APPARATUS FOR CONTROLLING THE ROTATION OF A REEL

Filed May 29, 1956

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This invention relates to apparatus for controlling the rotation of a reel and more particularly to an apparatus for applying an adjustable braking force to a rotating reel to tension the material being unwound therefrom.

An object of the invention is to provide a new and improved apparatus for applying an adjustable braking force to a rotating reel for tensioning the material being unwound therefrom.

A device illustrating certain features of the invention may include a stationary frame and an air cylinder supported thereon having a vertically reciprocable piston rod swivelly connected to one end of a shaft for lowering the shaft into engagement with a reel positioned therebeneath to effect a driving engagement therewith. A brake drum is splined to the shaft for rotation therewith and is held by the frame against axial movement, and a brake shoe is mounted on the frame is actuated by air pressure to apply an adjustable braking force to the drum for retarding the rotation of the reel to tension the material being unwound therefrom. A fluid operated clamp mounted on the piston rod is actuable into gripping engagement with the frame to lock the shaft in a lower operative position in engagement with the reel and in an upper position disengaged therefrom, and a control mechanism serves to release the clamp while the piston and shaft are being raised and lowered.

Other objects and advantages of the invention will become apparent by reference to the following detailed description thereof and to the drawings showing the novel and characteristic features of the present invention in which the elements are represented in the appropriate ratio and in the correct relative position.

Referring to the drawings, 10 represents a reel having wound thereon strand material in the form of a cable core 11 which is to be unwound at an unreeiling station and advanced to another station for the application of a metal or dielectric sheath thereto. The reel 10 is mounted for rotation about a vertical axis on a truck (not shown) which is movable into the unwinding station beneath an apparatus 15 for applying a braking force to the reel to tension the cable core 11 as it is being unwound.

The apparatus 15 comprises a stationary frame in the form of a cylindrical shell 20 which is secured to a ceiling 21 or to another suitable supporting member in spaced relation to the floor to provide clearance for movement therebetween of the truck and the reel 10 thereon. The shell 20 has upper and lower sections 22 and 23, the upper section of which has a flange 24 through which bolts 25 pass to secure the shell to the ceiling. The flanges 26 and 27 at the juncture of the sections 22 and 23 are secured together by bolts. An annular plate 29 mounted on the upper end of the section 23 supports a cylinder 32 of a fluid actuator, the piston 33 of which is reciprocable thereby and has a piston rod 34 extending downwardly therefrom. An annular head 37 is secured to the lower end of the piston rod 34 and has a swivel connection with the upper end of a shaft 38 by means of ball bearings 39, the inner race of which is attached to the shaft and the outer race of which is secured to the head 37. The lower end of the shaft has a reduced pilot portion 43 which fits in an aperture 44 in the head 42 of the reel 10 to maintain the reel 10 in coaxial alignment with the head 37. A cross arm 45 is secured to the lower end of the shaft 38 and has downwardly extending legs 46 therein which are engageable with the head 42 of the reel and limits the downward movement of the shaft 38 and which engage a pair of diametrically opposed driving pins 48 extending upwardly from the head 42 of the reel to establish a driving connection between the reel and the shaft 38 as the reel 10 is rotated during the unwinding of the cable core 11 therefrom.

Means are provided for applying a braking force to the shaft 38, which includes a brake drum 52 splined on the shaft 38 for rotation therewith and for movement of the shaft axially thereof. The brake drum 52 has hubs 53 extending from opposite ends thereof which are journaled in bearings 54, 55 formed on plates 56, 57 and these plates are secured to the flange end 58 of the shell section 23 by bolts 59 and spacers 60. The cylindrical peripheral surface of the brake drum 52 is engageable by a plurality of brake shoes or segments 61 of a commercial fluid actuated brake. The shoes 62 are bonded or otherwise secured to the inner periphery of an expandable annular tube 63 of rubber or other suitable material and the outer periphery of the tube is bonded or otherwise secured to an annular metal frame 64 which is secured to the underside of the frame plate 56. An air line 65 is connected to the expandable tube 63 through which compressed air is admitted under the control of an adjustable valve 66 to inflate the tube 63 and actuate the brake shoes 62 to apply a predetermined braking force to the brake drum 52. Collar 67 secured to the hubs 53 of the brake drum 52 engage the ends of the bearings 55 and restrain the brake drum against axial movement.

An idling actuated clamping device 70 is mounted on the head 37 for clamping the shaft 38 in its different positions whereby the shaft may be clamped in its lower operative position with the cross arm 45 in engagement with the reel 10 or in its retracted position in disengaged relation to the reel. The clamping device 70 comprises a cylindrical metal ring 71 having a flange 72 secured to the head 37 and an expandable annular tube 73 secured to the ring 71. On the outer periphery of the expandable tube 73 is mounted a plurality of segments or brake shoes 74 which are engageable with the inner periphery of the section 23 of the shell for effecting a clamping engagement between the head 37 and the shell to lock the piston 32 and the shaft 38 against axial movement in response to expansion of the tube 73. One end of a flexible air line 76 is connected to the tube 73 and is coiled within the lower section 23 of the shell to permit vertical movement of the clamping device 70, and the other end of the line 76 is connected to a control valve 79 for controlling the admission of compressed air from an air line 80 to the clamping device 70. Thus, by connecting and disconnecting the supply of compressed air to the expandable tube 73 the clamping device 70 may be actuated to clamp or release the head 37 relative to the shell 23. A vertically disposed rod 81 having its ends secured to the hub 54 of the plate 56 and the frame plate 29 engages a notch in the head 37 for preventing rotation of the head during reciprocation thereof.

The control valve 79 is connected by a line 84 to a control valve 85 and controls the passage of air from the supply line 80 into the valve 85, which in turn is connected by air lines 86 and 87 to the lower and upper ends
of the cylinder 32 for controlling the passage of air to the lower and upper ends thereof for effecting reciprocation of the piston 33 and the shaft 38. The valves 79 and 85 have cylindrical casings and double headed piston valves 90 and 91 which are yieldably retained in normal positions as shown in the drawings and are actuated by solenoids 92 and 93 to second positions as shown in dotted lines. The solenoids are connected, in a control circuit including push buttons 95 and 96 to a power line 97. The arrangement of control circuit and other components of the apparatus is such that the clamping device 70 is always released during movement of the piston 33 and the shaft 38 to and from their upper and lower positions.

In the operation of the device the piston 33 and the shaft 38 are in their normal upper position and a truck with a reel 10 therein is moved into unreeled position below and in coaxial alignment with the shaft 38. The operator then presses the down button 96, completing a circuit through and energizing the solenoids 92 and 93 to simultaneously actuate the valve pistons 90 and 91 to move them to their second positions shown in dotted lines in the drawings. With the piston 90 of the valve 79 in its second position compressed air from supply line 80 is cut off to the clamping device 70 which is then connected to an exhaust port 98 in valve 79 to release the clamping device.

With the piston 90 of the valve 79 in its second position compressed air from the supply line 80 passes through the valve 79 and the line 84 into the valve 85 and through the line 87 to the upper end of cylinder 32 to force the piston 33 and the shaft 38 downwardly until the cross arm 45 engages the reel 10, whereupon the operator removes his finger from the down button 96. The air in the bottom of the cylinder 32 escapes through the line 86 and an outlet port 99 in the valve 85 as the piston 33 is lowered. The button 96 then returns to normal position, opening the circuit and deenergizing the solenoid 92 and allowing the piston 90 of the valve 78 to return to its normal position shown in full lines in the drawing, whereupon communication is established by the air supply line 80 and the line 76 and compressed air then expands the tube 73 to actuate the clamping member 70 into gripping engagement with the shell 23 of the shaft against axial movement. As the cable core is un wound from the reel the reel is rotated whereby the pins 48 on the reel head engage the cross bar 45 and rotate the shaft 38 which is restrained from rotation by the braking force of the brake shoes 62 thereon, whereby the device 15 retards the turning movement of the reel 10 and thereby applies a predetermined tension to the cable core 11 tending to keep it taut as it is being unwound from the reel. By adjusting the pressure control valve 66 in the air line 65 the magnitude of the braking force applied to the brake drum 32 may be varied.

After the cable core 11 has been unwound from the reel 10 the operator presses the up button 95 and thereby closes a circuit to the solenoid 92 to energize it and retract the piston 90 of the valve 79 to its second or dotted line position and thereby disconnect the air supply from the clamping device 70 which is then automatically released. With the valve in its retracted position compressed air from the air line 80 passes through the valve 79 and the line 84 into the valve 85 and through the line 86 into the lower end of the cylinder 32 and raises the piston 33 and the shaft 38 to their upper position, and the air in the upper end of the cylinder 32 is exhausted through the line 87 and a port 100 in the valve 85. When the piston 33 and the shaft 38 have been raised to their upper position the operator removes his finger from the up button 95 which then is returned to its normal position, thereby deenergizing the solenoid 92 and causing the valve piston to be returned to its normal position shown in full lines in the drawing, whereby communication is reestablished between the compressed air line 80 and the line 76 to actuate the clamping device 70 into gripping engagement with the shell 23 to lock the piston 33 and the shaft 38 in their upper position.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of this invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. In a device for controlling the rotation of a reel to tension material being unwound therefrom, a shaft having a connector member fixedly mounted on one end thereof for establishing a releasable driving connection with said reel, stationary mounting means for supporting said shaft for rotation and for axial movement, actuating means on said mounting means for axially moving said shaft from an operative position with the connector member in engagement with said reel to a retracted position with the connector member spaced therefrom, means for releasably locking the shaft against axial movement in the operative and in the retracted positions, and means for applying an adjustable braking force to the shaft to retard the rotation of the reel for tensioning the material being unwound therefrom.

2. In a device for controlling the rotation of a reel to tension material being unwound therefrom, a shaft having a connector member on one end thereof for establishing a driving connection with said reel, a stationary member for supporting the shaft for rotation and for axial movement, an actuator on the stationary member including a reciprocable piston rod having a swivel connection with the other end of the shaft for axially moving the shaft from an operative position with the connector member in engagement with said reel to a retracted position with the connector member spaced therefrom, means on said piston rod cooperative with said stationary member for locking the piston and the shaft in operative and in retracted positions, a brake drum mounted on said shaft for rotation therewith and for axial movement relative thereto, means for applying an adjustable braking force to the brake drum to retard the rotation of the reel to tension the material being unwound therefrom.

3. In an apparatus of the type described, the combination of a stationary frame having a vertically disposed hollow cylindrical portion for receiving a reel thereunder, actuating means mounted on the frame and having a rod reciprocable within said cylindrical portion, a member expandable into gripping engagement with the cylindrical portion of the frame for holding the rod and the member against vertical movement, means for sequentially actuating the actuating means and the device to move the rod and the member from one position to another and to expand the device when the rod is not being moved, and means mounted on the stationary frame for applying a braking force to said member to retard the rotation of the reel for tensioning the material being unwound therefrom.

4. In an apparatus of the type described, the combination of a stationary frame having a vertically disposed hollow cylindrical portion for receiving a reel thereunder, a fluid actuator mounted in the frame having a piston rod reciprocable within said cylindrical portion, a member having a cross arm engageable with the rod for establishing a driving connection therewith, means swivelly con-
necting the shaft to the piston rod for rotation about the axis of the piston and for reciprocation therewith into and out of engagement with the reel, an annular fluid operated device fixed to said piston rod and expansible into gripping engagement with the cylindrical portion of the frame for holding the piston rod and the shaft against vertical movement, means for actuating the fluid actuator and the expansible device, a brake drum mounted on the shaft for rotation therewith and for axial movement relative thereto, means on said frame for supporting the shaft for rotary and axial movement and for supporting the brake drum against axial movement, and means mounted on the frame for applying a braking force to said brake drum for retarding the rotation of the reel to tension the material being unwound therefrom.

5. In an apparatus of the type described, the combination of a stationary frame having a vertically disposed hollow cylindrical portion for receiving a reel thereunder, a fluid actuator mounted in the frame having a piston rod reciprocable within said cylindrical portion, a shaft having a connector member engageable with the reel for establishing a driving connection therewith, means swivelly connecting the shaft to the piston rod for rotation relative thereto about the axis of the piston rod and for reciprocation therewith into and out of engagement with the reel, a fluid actuated annular device fixed to said piston rod and expansible into gripping engagement with said hollow cylindrical portion for holding the piston rod and the shaft against axial movement, valve means for controlling the flow of fluid to the actuator and to the expansible device to actuate them and effect the raising and lowering of the shaft and the release of the expansible device while the shaft is being raised or lowered, a brake drum mounted on the shaft for rotation therewith and for axial movement relative thereto, means on said frame for supporting the shaft for rotary and axial movement and for supporting the brake drum against axial movement, and means mounted on the stationary frame for applying a braking force to said brake drum for retarding the rotation of the reel to tension the material being unwound therefrom.

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