

"PAPER TRACTOR ASSEMBLY"

This invention relates to paper tractors by which is fed, for example, a printer.

Generally, there are two types of such paper tractors, one being a sprocket wheel type and another being a sprocket belt type. In these tractors, a plurality of sprockets formed on the outer periphery of a sprocket wheel or a sprocket belt are arranged to engage perforations formed in the sides of the paper. The paper is fed by rotating the sprocket wheel or sprocket belt to thereby move the respective sprockets.

The sprocket wheel or sprocket belt is slidably and non-rotatably mounted on a drive shaft and is accommodated in a chassis provided with an openable paper hold cover. The chassis is movable along the drive shaft and is set in accordance with the width of the paper. It can be fixed at a desired position by a fixing device provided on the chassis. Such a fixing device is disclosed in U.S. Patent No. 4,315,585, in which a protrusion having a circular arc-like cross section extends from a fitting hole in the shaft formed in the chassis. Fitted to the protrusion

is a fixed lever in which the contacting inner peripheral surfaces of the protrusion and fixed lever are arranged to be eccentric with each other relative to the support shaft. When the fixed lever is swung in one direction, the respective inner peripheral surfaces are pressed against and engaged with the shaft thereby to fix the chassis at a desired position while when the fixed lever is swung in another direction the engagement is released for axial movement.

In such a fixing device, the chassis and fixed lever have a complicated configuration, and the shaft and many parts must be provided, so that manufacturing takes much time, the cost is high and miniaturization and lightening are hindered.

It is therefore an object of this invention to simplify the structure, render manufacturing easy, reduce the manufacturing cost and achieve miniaturisation and lightening.

According to the present invention, there is provided a paper tractor assembly including a paper tractor slidably and non-rotatably mounted on a drive shaft, with sprockets to be engaged by paper to be fed

by rotation of the shaft, a chassis for the paper tractor slidably and non-rotatably mounted on a fixed member for movement laterally across the paper path substantially parallel to the axis of rotation of the drive shaft, and a locking lever having a locking cam which is movably mounted in a recess in the chassis, the locking cam having first and second cam faces and being swingable between locking and release positions, in the locking position of which a further surface of the locking cam engages the surface of the recess and the first cam face engages a part of the fixed member to restrict movement of the chassis, and in the release position of which the said further surface of the locking cam does not engage the said surface of the recess and the second cam face contacts the part of the fixed member in substantially non-engaged relationship to allow lateral movement of the chassis on the part of the fixed member, the first cam face and the part of the fixed member engaged thereby in the said locking

position having corresponding knurlings or similar formations to increase the engagement therebetween.

Preferably, the locking cam is of part-cylindrical form and is mounted in a part-cylindrical recess in the chassis.

In this case, the cam faces may be generally flat and inclined to one another.

In such a case, moreover, the maximum distance from the first cam face to the cylindrical surface of the locking cam may be greater than the maximum distance from the second cam face to the cylindrical surface of the locking cam.

The recess may extend through the chassis from side to side and the locking cam may be of corresponding length.

The locking lever may have protrusions at the ends of the locking cam to prevent disengagement of the locking lever from the chassis.

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

Figure 1 is a side sectional view of part of a machine incorporating a paper tractor assembly according to the invention;

Figure 2 is a front view, partly broken and partly sectioned, of the machine of Figure 1;

Figure 3 is a front view, to an enlarged scale, of a locking lever in the paper tractor assembly of Figure 1;

Figure 4 is an end view of the locking lever in the direction of arrow IV of Figure 3;

Figure 5 is a sectional view on the line V-V of Figure 3;

5 Figures 6 and 7 are sectional views of parts of the paper tractor of Figure 1 with the locking lever swung to its locked position; and

10 Figures 8 and 9 are sectional views similar to Figures 6 and 7 with the locking lever swung to its release position.

15 In one example of an embodiment of the invention, a pair of paper tractors is used in a printer to draw paper 5 (Figure 1) around a platen 17 in front of a print head 18. The paper 5 has perforations along each of its sides for engagement by sprockets 1a of sprocket wheels 1. Each sprocket wheel 1 has a hub 1b with an hexagonal hole by which the wheel is mounted upon a rotatable drive shaft 3 of hexagonal cross section. Thus, the sprocket wheels 1 are slidable upon, but not rotatable upon, the shaft 3.

20 The drive shaft 3 is rotatably mounted in a support frame 4 mounted on the printer with the shaft 3 parallel to the platen 17. Each sprocket wheel 1 has an accommodating chassis 2 including a pair of forwardly projecting arms 6 which a U-shaped cut-out 6a by which the arms 6 ride

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upon the hub 1b. The arms 6 also support a paper hold cover 7 which is pivotally mounted on the chassis 2 and is movable from an operative position (Figure 1) to a position at right angles and free of the sprocket wheel 1 (left side of Figure 2). The cover 7 is engaged at its pivot by a resilient leaf spring, so that the cover is held resiliently in one or other of its two positions. In the one position (Figure 1) the paper 5 passes under the cover 7 whilst the sprockets 1a project outwardly through a gap in the cover (right side of Figure 2). In this position of the cover 7, the paper 5 is prevented from escaping from the sprockets 1a. In the other position (left side of Figure 2) the cover is swung clear of the sprocket wheel and paper 5 can be removed from or inserted over the sprockets 1a. The leaf spring 8 has a substantially L-shaped cross-section and acts to detent the cover in one of its two positions. The covers 7 are pivoted on opposite sides of the chassis 2, so that the swinging of the covers releases the paper 5. Thus, the lefthand cover 7 is pivoted on the lefthand side of the arms 6 of the chassis 2 on the lefthand end of the shaft 3, whilst the righthand cover 7 is pivoted on the righthand side of the arms 6 of the chassis 2 on the righthand end of the shaft 3.

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A rail-like portion 9 extending widthwise of the recording paper is formed integrally with the frame 4 on the upper rear edge thereof (Figure 1). Each chassis 2 has a substantially L-shaped depending engagement member 10 at the rear end to engage the lower surface of the rail-like portion 9, so as to allow movement of the chassis 2 widthwise of the recording paper. The upper surface of rail-like portion 9 (Figure 2) is provided with transverse knurlings 9a, notches, teeth or serrations.

10 A locking lever A is pivotally mounted at the rear end of chassis 2. The locking lever A (Figure 3) has a locking cam 11 having a special cross sectional form. The locking cam 11 is fitted to be rotatable in a space S (Figures 6 to 9) defined by the upper knurled surface of the rail-like portion 9 and the lower cylindrical inner peripheral surface of a recess 12 provided at the rear end of the chassis 2. As shown in Figures 4 and 5, the locking cam 11 has a first lower flat cam face 13 and a second lower flat cam face 14. The cam faces 13 and 14 are at an angle to each other and in cross section form chords of a circle which is the cross section of a part-cylindrical portion of the locking cam 11. That portion has a cylindrical surface 15, and the distances from that surface 15 and the first and second cam faces are d_1 and d_2 , respectively, where d_1 is the distance

between the first cam face 13 and the surface 15 and
d2 is the distance between the second cam face 14 and the
curved surface 15. The first cam face 13 has transverse
knurlings 13a (Figure 3) which match the knurlings 9a and
are perpendicular to the longitudinal axis thereof. The
distance between the inner peripheral surface of the
recess 12 forming the space S (Figures 6 to 9) into which
the locking cam 11 fits and the upper surface of rail-like
portion 9 is set to be equal to, or slightly less than,
the distance d1 between the first cam face 13 and the
curved surface 15, and to be slightly greater than the
distance d2 between the second cam face 14 and the curved
surface 15.

Each locking lever A has a handle portion extending
at right angles to the longitudinal extension of the locking
cam 11. At its other end, each locking lever A has an
enlarged protrusion 16 (Figures 3 and 4) which, being
larger than the space S, prevents the locking lever A from
disengagement from the recess 12. The chassis 2 for each
sprocket wheel 1, has a restricting pin 19 which is engaged by
the handle portion of the locking lever A when the cam face
13 contacts the upper surface of the rail-like portion
9 (Figure 1), thus limiting the swinging movement of the
lever A in the forward direction.

In operation, when the locking lever A is swung to the locking position (Figures 1, 6 and 7), the curved surface 15 of the locking cam 11 on the locking lever A is engaged with the inner peripheral surface of the recess 12, and the first cam face 13 is engaged with the upper surface of the rail-like portion 9. Due to the size of the recess 12 in relation to the upper surface of the rail-like portion 9, the first cam face 13 is pressed into tight engagement therewith and the respective knurlings 9a and 13a interdigitate and prevent lateral movement of the chassis 2 across the width of the machine. Thus, the chassis 2 is restricted from moving by the engagement of the first cam face 13 and the upper surface of rail-like portion 9, whose knurlings 13a and 9a ensure such restriction of movement.

When the locking lever A is swung to its release position (Figures 8 and 9), the second cam face 14 engages the upper surface of the rail-like portion 9, but is not pressed into engagement because the distance d2 is less than the distance between the surface of the recess 12 and the upper surface. As the second cam face 14 has no knurling, it is in substantially non-engaged relationship with the upper surface of the rail-like portion 9, so that the chassis 2 is freely displaceable widthwise of the recording paper 5. As shown in Figures 8 and 9, in the release position of the locking lever A, the curved surface of the locking cam 11 is no longer engaged with the inner peripheral surface of the recess 12.

In order to insert recording paper 5 into the machine, each locking lever A is swung to its release position (Figures 8 and 9). Each chassis 2 thus rendered movable is moved to a desired position corresponding to the width of recording paper 5. The paper hold covers 7 are swung upwardly (left side of Figure 2), exposing the sprocket wheels 1 and sprockets 1a. Thereafter, the perforations in the side edges of recording paper are fitted onto the sprockets 1a of the sprocket wheels 1, paper hold covers 7 are then closed, and the locking levers are swung to their locked positions (Figures 1, 6 and 7). Both chassis 2 are then secured and the recording paper 5 is set for proper feeding.

In the embodiment described, the sprocket wheels 1 have protruding sprockets 1a on the outer surface thereof. However, this invention is applicable to a paper tractor in which the sprockets are disposed on an endless belt driven by a driving wheel. In the latter case, if, as disclosed in Laid-Open Japanese Patent Application No. 82058/1987, the belt driving wheel (rotary member) around which the sprocket belt is wound is fitted to a drive shaft 3 and the follower wheel is rotatably supported by chassis 2, the support shaft in that disclosure may be removed and replaced by a rail-like portion 9, in addition to the locking lever A.

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While in the described embodiment the inner peripheral surface of the recess 12 and the curved surface 15 of the locking cam are cylindrically formed, and the relationship $d_1 > d_2$ is satisfied (where d_1 is the distance between the first cam face 13 and the curved surface 15 and d_2 is the distance between the second cam face 14 and the curved surface 15) the shape of recess 12 and locking cam 11 is not limited to this. For example, one or both of the inner peripheral surface of recess 12 and the curved surface 15 of locking cam 11, may be formed as an eccentric surface or the distance between each of the cam faces 13 and 14 and the curved surface 15 of locking cam 11 may be selected properly depending on the shape of the inner peripheral surface of recess 12 and the curved surface 15 of locking cam 11.

It will be appreciated that a machine may have a single paper tractor according to the invention, the other paper tractor being immobile widthwise of the machine but that preferably two paper tractors according to the invention are provided.

The structure is very simple, manufacturing is easy, manufacturing cost is reduced and miniaturization and lightening are achieved.

CLAIMS

1. A paper tractor assembly including a paper tractor slidably and non-rotatably mounted on a drive shaft, with sprockets to be engaged by paper to be fed by rotation of the shaft, a chassis for the paper tractor slidably and non-rotatably mounted on a fixed member for movement laterally across the paper path substantially parallel to the axis of rotation of the drive shaft, and a locking lever having a locking cam which is movably mounted in a recess in the chassis, the locking cam having first and second cam faces and being swingable between locking and release positions, in the locking position of which a further surface of the locking cam engages the surface of the recess and the first cam face engages a part of the fixed member to restrict movement of the chassis, and in the release position of which the said further surface of the locking cam does not engage the said surface of the recess and the second cam face contacts the part of the fixed member in substantially non-engaged relationship to allow lateral movement of the chassis on the part of the fixed member, the first cam face and the part of the fixed member engaged thereby in the said locking position having corresponding knurlings or similar formations to increase the engagement therebetween.

2. An assembly as claimed in claim 1, in which the locking cam is of part-cylindrical form and is mounted in a part-cylindrical recess in the chassis.



3. An assembly as claimed in claim 2, in which the cam faces are generally flat and inclined to one another.

5 4. An assembly as claimed in claim 2 or 3, in which the maximum distance from the first cam face to the cylindrical surface of the locking cam is greater than the maximum distance from the second cam face to the cylindrical surface of the locking cam.

10 5. An assembly as claimed in any of claims 2-4, in which the recess extends through the chassis from side to side, and the locking cam is of corresponding length.

15 6. An assembly as claimed in claim 5, in which the locking lever has protrusions at the ends of the locking cam to prevent disengagement of the locking lever from the chassis.

7. A paper tractor assembly substantially as hereinbefore particularly described with reference to the accompanying drawings.

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