

PATENT SPECIFICATION

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(54) RECORDING TAPE TRANSPORT FOR RECORDING AND/OR PLAYBACK APPARATUS

(71) We, AUTOVOX S.p.A., an Italian Company, of 981 Via Salaria, 00199 Rome, Italy, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following:

This invention relates to twin-reel magnetic tape cassette apparatus that is recording and/or playback apparatus and hereinafter referred to as tape cassette apparatus.

In such tape cassette apparatus it is conventional and desirable to provide in addition to the normal forward tape transport speed used for recording and playback, two additional tape transport speeds, that is fast rewind and fast forward speeds.

In both normal forward and fast forward speeds a take-up carrier is driven, this carrier being adapted to be attached to the take-up reel for the tape. The take-up carrier will be driven at normal forward speed through a clutch device. Such clutch device is arranged to be disengaged or overridden when the take-up carrier is driven at fast forward speed and also when a further carrier is driven at fast rewind speed. This further carrier is that adapted to be attached to a take-off reel for the tape.

At normal forward speed the tape is transported at a governed substantially constant speed by a capstan and the take-up carrier is required to rotate at a constantly varying speed of angular rotation so that the take-up reel coaxial with and attached to it, may wind tape received from the capstan irrespective of the effective circumference of the reel at any instant. This effective circumference increases as more tape is wound onto the take-up reel. The function of the clutch device is to impact drive to the take-up carrier at these varying

speeds. For example there will be greater clutch "slippage" when the take-up reel is nearly full, has a large effective circumference and rotates slowly, than when the take-up reel is nearly empty, has a small effective circumference and rotates fast.

To this end it is known to construct the clutch device as a slipping friction coupling with a driven member which may slip relative to a driving member. The present invention includes a tape transport arrangement utilizing such a clutch.

In such tape cassette apparatus the tape needs to be governed at a substantially constant speed only during the normal forward speed condition, that is during recording and/or playback and conventionally such governing is effected by pressing the tape between a roller and the capstan.

The present invention has for its object to provide tape cassette apparatus with a tape transport arrangement which gives a satisfactory performance in the three operative conditions outlined above, that is normal forward, fast forward and fast rewind transport speeds. The apparatus should be capable of being made in as compact a form as is possible and in particular the number of components which require to be moved when a change of operative condition takes place, should be as low as possible.

According to this invention there is provided tape cassette apparatus (as hereinbefore defined) having a tape transport arrangement in which a first flywheel is continuously rotated by a main belt from a motor output shaft, said first flywheel being adapted, in one operative condition of the tape transport arrangement, to drive a take-up reel carrier through a slipping clutch mechanism and wherein in a second operative condition of the tape transport

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arrangement said carrier is driven for fast forward transport by a jockey pulley also continuously rotated by said main belt, while in a third operative condition said jockey pulley is movable out of driving engagement with said take-up reel carrier and into driving engagement with a take-off reel carrier to effect fast rewind, said jockey pulley idling out of driving engagement with both of said reel carriers during said first operative condition of the tape transport arrangement, and including also a further flywheel which has a capstan for governing tape movement at a substantially constant normal speed past a recording and/or playback head of the apparatus in said first operative condition thereof, said further flywheel being independent of the remainder of the tape transport arrangement except that it also is continuously rotated by said main drive belt.

With a tape transport system as above defined, it is possible to arrange that neither of the two flywheels employ their peripheries to transmit drive to the reel carriers in the fast forward and fast rewind conditions. For bringing one of these conditions into being the jockey pulley is moved out of a position in which it idles. When the jockey pulley is so moved, the tape can be disengaged from the capstan and, if required, the drive to the take-up carrier by way of the slipping clutch can be interrupted. The effects can be accomplished with advantageously few movable parts.

In the drawings, Figure 1 shows a schematic plan view of a recording tape transport arrangement according to a first embodiment of the present invention;

Figure 2 is a schematic transverse sectional view of the embodiment according to Figure 1;

Figure 3 shows schematically a first variation of the embodiment according to Figure 1; and

Figure 4 shows a second variation of the embodiment according to Figure 1.

With reference to the said drawings and in particular to Figures 1 and 2, there are provided flywheels 2 and 3 which receive power from a driving pulley 1 by means of a belt 14.

The flywheel 2 solely serves the purpose of governing the speed of rotation of a capstan 11. 13 represents a pressure roller which is movable (by means not shown) towards the capstan for pressing the tape thereagainst.

The flywheel 3 acts as a power take-off for indirect operation of the toothed wheel of the carrier 9 for the take-up reel, 12 representing a coupling for the take-up reel (not shown).

In particular, the pulley 4 of the flywheel 3 is linked with a grooved wheel 7 by means of a belt 15.

A slipping friction clutch (disengageable by a lever 16) transfers the drive from wheel 7 to a toothed pinion 8 which is always engaged with the toothed wheel of the tape carrier 9.

A jockey pulley 5 with a toothed pinion 6, can be positioned in three positions, depending on whether power is being transmitted to the tape carrier 9 for normal advancement, or whether the tape carrier 9 is being rotated rapidly for fast forward wind or whether the take-off reel tape carrier 10 is being moved rapidly for fast rewind.

As will be seen from the drawing, the jockey pulley 5 receives its power from the belt 14 and, if made having a small moment of inertia, does not influence the kinematic system with regards to the efficiency of the flywheels 2 and 3 in the compensation of spurious accelerations which the mechanism undergoes.

In one position of the jockey pulley 5, the pinion 6 of the jockey pulley itself engages directly with the toothed wheel of the tape carrier 10 and provides the "fast rewind" mode. At a second position, the pinion 6 of the jockey pulley 5 engages with the toothed pinion 8 and transmits to the tape carrier 9 the necessary movement for fast forward winding of the tape. Obviously, during these movements of the jockey pulley 5, suitable and known lever systems provide moving-away of the pressure roller 13, and by means of the lever 16, the disengagement of the slipping friction clutch thereby disengaging drive between the wheel 7 and the pinion 8.

In a variation illustrated schematically in Figure 3, and in which the parts which are identical to those in Figures 1 and 2 have been shown with the same numbers, and those which are similar to those parts previously illustrated are indicated with dashed numerals, the small pulley of the flywheel 3 is formed, as shown at 4', as a toothed pinion, and in which, in place of the belt 15, there is a toothed wheel 15' which engages with a toothed wheel 7' carrying the friction clutch adapted to drive with slip, the pinion 8. In this case, cut out of drive by way of the friction clutch can be obtained by moving the wheel 15' away from wheel 4' or wheel 7'.

Another characteristic which is particularly important in the system according to the present invention is the lever 17 which has the purpose of displacing the jockey pulley 5 to its various positions, and is used in particular for maintaining the jockey pulley 5 in a stable position so that the recorded may function normally, if the lever 17 is not operated, in the normal forward speed condition. As will be seen, the lever 17 has a bar, jockey pulley 5 being carried on the bar. The lever 17 is maintained in the rest position by a spring 22, so arranged that the jockey pulley 5 acts as a tensioner for the belt 14 and the pinion 6 is disengaged from pinion 8 and from the carrier 10.

The lever 17 is provided with two slots 21 within which there engage two corresponding pins which are carried on the chassis 18 of the apparatus.

Due to the effect of these two pins and the corresponding slots 21, in consequence of the force exerted by the spring 22, the lever 17 and hence the jockey pulley 5 are in a neutral position, that is the position shown in the drawings. Due to the effect of an angular displacement of the lever 17 with respect to the chassis 18, the latter pivots at one of the two pins and the path of the lever 17 is limited by the width of the slot 21 which corresponds to the pin which is not employed.

During this movement around one or the other of the pins, the jockey pulley will be carried into engagement either with the pinion 8 so as to transmit fast motion to the tape carrier 9, or, in the other direction, with the tape carrier 10 for fast rewind of the tape.

Figure 4 shows another arrangement of the same parts shown in Figure 1, which has the result of achieving a mechanism which is even more compact, this being for purposes which should be evident to those skilled in the art. In the said Figure 4, the same parts as in Figure 1 have been shown with the same reference numerals, with the exception of the lever 17 for control of the jockey pulley 5, which obviously, both in the solution shown in Figure 4 and in the solution in Figure 1, can be formed in a different manner to that shown.

It should be said that the various parts of the capstan 11, of the flywheel 2, of the collar 20 which is shrunk onto the capstan, and the bearing 19 of the flywheel 1 preferably make up a pre-mounted unit, thus simplifying the assembly of the equipment and its adjustment.

It should be pointed out that apart from the advantages indicated above, the kinesmatic system according to the present invention makes it possible to achieve appreciable economies and offers simplicity, industrial reproducibility, and reduction in dimensions.

WHAT WE CLAIM IS:—

1. Tape cassette apparatus (as hereinbefore defined) having a tape transport arrangement in which a first flywheel is continuously rotated by a main belt from a motor output shaft, said first flywheel being adapted, in one operative condition of the tape transport arrangement, to drive a take-up reel carrier through a slipping clutch mechanism and wherein in a second operative condition of the tape transport arrangement said carrier is driven for fast forward transport by a jockey pulley also continuously rotated by said main belt, while in a third operative condition said jockey pulley is movable out of driving engagement with said take-up reel carrier and into driving engagement with a take-off reel carrier to effect fast rewind, said jockey idling out of driving engagement with both of said reel carriers during said first operative condition of the tape transport arrangement, and including also a further flywheel which has a capstan for governing tape movement at a substantially constant normal speed past a recording and/or playback head of the apparatus in said first operative condition thereof, said further flywheel being independent of the remainder of the tape transport arrangement except that is also is continuously rotated by said main drive belt.

2. A tape cassette apparatus having a tape transport arrangement according to claim 1 and substantially as hereinbefore described with reference to any one or more of the accompanying drawings.

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AGENTS FOR THE APPLICANTS

Due to the effect of these two pins and the corresponding slots 21, in consequence of the force exerted by the spring 22, the lever 17 and hence the jockey pulley 5 are in a neutral position, that is the position shown in the drawings. Due to the effect of an angular displacement of the lever 17 with respect to the chassis 18, the latter pivots at one of the two pins and the path of the lever 17 is limited by the width of the slot 21 which corresponds to the pin which is not employed.

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It should be pointed out that apart from the advantages indicated above, the kinematic system according to the present invention makes it possible to achieve appreciable economies and offers simplicity, industrial reproducibility, and reduction in dimensions.

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1. Tape cassette apparatus (as hereinbefore defined) having a tape transport arrangement in which a first flywheel is continuously rotated by a main belt from a motor output shaft, said first flywheel being adapted, in one operative condition of the tape transport arrangement, to drive a take-up reel carrier through a slipping clutch mechanism and wherein in a second operative condition of the tape transport arrangement said carrier is driven for fast forward transport by a jockey pulley also continuously rotated by said main belt, while in a third operative condition said jockey pulley is movable out of driving engagement with said take-up reel carrier and into driving engagement with a take-off reel carrier to effect fast rewind, said jockey idling out of driving engagement with both of said reel carriers during said first operative condition of the tape transport arrangement, and including also a further flywheel which has a capstan for governing tape movement at a substantially constant normal speed past a recording and/or playback head of the apparatus in said first operative condition thereof, said further flywheel being independent of the remainder of the tape transport arrangement except that is also is continuously rotated by said main drive belt.

2. A tape cassette apparatus having a tape transport arrangement according to claim 1 and substantially as hereinbefore described with reference to any one or more of the accompanying drawings.

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