

VIDEO PRINTER

The present invention relates to video printers and more particularly to apparatus for holding a receiver sheet in a video printer.

5

Generally, a video printer produces a full-coloured image on a dye-absorbing receiver sheet by thermally transferring three different coloured dyes of yellow (Y), magenta (M) and cyan (C) in response to video signals. Namely, as shown in Figure 1 of the accompanying diagrammatic drawings, the three different coloured dyes of Y, M and C sequentially applied to a ribbon 1 are heated by a thermal print head (T.P.H.) 4 and transferred to a receiver sheet that is fixedly supported on a platen drum 2 and rotated therewith.

15

An apparatus for holding a receiver sheet to a platen drum is disclosed in U. S. Patent No. 4,815,870, as shown in Figure 2 of the accompanying diagrammatic drawings. In this case, when the receiver sheet 3 is supplied through a supply guide chute 'A', a bracket 7 is rotated clockwise (as seen) about a hinge 7b so that a cam follower 7a moves along the exterior camming surface of a first cam 5a, so that a part 7c of the bracket 7 pushes counterclockwise a part 6a of a clamp 6. Then a spring 9 is expanded and a clamp 8 lifted over the peripheral surface of the platen drum 2 so as to receive the receiver sheet 3. Subsequently, when the cam follower 7a of the bracket 7 moves over the camming surface of the cam 5a and the part 7c of the bracket 7 no longer applies a force to the part 6a of the clamp 6, the resilient force of the spring 9 causes the clamp 6 to be rotated clockwise to clamp the receiver sheet 3 to the platen drum 2.

20

When the receiver sheet 3 is discharged through a discharge guide chute 'B' after completion of printing, the platen drum 2 is rotated in the

25

30

direction opposite to that of printing. The clamp 8 is raised over the peripheral surface of the platen drum 2 to release the receiver sheet 3 as the bracket 7 moves along the exterior surface of a second cam 5b.

5 Such a conventional printer has the supply guide chute 'A' and discharge guide chute 'B' separated by the platen drum 2 as shown in Figure 2 and therefore the volume of the printer is relatively large. In addition, discharge of the receiver sheet 3 is effected by rotating the platen drum in the direction opposite to that of the printing. Moreover all of the three different
10 coloured dyes should be transferred to the receiver sheet before reversing the platen drum 2 in order to discharge the receiver sheet, thus increasing the printing time.

Preferred embodiments of the present invention aim to provide a colour
15 video printer wherein the platen drum is rotated only in one direction during supplying, discharging and printing a receiver sheet.

It is another aim to provide a colour video printer wherein the three different coloured dyes of Y, M, C are sequentially transferred to the receiver
20 sheet one by one at each rotation of the platen drum with the last third dye being transferred during discharge of the receiver sheet.

It is a further aim to provide a colour video printer wherein the thermal print head and receiver sheet holding means are moved by one and the same
25 cam means.

It is another aim to provide a colour video printer wherein the sheet supply and discharge guide chutes are vertically arranged at one side of the platen drum, thus reducing the volume of the printer.

According to one aspect of the present invention, there is provided a colour video printer for producing a full-coloured image on a dye-absorbing receiver sheet by thermally transferring thereto three different coloured dyes of yellow (Y), magenta (M) and cyan (C) applied to a ribbon in response to video signals, the printer comprising:

a supply guide chute for supplying said receiver sheet;

a discharge guide chute for discharging said receiver sheet;

a platen drum with two ends having central shafts and arranged so as to rotate only in one direction with said receiver sheet being fixedly supported upon the peripheral surface of said platen drum;

holding means for releasably holding said receiver sheet on said platen drum;

a head member having a first cam follower at one end and a thermal print head at any other end for thermally transferring said dyes of said ribbon to said receiver sheet;

at least one structure each with a second cam follower for operating said holding means so as to cause said holding means to co-operate with the peripheral surface of said platen drum to selectively hold said leading end of said receiver sheet; and

a cam gear with a first cam groove engaged by said first cam follower of said head member and a second cam groove engaged by each of the at least one said second cam follower or followers of said at least one link structure:

wherein said holding means is resiliently biased so as to cause said holding means normally to press against said peripheral surface of said platen drum, said at least one link structure is so made, upon rotation of said platen drum, as to temporarily move said holding means by rotating said cam gear, so that, said holding means may co-operate with said peripheral surface of said platen drum to hold and clamp said leading end of said receiver sheet to said peripheral surface after supply from said supply guide chute, said head member is biased towards said platen drum after said leading end of said receiver sheet has been clamped and held to said peripheral surface by said holding means to be positioned to transfer said dyes to said receiver sheet, and when said platen drum starts a third rotation for the last third dye to be transferred to said receiver sheet to which two of said three different coloured dyes of Y, M and C have been sequentially transferred one by one at each previous rotation of said platen drum, said leading end of said receiver sheet is released from said holding means during the transfer of said last third dye so as to allow said receiver sheet to move towards said discharge guide chute.

Preferably, said holding means comprises:

a pair of holder members each mounted on a respective one of said two ends of said platen drum so as to be pivotable about said central shafts; and

a pair of holders each attached to a respective one of said pair of holder members for clamping a leading end of said receiver sheet to the peripheral surface of said platen drum;

wherein there are a pair of link structures for cooperating with said pair of holder members to cause said pair of holders to cooperate with the peripheral surface of said platen drum;

and wherein said pair of holder members are resiliently biased by means of a pair of springs.

5 Preferably, said pair of link structures comprise a pair of sliders each with a guide slot for making a straight motion, said guide slot having a slope portion and horizontal portion, a first lever with said second cam follower for moving said pair of sliders forwards and backwards within a given limit according to the rotation of said cam gear, a pair of second levers each with a hinge at one end and a guide pin at the other end thereof, said pair of
10 second levers being pivoted on said hinges, and a pair of third levers for pushing said pair of holder members by pivotal movement so as to cause said pair of holders to co-operate selectively with said peripheral surface of said platen drum, said pair of third levers being pivoted by said second pair of levers when said pair of sliders move to a forward limit by pivotal movement
15 of said first lever.

Preferably, said head member is pivoted on a pin by rotation of said cam gear causing said thermal print head to contact said receiver sheet supported upon said peripheral surface of said platen drum when printing.

20

Preferably, said pair of holder members are substantially L-shaped with two branches, one of said two branches having at a base an elongated opening for receiving one of said central shafts and at an end opposite to said base one of said pair of holders extending at right angles, said pair of holders being
25 supported on or protruding from said peripheral surface of said platen drum as said pair of holder members move along said elongated openings about said central shafts.

Preferably, the other of said two branches has two guide pins at
30 opposite sides, said one branch also has a holder guide pin at a rear side

thereof near the respective said holder and the ends of said platen drum have relatively long first arcuate grooves for guiding a rear guide pin of said other branch and relatively short second guide grooves for guiding said holder guide pin when mounting said pair of holder members on said central shafts said
5 second guide grooves having a sloping guide surface.

Preferably, said pair of third levers are substantially T-shaped with three branches, a common base of said three branches having a circular opening for rotatably receiving said central shafts of said platen drum, two
10 adjacent first and second branches of said three branches respectively having first and second operational pins at the ends opposite to said common base, the remaining branch having at the end opposite to said common base a holder member engaging opening for movably receiving a front guide pin of said other branch of said pair of holder members, so that operation of said pair of
15 third levers is linked to said pair of holder members via said holder member engaging opening and front guide pin.

Preferably, said pairs of holder members and third levers are successively mounted on both ends of said platen drum about said central
20 shafts, said third branches overlap said other branches of said pair of holder members, and the branches of said pair of holder members with said holders are positioned opposite to the second branches of said pair of third levers around the first and third branches of said pair of third levers.

25 Preferably, said pair of second levers are so arranged that, as said pairs of sliders move to said forward limit, said guide pins thereof may be guided along said slope portion of said elongated guide groove so as to cause the ends of said pair of second levers with said guide pins to push said first or second operational pins of said pair of third levers, whereby said pair of third levers

are rotated to push said pair of holder members causing said holders to protrude from said peripheral surface of said platen drum.

Preferably, said pair of second levers are so arranged as to push said
5 first or second operational pins of said pair of third levers according to whether said holders of said pair of holder members face said supply guide chute or discharge guide chute.

Preferably, said discharge and supply chutes are disposed vertically
10 above one another at one side of said platen drum.

Preferably, said first cam groove of said cam gear is so shaped that said thermal print head of said head member may contact said receiver sheet supported on said platen drum during printing, and said second cam groove
15 is so shaped that said first lever may be operated so as to cause said holders of said pair of holder members to protrude from said peripheral surface of said platen drum when supplying or discharging said receiver sheet.

For a better understanding of the invention, and to show how the same
20 may be carried into effect, reference will now be made, by way of example, to Figures 3 and 4 of the accompanying diagrammatic drawings, in which:

Figure 3 is an exploded view for illustrating levers and holder members of a receiver sheet holding apparatus mounted on the ends of a platen drum
25 in a video printer according to an embodiment of the present invention; and

Figures 4A-4H are schematic diagrams for illustrating the overall structure of the receiver sheet holding apparatus and the operational relationship between the essential parts thereof in the video printer of Figure
30 3.

Referring to Figures 4A-4H, the apparatus for holding receiver sheets used in one example of a video printer according to the present invention comprises head member 40, cam gear 30, first lever 80, slider 50, second lever 90, third lever 70 and holder member 60. The holder member 60 and
5 third lever 70 are successively mounted on the ends of the platen drum 20 so that the motion of the third lever is connected to the holder member. A receiver sheet 100 is supplied via supply guide chute 102 to the platen drum 20 and discharged via discharge guide chute 104. The platen drum 20 has two ends each with a central shaft 21 and peripheral surface for fixedly
10 supporting the receiver sheet, and is so arranged as to be rotated only in one direction. The holder member 60 is pivotably mounted on the central shaft 21 of the ends of the platen drum and has a holder 61 for clamping the leading end of the receiver sheet to the peripheral surface of the platen drum.

15 The head member 40 includes a first cam follower 41 and thermal print head for thermally transferring to the receiver sheet the three different coloured dyes of Y, M, C, which are sequentially applied by a ribbon. The cam gear 30 comprises first and second arcuate cam grooves 31 and 32. The rotational motion of the cam gear 30, on the one hand, is transferred via the
20 first cam follower 41 and first cam groove 31 to the head member 40, and on the other hand, via second cam follower 82 and second cam groove 32 via a link structure to the holder member 60.

The link structure comprises the first lever 80 with the second cam
25 follower 82 at one end thereof, slider 50 connected with the other end of the first lever 80 by means of an operational pin 83, second lever 90 connected to the slider 50 by means of a hinge 91, and third lever 70 for receiving the motion of the second lever 90. The first lever 80 is so arranged as to pivot on a pivot pin 81 as the second cam follower 82 moves along the second cam
30 groove 32. The slider 50 is so arranged as to receive the motion of the first

lever 80 through the operational pin 83 at one end in order to move forwards and backwards. The other end of the slider 50 has an elongated guide slot 51 comprising horizontal and slope portions. At one end of the second lever 90 there is formed a guide pin 92 guided along the elongated guide slot 51 of the slider 50. The third lever 70 is substantially T-shaped with three branches 71, 73, 75, from a common base which has a circular opening for rotatably receiving the central shaft 21 of the platen drum. Among the three branches, the two adjacent first and second branches 73 and 75 respectively have first and second operational pins 74 and 76 at the ends opposite to the common base, and the remaining branch 71 has an elongated holder member engaging opening 72 at the end opposite to the common base.

As shown in Figure 3, the holder member 60 is substantially L-shaped with two branches, one of which branches has at its base an elongated opening 62 for receiving the central shaft 21, and at its end opposite to the base the holder 61 which extends at right angles. The holder 61 is supported on or protrudes from the peripheral surface of the platen drum 20. The holder member 60 is resiliently biased by means of a spring 66 so as to cause the holder 61 to normally press against the peripheral surface of the platen drum 20 near its end. The other branch has two guide pins 63, 63' at opposite sides thereof, and the said one branch also has a holder guide pin 65 at the rear side thereof near the holder 61. The ends of the platen drum have relatively long first arcuate grooves 22 for guiding the rear guide pin 63' of the other branch and relatively short second guide grooves 23 for guiding the holder guide pin 65. The second guide grooves 23 have a slope guide surface 25 outwardly inclined so that the holders 61 may protrude from the peripheral surface of the platen drum when the holder guide pins 65 are guided clockwise (as seen).

The holder members 60 and third levers 70 are successively mounted on both ends of the platen drum 20 about the central shafts 21, where the third branches 71 overlap the other branches of the holder members 60 and the branches of the holder members with the holders 61 are positioned opposite to the second branches 75 of the third levers between the first and third branches of the third levers. In this case, the front guide pin 63 of the other branch of each holder member is movably received by the holder member engaging opening 72 of the respective third lever 70, thus connecting the motion of the third lever 70 to the holder member 60. The end of the second lever 90 with the guide pin 92 is to push the first or second operational pin 74 or 76 in order to rotate the third lever clockwise.

The discharge and supply guide chutes 104 and 102 are arranged vertically above one another at one side of the platen drum 20. In this case, the second lever 90 is so arranged as to push the first or second operational pin 74 or 76 of the third lever, according to whether the holder 61 of the holder member 60 faces the supply guide chute 102 or discharge guide chute 104. The first cam groove 31 of the cam gear 30 is so shaped that the thermal print head of the head member 40 may contact the receiver sheet supported on the platen drum during printing, while the second cam groove 32 is so shaped that the first lever 80 may be operated so as to cause the holder 61 of the holder member 60 to protrude from the peripheral surface of the platen drum when supplying or discharging the receiver sheet.

In printing operation, if the cam gear 30 is rotated clockwise as shown in Figures 4A-4D, the first cam follower 41 of the head member 40 is guided from the starting position 31a (see Figure 4A) of the first cam groove 31 through the intermediate positions 31b, 31c (see Figures 4B and 4C) to the final position as shown in Figure 4D, thereby making the thermal print head contact the peripheral surface of the platen drum 20. On the other hand, the

second cam follower 82 of the first lever 80 is guided from the starting position 32a of the second cam groove 32 (see Figure 4A) through the intermediate positions 32b, 32c (see Figures 4B-4C) to the final position 32d as shown in Figure 4D, thereby pushing the slider 50 for the second lever 90 to pivot counterclockwise on the hinge 91. Then, the guide pin 92 is guided backwards along the guide slot 51 moving upwards along the slope portion thereof, so that the end of the second lever 90 with the guide pin 92 pushes the first operational pin 74 of the first branch 70 of the third lever 70, thereby rotating the third lever clockwise. Accordingly, the third branch 71 moves clockwise so as to make the holder member 60 connected thereto via the front guide pin 63 be guided clockwise by means of the rear pin 63 along the first guide groove 22 formed in the ends of the platen drum 20. Consequently the holder member 60 pivots on the central shaft 21 of the platen drum against the bias of the spring 66 and thus the holder guide pin 65 slides down along the slope guide surface 25 of the second guide groove 23 formed in the ends of the platen drum, so that the holder 61 protrudes from the peripheral surface of the platen drum so as to receive the leading end of the receiver sheet between the holder 61 and the peripheral surface of the platen drum.

Then the cam gear 30 is rotated counterclockwise so as to return the second cam follower 82 to the starting position 32a of the second cam groove 32, which in turn makes the slider 50 return to the original position, thus rotating clockwise the second lever 90 to the horizontal position. Meanwhile, the holder member 60 is retracted to the original position by the bias of the spring 66, so that the holder 61 clamps the leading end of the receiver sheet to the peripheral surface of the platen drum. In addition, the first cam follower 41 is guided to the starting position 31a of the first cam groove 31 and thus the head member 40 is raised away from the peripheral surface of the platen drum 20, while the platen drum is rotated clockwise until the holder 61 clamping the leading end of the receiver sheet faces the inlet of the

discharge guide chute 104 as shown in Figure 4E. Subsequently the cam gear 30 is again rotated clockwise so as to cause the thermal print head of the head member 40 to descend to press the receiver sheet to the peripheral surface of the platen drum as shown in Figure 4F. In this case, the curved surface of the second cam groove is so shaped as to cause the motion of the slider 50 to not raise the second lever 90.

In this state, the platen drum 20 is rotated clockwise twice to sequentially transfer two (Y and M) of the three different coloured dyes to the receiver sheet one by one at each rotation. Thereafter, when the platen drum starts a third rotation for the last third dye (C) to be transferred to the receiver sheet, the cam gear 30 is again rotated clockwise so as to rotate the third lever in the same manner as when supplying the receiver sheet, thus making the holder 61 of the holder member 60 protrude from (become spaced from) the peripheral surface of the platen drum. In this case, the second lever 90 pushes the second operational pin 76 of the second branch of the third lever 70. Accordingly, the leading end of the receiver sheet, as shown in Figure 4G, is released from the peripheral surface of the platen drum by its self-resiliency so as to move towards the discharge guide chute 104, while the cam gear 30 is rotated counterclockwise so as to return the second lever to the horizontal position. Subsequently, as shown in Figure 4H, the platen drum 20 is rotated clockwise to transfer the last third dye (C) to the receiver sheet while discharging the receiver sheet through the discharge guide chute 104. In this case, the curved surface of the first cam groove 31 is so shaped as to maintain the contact between the thermal print head of the head member 40 and the peripheral surface of the platen drum.



CLAIMS

1 A colour video printer for producing a full-coloured image on a dye-absorbing receiver sheet by thermally transferring thereto three different
5 coloured dyes of yellow (Y), magenta (M) and cyan (C) applied to a ribbon in response to video signals, the printer comprising:

a supply guide chute for supplying said receiver sheet;

10 a discharge guide chute for discharging said receiver sheet;

a platen drum with two ends having central shafts and arranged so as to rotate only in one direction with said receiver sheet being fixedly supported upon the peripheral surface of said platen drum;

15 holding means for releasably holding said receiver sheet on said platen drum;

20 a head member having a first cam follower at one end and a thermal print head at any other end for thermally transferring said dyes of said ribbon to said receiver sheet;

25 at least one link structure each with a second cam follower for operating said holding means so as to cause said holding means to co-operate with the peripheral surface of said platen drum to selectively hold said leading end of said receiver sheet; and

a cam gear with a first cam groove engaged by said first cam follower of said head member and a second cam groove engaged by said each of the



- 14 -

at least one second cam follower or followers of said at least one link structure:

5 wherein said holding means is resiliently biased so as to cause said holding means normally to press against said peripheral surface of said platen drum said at least one link structure is so made, upon rotation of said platen drum, as to temporarily move said holding means by rotating said cam gear, so that, said holding means may co-operate with said peripheral surface of said platen drum to hold and clamp said leading end of said receiver sheet to
10 said peripheral surface after supply from said supply guide chute, said head member is biased towards said platen drum after said leading end of said receiver sheet has been clamped and held to said peripheral surface by said holding means to be positioned to transfer said dyes to said receiver sheet, and when said platen drum starts a third rotation for the last third dye to be
15 transferred to said receiver sheet to which two of said three different coloured dyes of Y, M and C have been sequentially transferred one by one at each previous rotation of said platen drum, said leading end of said receiver sheet is released from said holding means during the transfer of said last third dye so as to allow said receiver sheet to move towards said discharge guide chute.

20

2 A colour video printer as claimed in Claim 1, wherein said holding means comprises:

25 a pair of holder members each mounted on a respective one of said two ends of said platen drum so as to be pivotable about said central shafts; and

a pair of holders each attached to a respective one of said pair of holder members for clamping a leading end of said receiver sheet to the peripheral
30 surface of said platen drum;



- 15 -

wherein there are a pair of link structures for cooperating with said pair of holder members to cause said pair of holders to cooperate with the peripheral surface of said platen drum;

5 and wherein said pair of holder members are resiliently biased by means of a pair of springs.

3 A colour video printer as claimed in Claim 2, wherein said pair of link structures comprise a pair of sliders each with a guide slot for making a
10 straight motion, said guide slot having a slope portion and horizontal portion, a first lever with said second cam follower for moving said pair of sliders forwards and backwards within a given limit according to the rotation of said cam gear, a pair of second levers each with a hinge at one end and a guide pin at the other end thereof, said pair of second levers being pivoted on said
15 hinges, and a pair of third levers for pushing said pair of holder members by pivotal movement so as to cause said pair of holders to co-operate selectively with said peripheral surface of said platen drum, said pair of third levers being pivoted by said second pair of levers when said pair of sliders move to a forward limit by pivotal movement of said first lever.

20

4 A colour video printer as claimed in Claim 1, 2 or 3 wherein said head member is pivoted on a pin by rotation of said cam gear causing said thermal print head to contact said receiver sheet supported upon said peripheral surface of said platen drum when printing.

25

5 A colour video printer as claimed in Claim 2, 3 or 4 wherein said pair of holder members are substantially L-shaped with two branches, one of said two branches having at a base an elongated opening for receiving one of said
30 central shafts and at an end opposite to said base one of said pair of holders



extending at right angles, said pair of holders being supported on or protruding from said peripheral surface of said platen drum as said pair of holder members move along said elongated openings about said central shafts.

5 6 A colour video printer as claimed in Claim 5, wherein the other of said two branches has two guide pins at opposite sides, said one branch also has a holder guide pin at a rear side thereof near the respective said holder and the ends of said platen drum have relatively long first arcuate grooves for guiding a rear guide pin of said other branch and relatively short second guide
10 grooves for guiding said holder guide pin when mounting said pair of holder members on said central shafts said second guide grooves having a sloping guide surface.

7 A colour video printer as claimed in Claims 3 and 6, wherein said pair
15 of third levers are substantially T-shaped with three branches, a common base of said three branches having a circular opening for rotatably receiving said central shafts of said platen drum, two adjacent first and second branches of said three branches respectively having first and second operational pins at the ends opposite to said common base, the remaining branch having at the end
20 opposite to said common base a holder member engaging opening for movably receiving a front guide pin of said other branch of said pair of holder members, so that operation of said pair of third levers is linked to said pair of holder members via said holder member engaging opening and front guide pin.

25 8 A colour video printer as claimed in Claim 7, wherein said pairs of holder members and third levers are successively mounted on both ends of said platen drum about said central shafts, said third branches overlap said other branches of said pair of holder members, and the branches of said pair
30 of holder members with said holders are positioned opposite to the second



- 17 -

branches of said pair of third levers around the first and third branches of said pair of third levers.

9 A colour video printer as claimed in Claim 7 or 8, wherein said pair
5 of second levers are so arranged that, as said pairs of sliders move to said forward limit, said guide pins thereof may be guided along said slope portion of said elongated guide groove so as to cause the ends of said pair of second levers with said guide pins to push said first or second operational pins of said pair of third levers, whereby said pair of third levers are rotated to push said
10 pair of holder members causing said holders to protrude from said peripheral surface of said platen drum.

10 A colour video printer as claimed in Claim 9, wherein said pair of second levers are so arranged as to push said first or second operational pins
15 of said pair of third levers according to whether said holders of said pair of holder members face said supply guide chute or discharge guide chute.

11 A colour video printer as claimed in any of the preceding claims, wherein said discharge and supply chutes are disposed vertically above one
20 another at one side of said platen drum.

12 A colour video printer as claimed in any one of claims 2 to 11, wherein said first cam groove of said cam gear is so shaped that said thermal print
25 head of said head member may contact said receiver sheet supported on said platen drum during printing, and said second cam groove is so shaped that said first lever may be operated so as to cause said holders of said pair of holder members to protrude from said peripheral surface of said platen drum when supplying or discharging said receiver sheet.

30

13 A colour video printer substantially as hereinbefore described with reference to Figures 3 and 4 of the accompanying drawings.

