May 16, 1961 D. A. CHALMERS 2,984,398

APPARATUS FOR DRIVING WEBS

Filed Dec. 31, 1957 2 Sheets-Sheet 1

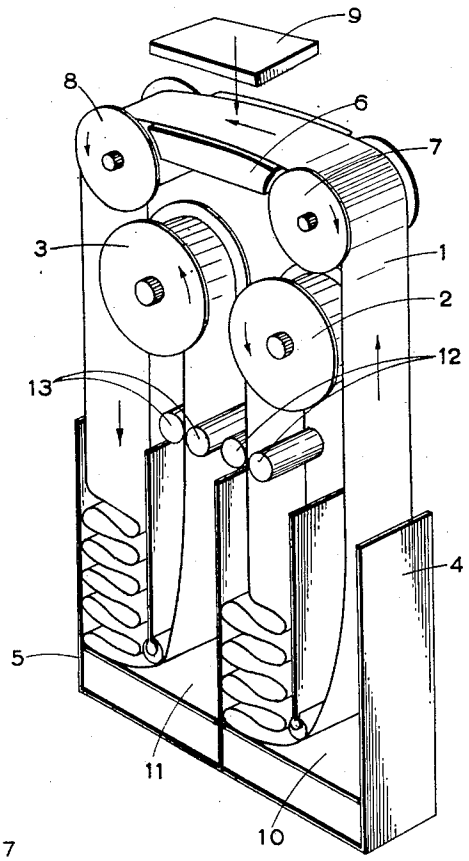

FIG. 1

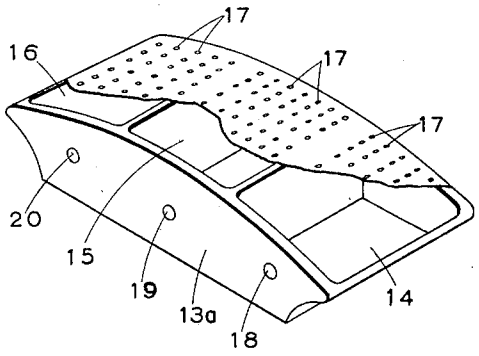

FIG. 2

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May 16, 1961 D. A. CHALMERS 2,984,398

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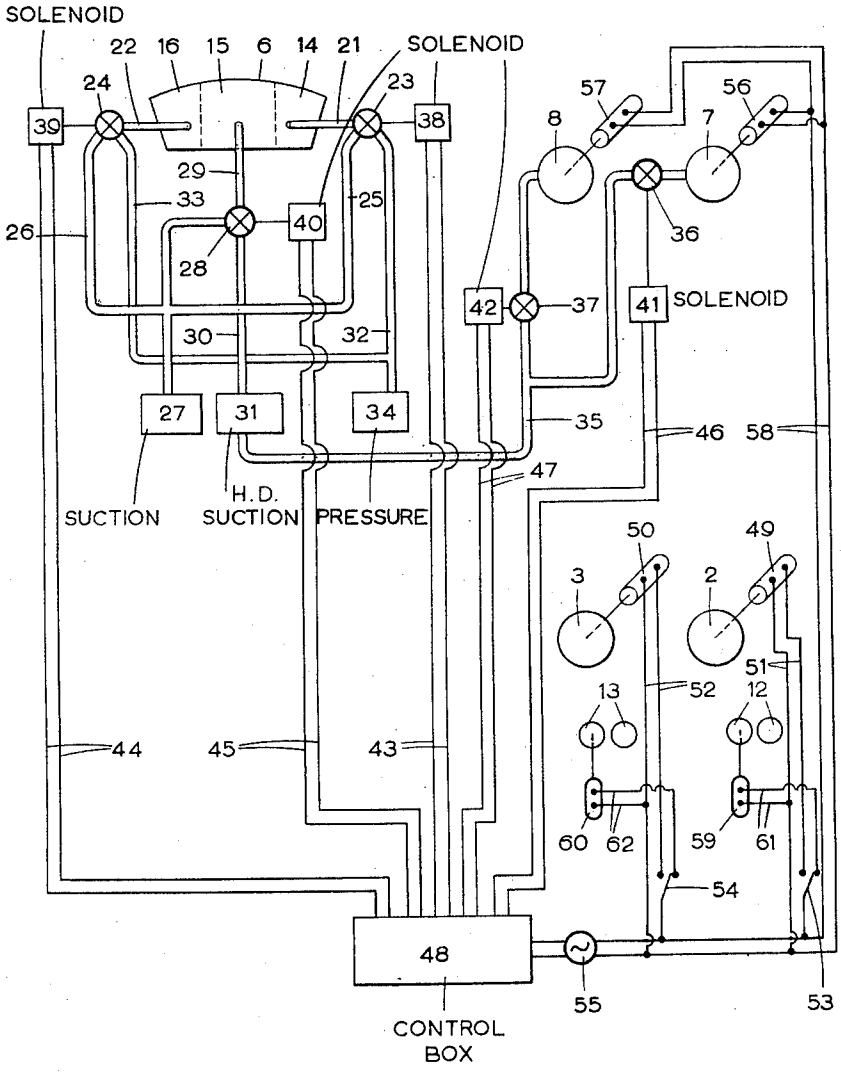

FIG. 3.

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APPARATUS FOR DRIVING WEBS

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14 Claims. (Cl. 226—95)

This invention relates to apparatus for driving webs and has particular but not exclusive reference to such apparatus employed for driving magnetisable tape for magnetic data storage purposes in so-called business machines.

It has been proposed in such machines to drive the tape in either direction past a magnetic transducing head or heads by means of capstan rollers, the tape being supported in its passage past the transducing head or heads on a supporting surface.

The object of the present invention is to provide an improved apparatus whereby the travel of the web over the supporting surface is improved.

According to the present invention there is provided apparatus for driving web comprising a stationary member having a supporting surface over which web is driven, means for driving the web over and relatively to said surface, said member having passages therein communicating with said surface, means for applying suction to one area of said surface through said passages in said member communicating with said area to cause the web to be drawn by suction into proximity to a leading area of said supporting surface to apply back tension to said web and means for applying a positive pressure to another area of said surface through said passages in said member communicating with said last-mentioned area to cause the web to be blown by said positive pressure from the trailing area of said surface.

The suction applied to one of the areas of said supporting surface whereby back tension is applied to the web can ensure that the web is firmly held in contact with the supporting surface, and the pressure applied to another area of said surface ensures that the web effectively floats on the surface of the support as the web is leaving the supporting surface. Moreover it may be arranged that suction can be applied to a central area of the support or to the whole of the support so as to stop the movement of the web.

In order that the said invention may be clearly understood and readily carried into effect it will now be more fully described with reference to the accompanying drawings, in which:

Figure 1 illustrates a perspective view of an apparatus for driving a magnetic tape,

Figure 2 is an enlarged perspective view partly broken away of the supporting surface for the tape shown in Figure 1, and

Figure 3 schematically illustrates the manner of applying pressure or suction to said supporting surface and the arrangement for driving the web.

The apparatus shown in the drawings is particularly suitable for use for magnetic data storage purposes in so-called business machines.

In Figure 1 of the drawings the reference numeral 1 indicates web in the form of a magnetisable tape which may be 4" wide and requires to be driven at a speed of about 200" per second. The ends of the tape are

wound on spools 2 and 3 and loops of said tape are stored in storage bins 4 and 5 from which tape can be driven over a supporting surface 6 in either direction by means of vacuum capstan rollers 7 and 8. A magnetic transducing head 9 is shown spaced from the surface 6 but will normally be disposed in close proximity thereto. The spools 2 and 3 are arranged to be selectively rotated in either direction by means of suitable motors so that a predetermined quantity of tape is stored in each bin, tape being fed to or withdrawn from the bins by the spools 2 and 3 according to the quantity of the tape therein. The loops of tape as shown in Figure 1 rest on weighing platforms 10 and 11 which are coupled to suitable switches such as mercury switches controlling the energization of the motors driving the spools 2 and 3. These motors or separate motors are arranged to drive pairs of rollers or vacuum capstans 12 and 13 which serve in known manner to unwind or assist in the unwinding of tape from the spools and to apply back tension to the tape when it is being wound on said spools.

The capstan rollers 7 and 8 are continuously rotated in opposite directions and suction is selectively applied to the capstan rollers so that the roller to which suction is applied is operative to draw the tape into driving engagement therewith whereby the tape will be driven in the direction of rotation of said roller. Thus, the tape can be driven past the head 9 in either direction depending on the selective application of suction to the rollers 7 and 8.

The supporting surface 6 is shown in greater detail in Figure 2 and as will be observed the top surface of the support approximately conforms to the surface of a circular cylinder, the ends of said top surface being in close proximity to and substantially tangential with respect to the peripheral surfaces of the respective capstan rollers 7 and 8. The supporting surface 6 is mounted on a casing 13*a* having three chambers 14, 15 and 16, and the supporting surface 6 comprises a plate mounted on the casing 13*a* and provided with a multiplicity of passages which in the embodiment shown comprise small holes 17 which communicate with the chambers 14, 15 and 16. Each chamber is provided with a duct 18, 19 and 20, the ducts 18 and 20 being connected selectively to a suction source or air pressure pump so that suction or air under pressure can be selectively applied to the chambers 14 and 16 whilst the duct 19 is connected to a suction source so that suction can be selectively applied to the central chamber 15. Assuming that the tape 1 is travelling from right to left in Figure 1 of the drawings across the surface 6 is it arranged that the chamber 14 has applied thereto a partial vacuum so that the leading area of the surface 6 over the chamber 14 has suction applied thereto which results in a back tension being applied to the section of tape which extends between the driving capstan 8 and the chamber 14 so that by virtue of the curved path along which the tape is constrained to pass the tape is held in close contact with the surface 6. Thus the tape is held against the central section of the supporting surface so that the transducing heads 9 can be mounted in proximity to the central section of the surface 4 and slightly spaced therefrom without the possibility of the magnetisable coating on the tape scraping the surface of the heads. When the tape is travelling from right to left as aforesaid, the chamber 16 has a slight air pressure applied thereto so that the tape rides on a layer of air over the trailing area of the surface 6 over the chamber 16, and hence there is no tendency for the tape to stick to the surface 6 as it leaves said surface. When the tape is travelling from left to right suction is applied to chamber 16 and slight air pressure to the chamber 14. When it is desired to stop travel of the tape suction can be ap-

plied to the chamber 15 and also if desired to both of the chambers 14 and 16.

The large number of small holes 17 provided in the surface 6 not only serve to enable suction or pressure to be applied to the tape passing over said supporting surface but also enables loose particles of the magnetisable coating of the tape which may have dislodged therefrom to be sucked into one of the chambers 14, 15 or 16 so as to prevent an accumulation of particles on the supporting surface 6.

Figure 3 of the drawings illlustrates schematically the manner in which suction or air pressure is supplied to the chambers 14, 15 and 16 and the manner of controlling the electric motors driving the rollers 2 and 3, 7 and 8 and 12 and 13. As shown in Figure 3 the chambers 14 and 16 are connected by pipelines 21 and 22 through two-way valves 23 and 24 connected by pipelines 25 and 26 to a source of suction indicated at 27. The source 27 is also connected through a two-way valve 28 and by a pipeline 29 to the chamber 15, the valve 28 also being coupled by pipeline 30 to a suction source 31 having a higher degree of suction than the source 27. The valves 23 and 24 are also connected by pipelines 32 and 33 to a source of pressure indicated at 34. The source of suction 31 is also connected by a pipeline 35 through single-way valves 36 and 37 to the vacuum capstan rollers 7 and 8. The valves 23, 24, 28, 36 and 37 are controlled respectively electromagnetically by means of solenoids 38, 39, 40, 41 and 42 which are connected respectively by leads 43, 44, 45, 46 and 47 to a control box 48 whereby the solenoids can be operated in suitable timed sequence to perform the operations of selectively supplying suction or air pressure to the chambers 14 and 16 respectively and also to the vacuum capstan rollers 7 and 8 according to the required direction of movement of the tape 1 and suction to the chamber 15 and if desired to the chambers 14 and 16 for braking purposes. It will be noted that two sources of suction 27 and 31 are employed, the source of suction 31 which has a higher degree of suction than the source 27 being employed for applying suction to the vacuum capstan rollers 7 and 8 and also to the chamber 15, the suction from the source 31 when applied to this latter chamber serving to apply a brake to the travel of the web 1. The suction source 27 is also shown as being connected to the valve 28 of the chamber 15 so that if desired suction can also be applied from the source 27 to the chamber 15 so as to assist in maintaining the tape in close contact with the central portion of the support 6 as it is passing the transducing heads.

The spools 2 and 3 are driven by electric motors 49 and 50 respectively and these motors are connected by leads 51 and 52 through switches 53 and 54 to a source of current supply indicated at 55. The switches 53 and 54 are controlled by the weighing platforms 11 and 10 as above described. The vacuum capstan rollers 7 and 8 are driven by electric motors 56 and 57 which are connected by leads 58 to the source of current supply 55, and one of each of the pairs of rollers 12 and 13 are also driven by electric motors 59 and 60 which are connected by leads 61 and 62 to the leads 51 and 52 before the switches 53 and 54 so that the motor driving one of the rollers 12 is energised to remove tape from the spool 2 and to feed it to the bin 4 when the quantity of tape therein reaches a predetermined minimum and likewise the motor 60 is driven to drive one of the rollers 13 to feed tape to the bin 5 when the quantity of tape therein is a predetermined minimum.

When tape in either of the bins 4 and 5 reaches a predetermined maximum quantity the motors 49 and 50 which drive the spools 2 and 3 are energised so as to remove tape from the bins, the motors 59 and 60 driving the rollers 12 and 13 being preferably de-energised so that back tension is applied to the tape as it is being wound on the spools 2 and 3.

What I claim is:

1. Apparatus for driving web comprising a stationary member having a supporting surface over which web is driven and said supporting surface being provided with a leading area and a trailing area, means for driving the web over and relatively to said surface, said member having passages therein communicating with said surface, a suction source, means for applying suction from said source to said leading area of said surface through said passages in said member communicating with said leading area to cause the web to be drawn by suction into proximity to said leading area of said supporting surface to apply back tension to said web, a source of positive pressure and means for applying a positive pressure from said latter source to said trailing area of said surface through said passages in said member communicating with said trailing area to cause the web to be blown by said positive pressure from said trailing area of said surface.

2. Apparatus according to claim 1, wherein said member has an intermediate area having passages therein communicating with an area intermediate the leading and trailing areas of said surface and means for applying suction to said intermediate area.

3. Apparatus for driving web comprising a stationary member having a supporting surface over which web is driven and said supporting surface being provided with a leading and trailing area, means for driving the web in either direction over and relatively to said surface, said member having passages therein communicating with said surface, a suction source, means for applying suction from said source to the leading area of said surface through said passages in said member communicating with said leading area when the web is travelling in one direction, to cause the web to be drawn by suction into proximity to said leading area of said surface to apply back tension to said web, a source of positive pressure, means for applying positive pressure to the trailing area of said surface through said passages in said member communicating with said trailing area when the web is travelling in said direction to cause said web to be blown by said positive pressure from the trailing area of said surface and means for reversing the direction of movement of said web when said leading area becomes a new trailing area and said first-mentioned trailing area becomes a new leading area and means for changing over the supply of suction and pressure so as to apply suction to said new leading area and positive pressure to said new trailing area.

4. Apparatus according to claim 3, wherein said member has an intermediate area having passages therein communicating with an area intermediate the leading and trailing areas of said surface and means for applying suction to said intermediate area.

5. Apparatus for driving web comprising a stationary member having a supporting surface conforming approximately to the surface of a circular cylinder over which web is driven and said supporting surface being provided with a leading area and a trailing area, means for driving the web over and relatively to said surface, said member having passages therein communicating with said surface, a suction source, means for applying suction from said source to said leading area of said surface through said passages in said member communicating with said leading area to cause the web to be drawn by suction into proximity to said leading area of said supporting surface to apply back tension to said web, a source of positive pressure and means for applying a positive pressure from said latter source to said trailing area of said surface through said passages in said member communicating with said trailing area to cause the web to be blown by said positive pressure from said trailing area of said surface.

6. Apparatus for driving web comprising a stationary member having a supporting surface over which web is

driven and said supporting surface being provided with a leading area and a trailing area, driving means for driving web over and relatively to said surface, said driving means including at least one roller disposed in proximity to one end of said supporting surface, said end of said supporting surface being substantially tangential with respect to the peripheral surface of said roller, said member having passages therein communicating with said surface, a suction source, means for applying suction from said source to said leading area of said surface through said passages in said member communicating with said leading area to cause the web to be drawn by suction into proximity to said leading area of said supporting surface to apply back tension to said web, a source of positive pressure and means for applying a positive pressure from said latter source to said trailing area of said surface through said passages in said member communicating with said trailing area to cause the web to be blown by said positive pressure from said trailing area of said surface.

7. Apparatus according to claim 6, wherein said member has an intermediate area having passages therein communicating with an area intermediate the leading and trailing areas of said surface and means for applying suction to said intermediate area.

8. Apparatus according to claim 6 including means for selectively applying suction and positive pressure to said areas, wherein said roller is of the vacuum type and means are provided for applying suction to said roller in timed sequence with the selective application of suction and positive pressure to said areas.

9. Apparatus for driving web comprising a stationary member having a supporting surface over which web is driven and said supporting surface being provided with a leading and trailing area, a capstan roller of the vacuum type disposed at each end of said member, means for driving said rollers in opposite directions thereby to drive said web over said supporting surface when suction is applied to one or other of said rollers, said member having passages therein communicating with said surface, a suction source, means for applying suction from said source to the leading area of said surface through said passages in said member communicating with said leading area when the web is travelling in one direction to cause the web to be drawn by suction into proximity to said leading area of said surface to apply back tension to said web, a source of positive pressure, means for applying positive pressure to the trailing area of said surface through said passages in said member communicating with said trailing area when the web is travelling in said direction to cause said web to be blown by said positive pressure from the trailing area of said surface and means for reversing the direction of movement of said web when said leading area becomes a new trailing area and said first-mentioned trailing area becomes a new leading area, means for changing over the supply of suction and pressure so as to apply suction to said new leading area and positive pressure to said new trailing area, and means for selectively applying suction to said rollers to determine the direction of movement of said web in timed sequence with the application of suction and pressure to said supporting surface.

10. Apparatus according to claim 9, wherein said member has an intermediate area having passages therein communicating with an area intermediate the leading and trailing areas of said surface and means for applying suction to said intermediate area.

11. Apparatus for driving web comprising a stationary member having a supporting surface in the form of a perforated plate over which web is driven and said supporting surface being provided with a leading area and a trailing area, means for driving the web over and relatively to said surface, chambers communicating with said leading and trailing areas of said supporting surface, a suction source, means for applying suction to one of said chambers to apply suction through said perforations to said leading area of said surface to cause the web to be drawn by suction into proximity to said leading area of said supporting surface to apply back tension to said web, a source of positive pressure, and means for applying a positive pressure to another of said chambers to apply a positive pressure through said perforations to said trailing area of said surface to cause the web to be blown by said positive pressure from said trailing area.

12. Apparatus according to claim 11, wherein a further chamber is provided communicating with an area of said surface intermediate said leading and trailing areas and means for applying suction to said chamber communicating with said intermediate area.

13. In magnetic tape transducing apparatus the provision of a stationary member having a supporting surface over which tape is driven and said supporting surface being provided with a leading area and a trailing area, means for driving the tape over and relatively to said surface, said member having passages therein communicating with said surface, a suction source, means for applying suction from said source to said leading area of said surface through said passages in said member communicating with said leading area to cause the tape to be drawn by suction into proximity to said leading area to apply back tension to said tape, a source of positive pressure, and means for applying positive pressure to said trailing area of said surface through said passages in said member communicating with said last-mentioned area to cause the tape to be blown by said positive pressure from said trailing area.

14. In magnetic tape transducing apparatus the provision of a stationary member having a supporting surface over which tape is driven and said supporting surface being provided with a leading area and a trailing area, means for driving the tape in either direction over and relatively to said surface, said member having passages therein communicating with said surface, a suction source, means for applying suction from said source to the leading area of said surface through said passages in said member communicating with said leading area when the tape is travelling in one direction to cause the tape to be drawn by suction into proximity to said leading area of said surface to apply back tension in said tape, a source of positive pressure, means for applying positive pressure to the trailing area of said surface through said passages in said member communicating with said trailing area when the tape is travelling in said direction so as to cause said tape to be blown by said positive pressure from the trailing area of said surface and means for reversing the direction of movement of said tape when said leading area becomes a new trailing area and said first-mentioned trailing area becomes a new leading area and means for changing over the supply of suction and pressure so as to apply suction to said new leading area and positive pressure to said new trailing area.

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