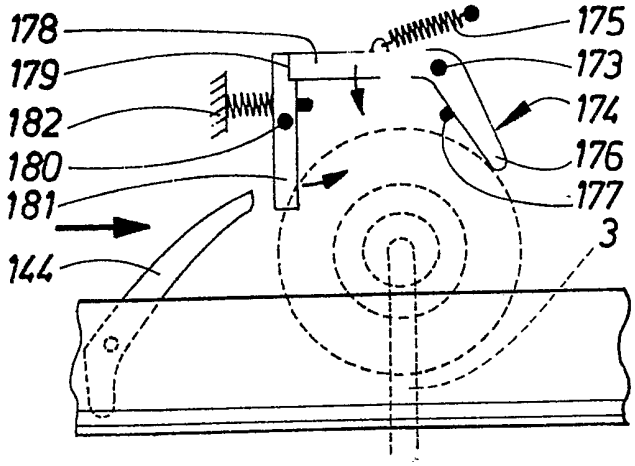

FIG. 14

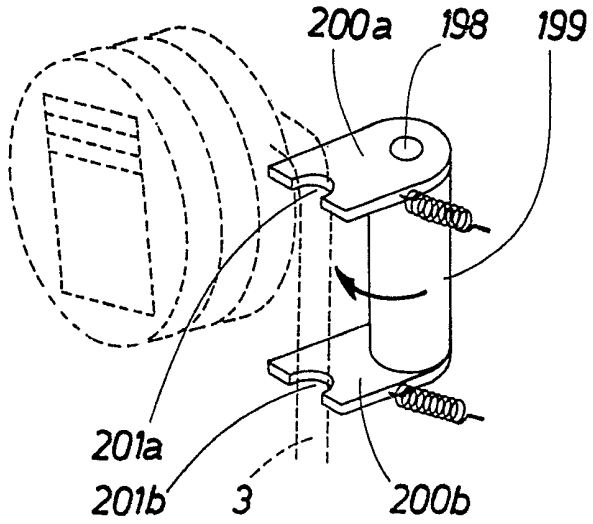
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FIG. 15

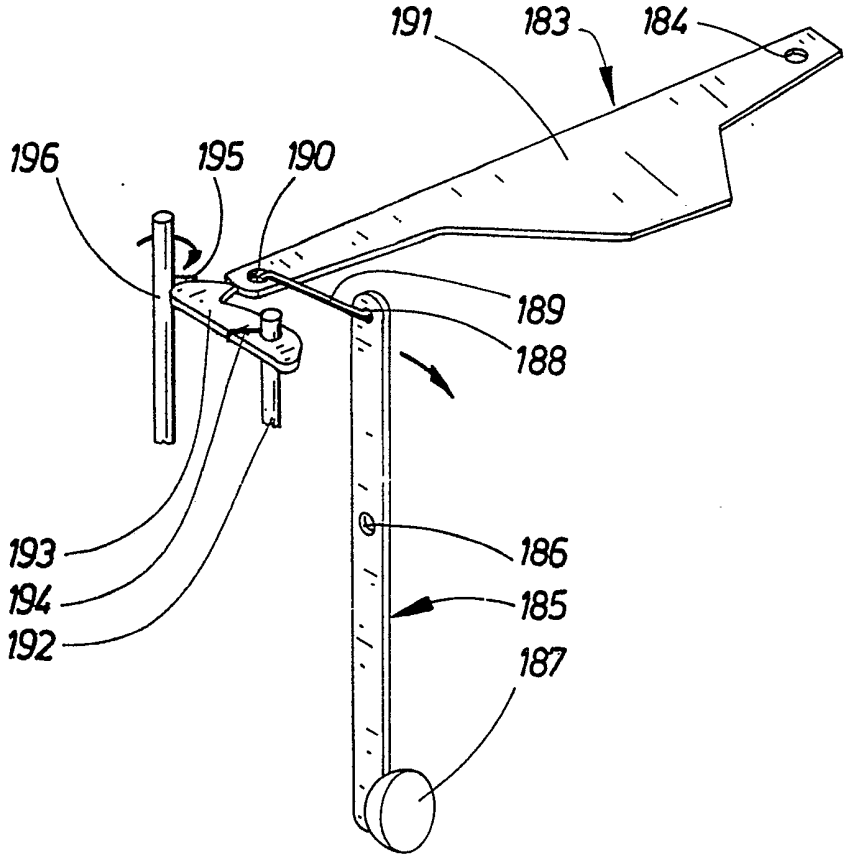
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FIG. 16

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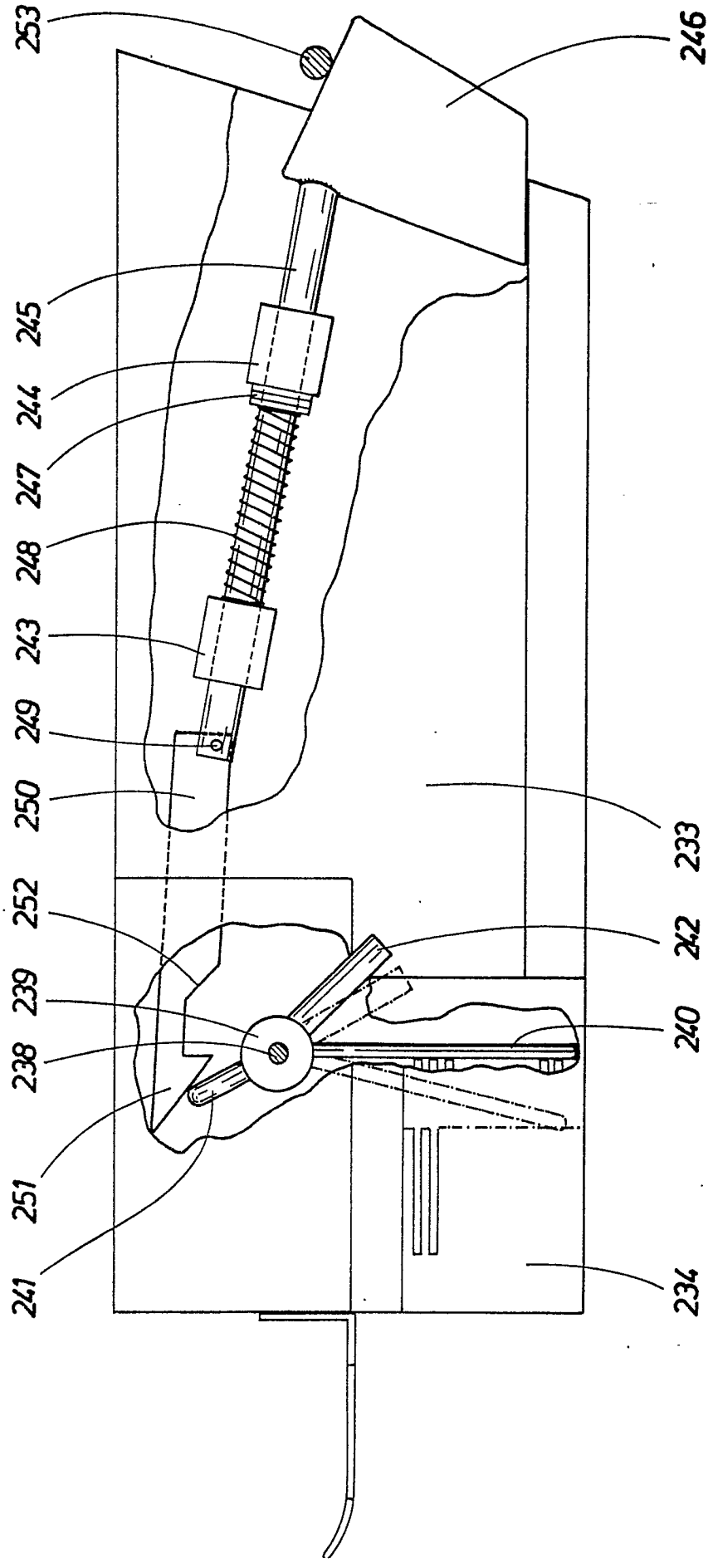

FIG. 17

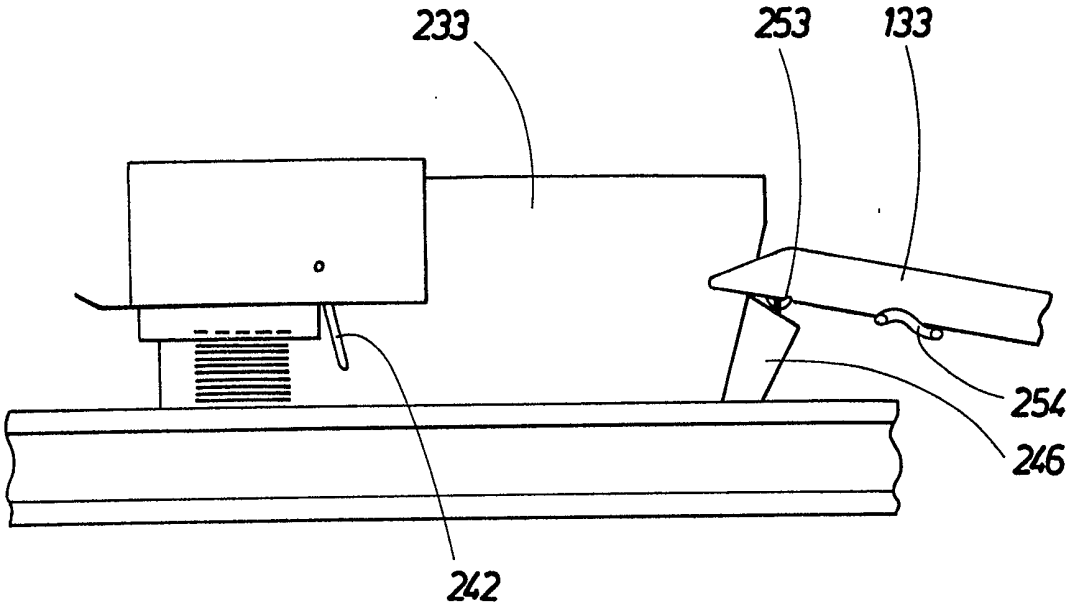

FIG. 18

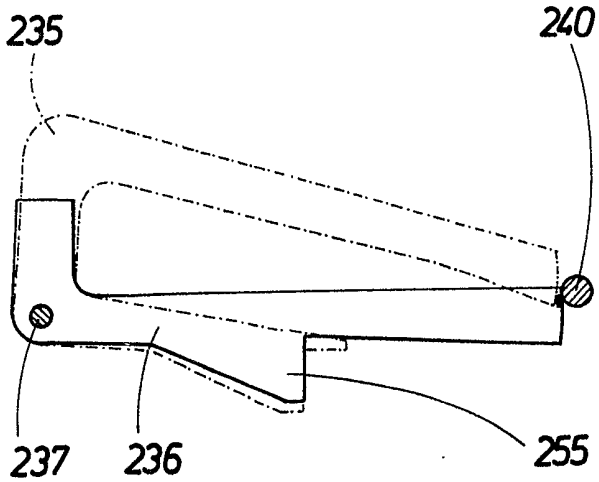

FIG. 19

SPECIFICATION

Distribution system for workpieces

The present invention refers to a distribution system for workpieces, including a continuously driven main conveyor and branch conveyors forming loops between points on the main conveyor and leading to respectively from different stations for the working of the workpieces.

Conveyor systems of the kind referred to are already known in several types. Anyhow known conveyors which offer a real solution to the transport problems inherited in manufacturing systems of a more flexible character are very complicted in design.

The main object of the invention is to provide a universally applicable device which is simple and reliable in construction and in which the objects to be transferred between the different stations may be automatically transferred to selected stations at the same time as the personnel at the different stations may redirect one or several of the objects to other available stations.

Other objects and advantages connected to the new conveyor device will be apparent from the specification and the drawings.

The object of the invention are obtained by means of a distribution system for workpieces characterized in that the main conveyor is provided with a continuous driving element running along a track and provided to force carriers for the work pieces to move along the track by means of a driving motor and that the branch conveyors are provided to let the carriers move along the conveyor by means of gravity on a section of the conveyor sloping downwards in the transportation direction and to move from the working station substantially at the lowest point of the conveyor upwards back to the main conveyor by means of a discontinuous working driving means provided to move to and fro along the section of the conveyor descending from the working station to the main conveyor.

The drawings illustrate a preferred embodiment of the invention as well as some details of the same. In the drawings

Figure 1 shows in prespective view a section of a branch conveyor track;

Figure 2 illustrates a cross section through the drive device of the conveyor;

Figure 3 provides a longitudinal section through the drive device;

Figures 4 and *5* illustrate stopping means along the track;

Figure 6 shows a sectional view of the main conveyor;

Figure 7 shows schematically the main conveyor;

Figure 8 is a side view of the carrier to be transported by the conveying device;

Figure 9 is a side view of the carrier;

Figure 10 is a perspective view of a portion of the address section of the carrier while;

Figure 11 and *Figure 12* show in perspective respectively from below one of the address elements of the address section;

Figure 13 is a perspective view of an address apparatus and

Figure 14 shows diagrammetically a latch arrangement;

Figure 15 shows diagrammetically a means belonging to the address apparatus and serving to hold the carrrier during the addressing operation;

Figure 16 shows diagrammetically and in perspective how the keys of the keyboard of the address apparatus may control the actuating members of the apparatus;

Figure 17 illustrates a sensing apparatus, partly in section;

Figure 18 shows the same apparatus in a side view and with an unloading arm in an inactive ready position;

Figure 19 is a plan view relative to Figures 17 and 18 in this sensing apparatus adapted sensing elements in a non-operated position.

Generally the distribution system includes a continuously feeding main conveyor 101 according to Figure 7, see also Figure 1. It comprises a driving element 102 made from a relatively rigid material with low friction coefficient such as amide plastic resin and being guided in a guiding profile 116, shown in Figure 6, which determines the extension of the conveying path. The driving element 102 can be composed of sections 103, 104 which are joined together.

The driving element 102 shows corrugated-shaped running outer sides located in two outer planes opposed to each other of element 102. In end view, the driving element in Figure 6 is mainly square-shaped in which two sides of the square are composed of the said outer corrugated surfaces and the other two of the two side surfaces which constitute the breadth of the corrugated band. From said outer surfaces V-shaped grooves 108 stretch inwards forming the corrugations (Figure 7).

A corrugated band, such as drive element 102 will have a substantial capacity for modification of shape resulting from its basic form. This property can be controlled by altered forming with larger or smaller material thicknesses. The depth of groove 108 is also of significance and in particular the overlapping between grooves, i.e. the distance along which grooves from one side of the element penetrate the line along which the bottoms of the grooves from the other side are positioned. By means of a suitable overlapping the element can be possible to bend in both directions for following a track curved as well as in slopes and can also be twisted if desired. In spite of this the element can have a good transportation capacity. Without overlapping a certain bending in both planes is achieved, but on the other hand no stretch or compression possibilities are obtainable apart from that permitted by the material's own stretch or compression properties. In certain cases it may however happen that an unstretchable driving element is wanted and in that case the groove depth can be limited.

As also stated, the driving element shall also be sufficiently stiff to permit of the connection of carrier elements and driving devices to occur in grooves 108. In that case, the requirement to be met is that,

during driving resistance and loading, the element must not straighten itself out so that the corrugations and hence the grooves change their shape appreciably owing to pitting by the driving device. This is achieved by preventing the material thickness from becoming too small and by choosing a relatively stiff material. A stiff amide resin which can be die cast is an example of a suitable choice of material.

In Figure 6 driving element 102, shown in section, is set in a guiding means. The latter is composed of an aluminum profile 116, in which has been inserted a U-rail 117 of a material with good sliding properties vis-a-vis the material in driving element 102. Aluminum profile 116 has at the upper side an opening 118 which is capped by upward-pointing flanges 119. Upper side 120 of the profile from which flanges 119 project are shaped like a flat roller-way. The sides of flanges 119 and openings 118 are shielded by two profiles 121 of a material with good sliding and abrasive qualities. Profiles 121 expose lower collar flanges which form a support from above for driving element 102. Driving element 102 therefore lies in U-flange 117 and is removed from its base and steered by its flanges, obtaining a certain degree of support from flanges 122 from above. As will be apparent also from Figure 7, the driving element is so mounted that its sides 7 are pointed upwards and downwards and hence grooves 108 are open at both sides.

Grooves 108 can therefore be employed for driving the carriers. Figure 6 shows one such carrier 2 with wheels 21 which can run along the upper side 120 of profile 116 and is thereby steered by flanges 119 via profiles 121. The carrier includes a load holder 23 via a centre shaft 22 and can have the shape of a hook, a bowl or practically speaking any kind of carrier, depending on the nature of the goods to be conveyed. A transporter 127 with two fingers 128, sunk in two grooves to driving element 2, stretches downwards (see also Figure 7) is in contact with centre shaft 22 and conveys load holder 23. Figure 6 shows also how profile 116 can have a sliding bar 129 at the extreme base to form a support for load-holder 23 in case the latter should swing.

The drive system for driving element 102 is shown in Figure 7. According to the figure the drive element here forms an endless belt, running over a long-distance track. At the middle point of the track, where the parts of the driving element travel parallel with each other, there are two toothed wheels 130 which clamp inwards-facing grooves 108 to the drive element. Working of the toothed wheels is controlled by intervening pulley 131, which via belt 132 operates the toothed wheels with an electric motor (not shown) as power source. Profile 116 appears in the middle of the toothed-wheel entries through which the toothed wheels extend to the driving element. In general the profile can be of the same section and manufacture for the whole of its length and the track formed by the spar is likewise endless. This track can be assembled from several units such as straight, bent in one or more planes and even twisted units. The movement of the driving element is not impeded by relatively extensive bending and twisting - in fact the former assist the re-shaping process because of steering by the track formed by the spars. For very long tracks several driving point can be arranged and synchronisation obtained via the driving element. It is likewise possible to drive devices from the driving element, e.g. a discharging unit or stripper for materials on the carrier. The main conveyor 101 is supported by a member of columns not shown and is provided with bars 340. The bars 340 in turn support outriggers 341 for supporting the branch conveyors and means belonging to the same.

The branch conveyors may cooperate with the main conveyor just described as shown in Figure 1, which shows a working station in a producing line used for manufacturing shirts. The branch conveyor according to this figure includes a first section 132, which is in the shape of a girder which extends obliquely downwards from the main conveyor and in its upper end terminates in a turnable unloading arm 133, which in its upswung position permits roll-bearing carriers 23 which have been transported by the main conveyor to pass behind but in its lowered position catches the carriers so that they by gravity may slide downwardly along the section 132 until they are caught by a catch 136, adapted at the entrance of a so-called address apparatus 135. The section 132 continues in another upwardly slooping section 137, which in its upper end terminates in a turnable unloading arm 138. A part of the section 137 includes a pressure medium operated cylinder (Figure 3) which consequently has the same outer diameter as said girder.

Figures 2 and 3 show the girder with reference numeral 1 which forms a roller track for a number of the carriers 2 which are designed to carry material hanging therefrom by means of hooks 3. The girder 1 is supported by a frame in which bar 340 forms a part. Over the initial section 132 of the path the latter slopes in the direction of transportation, so that the carriages roll forward under their own weight. This means that they arrive at a lowest point along the path where said catch 136 is positioned. This lowest point is followed by said inclination 137 in the track along which the carriages have to be fed by means of a drive device (including said pressure operated cylinder). A detent device 5 forms part of the drive arrangement. After the ascending portion 137 of the track there is an unloading section of the unloading arm which has been mentioned before. It slopes downward in the direction of transportation.

Figure 2 illustrates the girder 1 in cross section. As can be seen from the diagram the girder is tubular in shape with a groove 11 of large diameter and two holes 12 and 13 of smaller diameter. The upper portion of the girder which encloses the groove 11 has two parallel side surfaces 14, which are terminated at the bottom by flanges 15 with upper surfaces 16. At the top the girder is terminated by short flanges 17 which, as will be explained later, can function as guides for the feeding device. Under the flanges 15 there are grooves 18 on both sides which, as shown on one side can be employed for supporting a protective border 19. Underneath the girder has a dovetail-like groove 20 which is provided for attachment and support of the girder, this being

joined to a frame by means of clamping devices which engage in the groove 20.

The cross section described comprises a section of the girder which is central to the invention. However the girder need not consist solely of this portion, but can for different applications possess further sections, used for example for attaching adjacent devices or for types of suspension other than those specified in which the groove 20 forms a part.

As shown in Figure 2, the upper surfaces 16 of the flanges 15 are designed to support wheels 21 on the carriages 2 previously mentioned. The side surfaces 14 serve to guide the wheels 21. The wheels are joined by means of a shaft 22 from which, on one side, an arm 23 projects, which is terminated at the bottom by the hook 3 previously mentioned (not shown in Figure 2). As indicated previously by Figure 2, the groove 11 is employed as a mounting for a reciprocating drive chain 24, which like other devices mounted in the groove 11 will be described subsequently.

Figure 3 shows a longitudinal section through the girder adjacent to the ascending section 137 in accordance with Figure 1. The direction of transportation of the carriages 2 along the ascending section is indicated by an arrow 25 in Figure 3.

In Figure 3 we see once more several of the sections of the girder 1 described previously, including the groove 11 and the apperture 12. In Figure 3 the girder is divided into two sections, for reasons of space, the lower section being intended to follow on to the right after the upper section. A plug 26 in the form of a cylindrical body with a O-ring 27 inserted in a groove is provided to the extreme left in the first section of the girder, represented by the upper section, and on one side there is a buffer ring 28. The plug 26 is secured at the desired location in the groove 11 by virtue of the fact that the hole is drilled through the base of the groove between the flanges 17, an oval pin provided with a screwdriver slot being introduced through the said hole, whereby in one rotational position the pin can be freely introduced into a groove 31 on the plug 26, whilst in another rotational position it presses against the sides of the groove and is thus held firmly. At some distance from the plug 26 there is a second plug 32 which is held in position in the same way by means of an oval pin 30. The plug 32 has two O-rings 33 together with a buffer ring 28 in roughly the same manner as plug 26. As distinct from plug 26 however plug 32 is traversed by a groove 34 with a sealing bush 35. The plugs 26 and 32 have buffer rings 28 which face each other and in the space between them a piston 36 is inserted provided with two retaining rings 37 and fastened to a piston rod 38 by means of a pin 39. The piston rod 38 extends through the grooves 34 and is sealed against the gland 35. The piston 36 is designed to move backwards and forwards in the cylindrical space 40 formed by the groove 11 between plugs 26 and 32. In order to bring about movement of the piston a pressure medium must be fed into the cylindrical space alternately on either side of the piston. The holes 12 and 13 are employed for this purpose, whereby one of the holes is connected by means of a drilled transverse hole 41 with one end adjacent to the plug 32 of the cylindrical space whilst the second hole is joined by means of a second transverse drilled hole 42 with the other end of the cylindrical space at plug 26. Since the holes have to be drilled from outside, this results in an outlet to the outside of the girder which has to be sealed. As shown in Figure 3, this is done by pressing balls 43 into the outer ends of the holes 41 and 42. The pressure medium, preferably compressed air, can be supplied to the holes 12 through hose nipples 44. The ends of the hole 12 has to be sealed at the end of the beam, and this can similarly be done by pressing in balls 45 (see the lower section of figure, on the right).

Figure 3 illustrates two cylindrical spaces. There is actually nothing to prevent several pistons being provided along the piston rod 38 and these can be located between plugs of the same type as plug 32. These cylindrical spaces are connected in the same way as cylindrical space 40 by means of drilled holes 41 and 42 which resemble the transverse drilled holes. By this means the piston force which is restricted by the limited dimensions of the girder and the desire to restrict the internal pressure therein should it be decided to design this as extruded profile in aluminium or plastic, can be doubled or multiplied even further. In this connection it is not essential to design all pistons so that they exercise force in both directions. With the arrangements shown here the conveyor work takes place only in one direction (see arrow 25), whilst the movement in the other direction is a return stroke, which requires a negligible amount of force.

Having regard to the above-mentioned conditions in the present embodiment the force in the direction of transport has been doubled by providing the piston rod 38 at its end (see the lower section in Figure 3) with a second piston 46 having sealing rings 37. Here too the piston rod is attached by means of a pin 39. Here too there is a transverse drilled hole 47 which is linked with the same hole 12 from which the transverse drilled hole 42 originates.

The cylindrical space or spaces which are formed in the groove 40 form together with the piston 36 and 46, and possibly with further pistons, a pneumatic force device. Alternatively the force device can be hydraulic, but here it is assumed that the drive takes place by means of compressed air. The member which moves the force device is the piston rod 38. This must be connected to a driven device and in the following a description is given of a forward-drive device for the carriages 3. For this purpose the piston rod 38 is provided with a head 48 which forms a part of the piston 46. Through this there is a hole 49 to which the chain 24 shown in cross section in Figure 2 is connected by means of a pin 50. The chain consists of links 52 which are fork - shaped at their ends. The fork-shaped end of the first link surrounds the said head 48 and is joined with this by means of the pin 50. The second link 52 in the chain surrounds the fork-shaped outer end of the first link 52, after which the remaining links follow in the same manner in sequence. This description should indicate that one fork-shaped end of the link is wider than the other. In each link, inside the narrower fork-shaped

link a wheel 54 (see also Figure 2) with a centre groove 55 and slide ways 56 is provided, which can be inscribed in a circle having a diameter somewhat less than that of the groove 40. Thus the chain with its wheel 54 can be carried in the groove 40. The outer link ends and the wheels 54, each of which thus possess two roller paths 56, are mounted on the inner link end which is provided with studs which extend outwards and through the holes in the outer link and inwards through the holes in the wheel 54.

The links 52 are all mutually identical in the embodiment illustrated and they also contain the holes extent arms 59, which by means of a surface 60 can rest against a centre portion 61 of the respective links which forms a bridge between the link sides are mounted in the links by means of pins 58. Thus the detent arm 59 cannot be moved backwards (anti-clockwise in Figure 3) beyond its raised position in which the arm tries to maintain itself against the action of a trosion spring, not shown. On the other hand the detent arm can be moved forwards inside the outermost portions of the link, i.e. the slide paths 56. This means the detent arm comes to rest in the grooves 55 of the nearest roller. Not every link is provided with a detent arm, these being located at a certain distance, as will be indicated by the following description. The detent arms can extend outwards from the groove 40 thanks to the provision of the groove 62 between the flanges 17 (see Figure 2) at the centre of the location where they should make contact.

The chain described is designed to feed the carriages 3 along the ascending portion 137 of the girder 1 by means of its detent arms. Hence for this purpose the detent arms of the chain move too and fro so that they can feed the carriages in sequence up the incline with the detent arms in the unfolded position, whilst during the return stroke the detent arms can swing inwards against the action of the said spring so that they can pass at the rear of the carriages for a new working stroke. However to ensure that the carriages are not participating in the return movement, the detent device 5 mentioned in conjunction with Figure 1 is provided. This consists of a U-shaped girder 66 which is attached in the grooves 20 on girder 1 and is thus supported by the latter. The upper flange 67 of girder 66 carries a hinge-mounted detent hook 76 which is spring-loaded so that it can fold downwards, giving way to the carriages when these pass in the feed direction, but which drops out at the rear of the carriages and prevents a return movement past the detent hook. Hence the detent device 5 is self-acting as a result of the pressure exerted by the carriages during their forward feed.

Thus the force device which is formed by the components described which are inserted in the tubular-shaped girder 1 is used for the forward transport of the material on the girder which is designed as a roller track. However, force devices designed in a similar manner which are integrated with the girder 1 can be employed for functions other than direct forward transport, such as different control functions. As an example of such an application of a force device integrated with a girder, a description will be given in the following of the step forward feed catch denoted by 136 in Figure 1. The object of this is to feed the carriages forward stepwise one at a time in a pre-determined time sequence regardless of whether the forward feed along th sloping portion 132 of the track occurs in a different sequence. Hence the carriages can form a queu in front of the step forward feed catch 136 and from this be released one by one to the lowest point of the track where it is assumed that there is a delay station for the material.

As shown in Figures 4 and 5 the same type of device as the device 5 and the catch 136 to form the frame can be used. It is formed by the U-shaped girder 66. As shown in Figure 5 two edge flanges 68 which form between them a groove 69 proceed downwards from its upper flange 67. The lower flange 70 of the girder is fastened at the groove 20 to the previously-mentioned girder 1 which contains the force devices and which comprises the track for the carriages 2. The spring-loaded detent hook 76 which can pivot around a shaft 77 and which attempts to adopt the lower position illustrated in Figure 4 under the action of a spring 71 is mounted in the groove 69. From this position the detent hook 76 can be folded upwards to an upper position. In the lower position the detent hook 76 rests against the shaft 22 of a carriage 2 which is moving along the girder 1. The detent hook 76 has a stop surface 78 which is so steep that the axle 22 of the carriage is not able to lift the detent hook against the action of spring 70 which attempts to swing it downwards to the stop position illustrated in Figure 4. As shown in Figure 4 the detent hook 76, in front of the stop surface 78, has a gently sloping surface 79 which however can never be reached by the axle because it is surrounded by downward-projecting flanges 80.

As shown furthermore by the figures, in the centre of the step forward feed device 5 a chain 81 of the type previously described is inserted which by means of a forward feed arm 82 which can swing forward in the direction of feed as previously described. The chain can be fed forward and backwards by means of a force device of the type already described. This force device can be separated if it is desired to control the stepwise dorward feed by means of the detent, regardless of the forward feed along the ascending portion 137 of the track. However since the same number of carriages generally has to be transported away from the delay station 136 as is fed step-wise to the latter, a single force device can often be employed for both functions to feed the carriages forward step-wise through the step forward feed detent and to feed them up along the ascending portion 137. For this purpose an extended chain proceeds from the force device and is provided with forward feed arms both at the forward feed detent 5 and the ascending section.

The said step forward feed arm 82 has such an area of movement that it moves in under the surface 79 of the detent 76. Since the arm is of such a length that it can just move in under the upper initial portion of the surface 79, during the continued feed in the feed direction of the arm the latter lifts the detent hook 76 for movement clockwise, as shown in

Figure 4. As a result the stop surface 78 is moved about the axle 22 and as a result of the slope of the track, the carriage passes the detent hook 76. The carriage can pass the arm 82 on its path up to the step forward feed device because the carriage is able to fold the arm forward (but not backwards) as previously described in conjunction with the arm 59.

The invention is that the carriages will be fed one at a time when the desired time interval has elapsed a pressure medium is supplied, through a valve which is controlled in a suitable manner e.g. manually controlled, through the nipples 44 to the hole 12 and further through the transverse holes 42 and 47 and thus to the rear of pistons 36 and 46. At the same time the space in front of the piston 36 is connected to a vent position by way of the hole 41 and the longitudinal hole 13. The piston 46 has already been vented on its front face as a result of the connection with apperture 62. This circumstance results in the pistons and thus the piston rod 38 moving in the feed direction (arrow 25 in Figure 3). The chain 24 and thus also the detent arms 82 (denoted in Figure 3 by 59) participate in this movement. During this the detent arm 82 is led underneath the surface 79 of the detent hook 76 and lifts the detent hook so that the axle 22 of the carriage can pass by the surface 78. The carriage proceeds out of the detent device 5 as a result of the slope of the track and reaches the lowest point 6.

In the embodiment illustrated the chain 24 continues past the lowest point 26 and into the ascending portion 137. Along this section the chain exhibits detent arms 59 (designated as the drive device 8 in Figure 1). During their forward movement, since they cannot be tilted backwards as a result of the surface 61 being supported against the transverse portion 60, these detent arms can entrain the trolley which has been advanced past the detent hook 65 in the detent device 64 which prevents reverse feed. During their backward passage however the detent arms can deflect downwards to the position shown by the dash-dotted lines in Figure 3. Thus the carriage which is held against the detent hook 65 cannot move downwards along track section 137. During the next movement of the chain 24 and thus of the detent arms 59 the carriage can consequently be moved upwards once again. In this way the carriages can be advanced by means of the detent arms 59 on chain 24 up along section 137 by means of the drive from the said cylinder arrangement in girder 1. Dependent upon the stroke length, arrangement of the detent devices, the number of detent arms and the length of the ascending section, the carriages can be moved up along this by means of one or more repeated strokes of the cylinder device to reach the section 10 which once more slopes downwards. From this the carriages roll under their own weight to a discharge pipe, another delay station or another reception point for the carriages.

A considerable advantage of this part of the invention is that at least the major portion of the track can be arranged in the form of a uniform parallel girder. By making slight changes to it along its length it can be fitted out as a pneumatic or possibly hydraulic drive device, as control device for the drivers for the material support devices, or as device for controlling anciliary equipment such as step detents and the like along the track. In accordance with the embodiment the girder is at the same time designed as roller track for carrying devices for goods and furthermore comprises a fixing point for additional equipment such as detent devices. The girder, which is preferably manufactured in the form of an extruded profile, thus performs a large number of functional requirements in a single continuous configuration.

In the following will be described how the carrier may be automatically directed between the different stations. According to the invention the carriers 23 are for this purpose provided with adjustable operating means which by means of a so called address apparatus may be set in a certain manner, whereupon the setting may be sensed in sensing stations, which the carriers pass.

The carrier, shown in Figures 8-12 includes the rod 23, provided with a suspending element such as a garment hanger hook 3. The rod 23 is in its upper portion bent to a pivot 22 for the rollers 21 which have inner flanges 161, contacting the conveyor tubes, outer flanges 162 and a hub portion 63. To the pivot 22 is fixedly connected a stationary element 164 which carriers the operating elements in the form of keys 165, which form the address section of the carrier. The stationary element may preferably be injection molded in a plastic material and may comprise upstanding walls 166, each provided with a groove 167 for receiving a not shown axis, passing through holes 168 in the keys and may also be provided with a preferably downwardly tapering reinforcement 169 to act with friction against the walls of the keys, the thickness of which is illustrated in Figure 12. Owing to these characteristics the keys may remain without the use of any detent means in alternatively a position in which the actuating portion 172 of the same is depressed or in a position in which it projects.

In order to easily operate the keys and thus determine the destination of the carrier in question, an address apparatus 135 is adapted according to Figure 1, the structure of said address apparatus being illustrated more in detail in Figures 13-16. The entering catch 136 which has been indicated in Figure 1 and the purpose of which is to prevent a carrier to enter the address apparatus by gravity. This catch is replacing the catch described in connection with Figures 4, 5 when the address apparatus is used, and may consist of a spring loaded yoke or a catch according to Figure 14, which latter may also be used when a great number of heavy carriers are apparent on the line section 132. This catch includes a crank arm 174, pivotally arranged about a shaft 173 and held in the shown position by means of a coil spring 175, thereby resting with a yoke-shaped portion 176 against an abutment 177 and with another arm portion 178 against the dent 179 of a release arm 181, pivoted at 180 and held in the position shown by means of a compression spring 182. A carrier, the flanges of which have been caught by the yoke-shaped arm portion 176 is prevented from passing as the crank arm is locked against

swinging in an anti-clockwise direction and following carriers may not operate the release arm 181, as the latter is situated intermediate the flanges 162. A release section may only take place in connection with the mechanical feeding by means of the feeder dogs 144 and such feeding action causes the carrier, held by arm portion 176 to be pushed into the address apparatus.

In this one a plurality of actuating elements 183 are pivotally adapted relative to the common axis 184. These actuating elements are operated by means of key arms 185, which are pivotally adapted in relation to an axis, which penetrates bearing openings 186 in the key arms and which is preferably obliquenly arranged in order to compensate for the different distances between the keys 187 and the actuating members in question. In their upper ends the key arms 185 are provided with holes 188, in which are received bent portions of connecting elements 189 which with a second bent portion protrude through an opening in the actuating elements 183. By depressing a key the corresponding actuating element will thus be swung so that its operative portion 191 will project outwardly so that it may depress a corresponding key 164 of a carrier 2. In order to secure the actuating elements in their set position a number of catches 193 are pivotally adapted about a common axis 192, said catches being each influenced by a coil spring 194 to resiliently press against one end of the actuating elements 183 so that the catches may drop in behind the free end of the actuating elements 183 when the latter have been brought to their active positions. It is seen that every carrier, which passes the address apparatus 197 will receive the address, set upon the keyboard. To release the catches 193, i.e. for setting a new address, resetting elements 195 secured to a vertical axis 196 are given a movement in the direction of the arrow by means of turning the axis 196, which causes all catches to be reset and the spring loaded actuating elements 183 to return to their initial positions. In the section 132, preferably in the address apparatus are arranged means for pressing down all of the keys 165 of the carriers, which pass the section in question so that they occupy their normal inactive position and consequently will receive the new address, indicated by the actuating elements 183. In the section 197 of the address apparatus is about an axis 198, which like the rod 3 of the carrier is obliquely arranged, rotatably mounted a structure 199, provided with an upper support plate 200a and a lower support plate 200b, each having a notch 201a respectively 201b. This structure is held in the position shown in Figure 15 by means of coil springs 202 and it is apparent that a carrier, which is fed into the address apparatus and the rod 3 of which reaches the notches 201a, 201b will turn the structure 199 in the direction of the arrow in Figure 15. The structure will thereby be steadily pressed against the actuating elements when passing the operating portions.

In order to direct the carriers, transported in the main conveyor to the branch conveyors, which are indicated by the codes of the carriers there is arranged in connection with each second line a sensing apparatus 233, the principal structure of which is shown in Figure 24. The sensing apparatus or sensing station is thereby so arranged adjacent the main line that the carriers, transported on the main line will operate the address unit as they pass the same. The address unit comprises a block 234, provided with slots, in which sensing plates - seen in the plan view in Figure 19 - and designated 235 respectively 236 are pivotably mounted about a common axis 237. About a horizontal axis 238 is rotatably mounted a hub 239, which carriers a downwardly directed pin 240, which normally rests against the outer ends of the sensing plates as seen in Figure 19 as well as an upwardly directed arm 241 and an obliquely downwards directed arm 242 for each flange 62 of the carriers. It may be noted that the pin 240 and the arm 141 are located behind the arms 242, i.e. within the address unit, as will be apparent from Figure 18. In the unit is a rod 245 slidably arranged relative to a pair of fixed guides 243 and 244 and said rod comprises in its free end an operating plate 246. A spring 248, arranged between the guide 243 and a flange 247 of the rod 245 urges to hold the rod in the position shown in Figure 17. In its opposite free end the rod is at 249 hingedly connected to a catch 250. This one comprises a dent 251 as well as a sloping surface 252 for a purpose which will be later explained. As will be seen in Figure 18 the unloading arm 133 is provided with a welded on bent rod 253 which may rest against the operating plate 246 and also a second bent rod 254, intended to cooperate with the flanges of the carrier in a manner to be described.

The sensing apparatus just described works as follows:

The carriers pass the sensing apparatus and in doing so their actuating members 165 influence the portions 255 of the sensing plates. The actuating members, which have been operated by means of the operating elements of the address apparatus will then operate the correspondingly located plates 235 and 236. As the latter are of two different types it is seen that the pin 240 (Figure 19) may be displaced to the left in the figure only when the plate 235 as well as the plate 236 have been actuated and it is obvious that a two digit code will be suitable for the purpose. The carriers, which have a code, which does not correspond to the code, set in the sensing station will of course pass the sensing station without interfering the same otherwise then in the sense that the arms 242 will be swung anti-clockwise, whereupon they by means of gravity return to their initial position. If, however, a carrier, bearing the same code as the sensing apparatus its actuating elements will first generate an opening between the sensing plates, which will permit the pin 240 to swing to its dotted position in Figure 17. This swinging movement may be obtained by means of the weight of the assembly 239-242 or by means of a weak spring. During the swinging movement the arm 241 will ride over the sloping portion of the dent 251 and the dent will consequently drop down behind the arm in question. At the continuing feeding of the carrier its flanges 162 will turn the arms 242 in an anti-clockwise direction. As the dent 251 is now in

engagement with the arm 241, the rod 245 with its actuating plate 246 will consequently against the action of the spring 248 be displaced to the left in the figure. When the actuating plate has been so far retracted that it is positioned to the left of the rod 253 of the unloading arm 133 these two elements will swing down by means of gravity of their ready position. The carrier will therefore be fed up on the unloading arm 133 and during the continued feeding the sloping edges of the dogs will act upon the rods 254 of the unloading rods. When the actual feed doog abuts against rod 254 its unloading arm will be lifted up so that it again falls down towards the upper surface of the actuating plate 246. The actuating plate has namely during the meantime returned to its initial position as the arm 241 owing to the arrangement of the catch passes the dent 251 at the end of the anti-clockwise swinging movement of the arm 241. All the elements of the sensing apparatus have thus reached their initial positions and the apparatus is consequently adapted for repeatedly functioning as described above. The carrier leaves the unloading arm 133 and the adjacent section by means of gravity.

CLAIMS

1. Distribution system for work preferably in the garment industry including a main conveyor and a number of branch conveyors each one forming a loop from the main conveyor through a working station or similar and back to the main conveyor, CHARACTERIZED in that the main conveyor is provided with a continuous driving element running along a track and provided to force carriers for the work pieces to move along the track by means of a driving motor and that the branch conveyors are provided to let the carriers move along the conveyor by means of gravity on a section of the conveyor sloping downwards in the transportation direction and to move from the working station substantially at the lowest point of the conveyor upwards back to the main conveyor by means of a discontinuous working driving means provided to move to and fro along the section of the conveyor descending from the working station to the main conveyor.

2. System according to claim 1, CHARACTERIED in that the main conveyor comprising an elongated driving element designed to be moved by a driving device on a track, equipped with driving devices for the driving element, together with said material-carrier element movable at least partly along the track and devised to be attached to the driving element and thereby accompany the same in its movement for the transport of material, in which the drive element has the shape of a band with corrugations, between which are constructed transverse grooves, whereby the material in the driving element is hard and resilient and consists principally of stiff plastic material and is so dimensioned that the corrugation and hence grooves in general preserve their shape with the selected driving resistance and follow the intended load impelled by it or driving device gripping at various points, while the corrugated shape of the driving element and its resilience are so devised that the same, in spite of their relative stiffness, can be extensively bent in several planes and/or twisted by steering devices.

3. System according to claim 2, CHARACTERIZED in that grooves are arranged to be attached to carrier element by means of sections contrived so as to engage grooves on the carrier element.

4. System according to claim 3, CHARACTERIZED by the fact that engaging sections for the carrier elements are sufficiently loosely arranged in respective grooves that they can easily be either inserted into or withdrawn from the grooves for temporary coupling or uncoupling of the carrier element.

5. System according to claim 4, CHARACTERIZED in that the driving element has the shape of a corrugated band of mainly uniform thickness, forming a simple coil running in zig-zag fashion.

6. System according to any of the foregoing claims, CHARACTERIZED in that the branch conveyors are each including a section that consists of a girder having the shape of a hollow profile with a groove, which in the lengthwise direction of the track on the one hand exhibits one or more sections with completely closed cross sections, and secondly one or more sections provided with a side apperture, whereby plugs are inserted in the completely closed section or sections, between which one or more cylindrical spaces are formed, each arranged to enclose a piston with a piston rod which extends outside the cylindrical space, whereby in the open section or sections extended, preferably flexible devices capable of movement in the lengthwise direction of the groove, and joined with piston rod and provided with the said carrier devices which are accessible through the said side apperture, and whereby on the outside of the girder a track is arranged for the said material carriers adjacent to the said side apperture so that the carrier devices can make contact with the goods carriers through the said apperture whereby the cylindrical space is connected with pipe lines for a pressure medium so that the piston or pistons can be moved backwards and forwards thanks to the introduction of the pressure medium on different sides thereof, whereby the device is entrained by means of the piston rod so that the carrier device moves the goods carrier devices in the desired transport direction.

7. System according to claim 6, CHARACTERIZED in that apart from the groove, the girder has at least two longitudinal holes which are arranged to connect with the groove inside the said cylinder space and secondly to make connection with a source for the supply of medium under pressure, whereby the said holes function as connecting pipelines for this.

8. System according to any of the preceding claims 6 or 7, CHARACTERIZED in that several pistons are connected to the same piston rod in order to multiply the force governed by the piston area which corresponds to the pressure of the pressure medium and the dimension of the groove.

9. System according to any of the preceding claims 6, 7 or 8, CHARACTERIZED in that the device has the shape of a chain, the links of which are

provided with roller devices arranged to run in the groove and on which at least certain links are arranged so as to support the said carrier devices.

10. System according to claim 9, CHARACTERIZED in that the carrier device has the shape of a detent arm which extends from the chain out through the apperture and which in the desired direction of forward movement is locked in a projecting position, but which is arranged to deflect inwards in the event of movement in the return direction.

11. System according to any of the foregoing claims, CHARACTERIZED in that an unloading arm by means of the sensing apparatus, which is arranged at different positions alongside the main conveyor and which serves to sense an address connected to the carriers of the main conveyor may be alternatively brought up to an upper position, in which it does not act upon the carriers, or to a lower position, in which the carriers in question are forced to move up on the unloading arm and be transferred to the respective branch conveyor.

12. System according to claim 11, CHARACTERIZED in that address elements of each carrier consist of a plurality of operating arms, adapted to be pivoted between two end positions and being provided with actuating portions, which in one of the end positions of the arms project more from the carrier in an axial direction than they do when the arm in question is in its other end position and that the arms are adapted to be loosably arrested in their actual end position.

13. System according to claim 12, CHARACTERIZED in that a sensing apparatus, provided at the main conveyor and in connection with the branch conveyor, each comprises a plurality of sensing arms, adapted to come into contact with the operating arms of the carriers when the latter pass said sensing apparatus so that said sensing arms in case of concordance between the codes, constituted by the operating arms and the sensing arms of the sensing apparatus in question permit an arm assembly to be moved from a position, in which it cannot operate a support element, belonging to the sensing apparatus and acting upon a projection of an unloading arm into a position, in which said arm assembly when influenced by the carrier which has operated the sensing arm, causes the support element to move away so that the projection and consequently the entire unloading arm may move down to its unloading position.

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