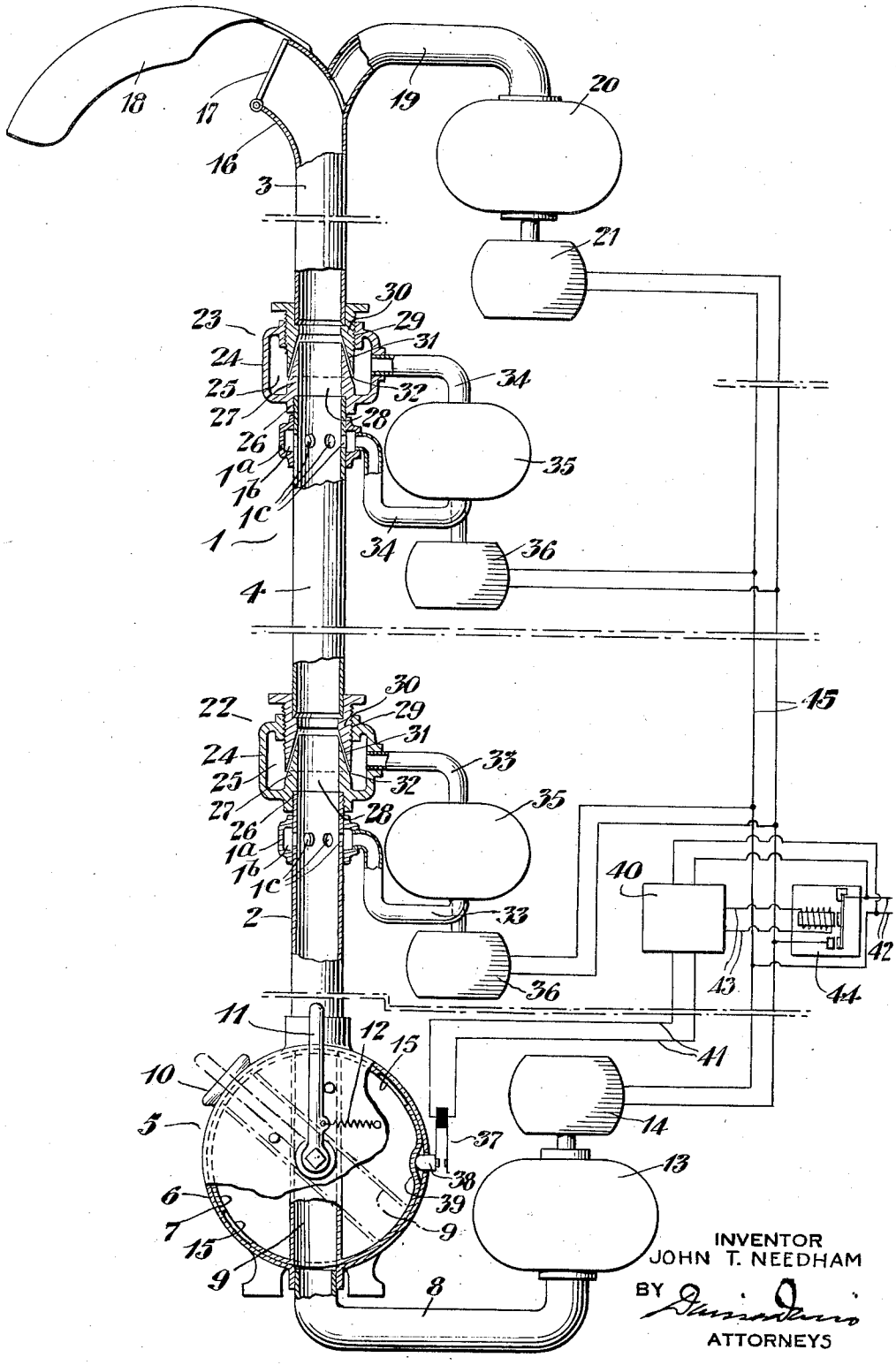
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PNEUMATIC DISPATCH TUBE APPARATUS

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PNEUMATIC DISPATCH TUBE APPARATUS

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Important objects of the present invention are, to provide improved efficient means for causing a carrier-propelling flow of air through a pneumatic dispatch tube line, and to provide an efficient pneumatic dispatch tube apparatus designed for positive and rapid propulsion of carriers along a tube line of great length. Other objects of the invention will appear hereinafter.

In the drawing, the figure is an elevation of the dispatch tube apparatus, partly in section.

The apparatus includes a dispatch tube line 1, in the present instance comprising two end tube sections 2 and 3 and an intermediate tube section 4. To the outer end of section 2 is attached a sending terminal device 5. Said device comprises a drum-like casing 6 in which a hollow cylinder 6 is rotatably mounted. The tube section 2 is connected to the drum-like casing at one point and an air supply pipe 8 is connected to the casing at a diametrically opposite point. Mounted within the cylinder 7 is a tube defining a diametrical passage 9 for receiving the carriers. Normally said passage is disposed in register with the connections of the dispatch tube and the supply pipe. Spaced around the casing from the dispatch tube connection is a bell mouth 10. When a carrier is to be inserted the cylinder 7 is rotated by means of a handle 11 to bring the passage 9 into register with the bell mouth, and the carrier is inserted through the bell mouth and into the passage 7. The handle is then released and, together with the cylinder 7, is returned to normal position by a spring 12. Supply pipe 8 leads from a source of air under pressure. In the present instance this source is a blower or other compressor 13 driven by an electric motor 14. The hollow cylinder 7 has diametrically disposed ports 15 to register with the supply pipe and the dispatch tube when the cylinder is rocked to position for the insertion of a carrier and permit a flow of air through the cylinder from said pipe to the tube.

The outer end of tube section 3 is curved and forms the discharge terminal 16 which is normally closed by a hinged, airtight closure 17. Attached to said tube end is an arcuate shield 18 forming a guide for the discharged carriers. Connected to the tube section 3 at a point near the discharge terminal is a suction pipe 19. This pipe leads to the inlet of a blower 20 or other suitable suction device, driven by a motor 21.

An injector device 22 connects together the tube sections 2 and 4, and a similar injector device 23 connects together the tube sections 3 and 4. These devices are preferably spaced a material distance apart and material distances from the terminals. Each injector device comprises a box-like casing 24 forming an air chamber 25. One of the connected tube sections is screwed into one wall of said casing, as at 26, and said wall is formed with a conical, nozzle-like projection 27 alining with the connected tube sections and formed with a bore 28 forming part of the carrier passage in the tube line. Said projection tapers toward the discharge end of the tube line. A threaded aperture 29, alining with projection 27, is formed in the opposite wall of the casing and has a threaded sleeve 30 screwed into it. Said sleeve is formed at its inner end with an annular, conical, internal surface 31 which telescopes over the nozzle 27 and cooperates with the conical surface of the latter to define an annular injector port 32 leading from the chamber 25 obliquely into the tube line. The opposed port-forming surfaces are of material length longitudinally of the tube line and correspondingly tapered, and their taper makes quite a low angle with the tube line in order to give positive longitudinal direction to the air injection. The sleeve receives and rotatably fits an end of one of the connected tube sections and is formed with a bore forming part of the carrier passage. By turning the sleeve the space between the tapering port walls may be varied to change the size of the port and to entirely close the port when required.

The injector devices 22 and 23 are supplied with air which is withdrawn from the dispatch tube line at intermediate points suitably spaced along the line. For supplying the injector 22 a by-pass pipe 33 leads from the tube line at a point between the sending terminal 5 and said injector and preferably near the latter. At its opposite end, pipe 33 is connected to casing 24, and opens into the air chamber 25. A similar by-pass pipe 34 leads from the tube line at a point between the two injectors and preferably near injector 23. Its opposite end is connected to the casing of said injector and opens into the air chamber thereof. Connected into each by-pass is an air compressor 35 which is driven by an electric motor 36. Each of the pipes 33 and 34 is connected to the tube line through the medium of a casing 1a which surrounds the tube and refines an annular chamber 1b. The tube has ports 1c equally spaced around it and opening into the chamber 1b, and said chamber opens into the connected pipe 33 or 34. Thereby the suction is evenly distributed around the tube.

At the sending end of the tube line is an electric

switch 37. This switch comprises two normally separated contact fingers. One of these fingers is provided with an insulation projection 38 extending through an opening in the terminal casing 6 and into a cam recess 39 formed in the periphery of cylinder 7. Thereby when the cylinder is rocked for insertion of a carrier one switch finger is cammed against the other to close the switch. A timer, diagrammatically indicated at 40, is connected into a circuit 41 controlled by the switch and is supplied with current from the line wires 42. The timer controls a circuit 43 into which a motor controller 44 is connected and the latter controls a circuit 45 into which the motors 14, 21 and 36 are connected.

When a carrier is inserted into the sending terminal device and the cylinder 7 rotates to bring the carrier into alinement with the tube line the switch 37 is closed and the timer is operated. The timer operates the motor controller 44 for closing the motor circuit and holding it closed for the required length of time and the motors drive the compressor 13 and the suction device 20. Air under pressure is forced through the supply pipe 8 and into the passage 9 to propel the carrier into the tube line. Air is also withdrawn from the discharge end of the tube through the pipe 19 by the operation of the suction device 20 and a partial vacuum is created in advance of the carrier. Simultaneously, the motors 36 are driven to operate the compressors 35. Air is thereby withdrawn by suction through the pipes 33 and 34, compressed into the air chambers 25 at a high pressure and injected back into the tube at a high speed and with great force, the force of the injection being increased by the suction in advance thereof. The pressure introduced at the sending terminal together with the suction at intermediate points and at the discharge terminal moves a carrier rapidly inward from the sending terminal. A strong impulse is received by the carrier from the first air injector and this injection assisted by suction farther along the line propels the carrier rapidly to the second injector from which it receives another impulse which boosts it rapidly toward the discharge terminal. Here it kicks open the closure 17 and is discharged from the tube. A carrier is thereby propelled along the tube line more rapidly and positively and with less expenditure of power than is customarily required. Only a small volume of air need be withdrawn through the pipes 33 and 34 for the injectors. The timer, when it has operated for a predetermined time, opens the circuit 43 of the motor controller 44 and the latter then automatically opens the motor circuit 45.

The apparatus is intended primarily for very long tube lines which ordinarily require a great expenditure of power to create sufficient pressure and suction at opposite ends of the line to propel the carrier along the length thereof. By the provisions for suction and injection at intermediate points in the line in combination with the supply of pressure at the sending end of the line and suction at the discharge end of the line the expenditure of power may be greatly reduced. At the same time the carrier will be more positively and rapidly propelled. The injectors are independently adjustable to vary the injection at the different points along the line according to the requirements. Also, if required, the injection and suction at the different points may be further varied by using compressors of different capacities and driving them at different speeds.

The intermediate injector devices, the end compressor 13 and the exhaust device 20 are operable simultaneously and they cooperate to quickly set the entire long column of air in the dispatch tube in forward motion for rapid carrier propulsion. When the tube is inactive it is charged with a column of air at atmospheric pressure. When a carrier is dispatched in an ordinary dispatch tube line this column of air by its inertia and by its friction in the tube resists the force of the air introduced at the sending terminal and materially retards the travel of the carrier. Also, when the tube is very long the forward flow of the air introduced at the sending terminal is resisted by friction in the tube and a dormant pressure tends to build up adjacent the sending terminal after the carrier has receded along the line from the terminal. The injector devices cooperate with the end compression and suction means to overcome the inertia and friction of both the column of air originally in the tube and the air introduced by the end compressor.

The forcible forward injection of air at intermediate points in the line thrusts forward the air originally in the tube, in advance of the carrier, creates a suction and renders the air introduced at the sending terminal more effective. When the carrier passes each injector it is subjected to the forward thrust of the injection and at the same time the injection, by its suction effect upon the air introduced at the sending terminal back of the carrier overcomes the tendency of said air to sluggishness and rapidly advances it. Thereby all of the air in the tube is set in rapid motion at once, resisting back pressure upon the carrier is substantially relieved, and an ideal condition is quickly established throughout the entire length of the tube, for rapid and positive carrier propulsion. From the sending terminal to the discharge terminal the carrier passage of the tube is constantly open and unobstructed so that the flow of the entire column of air and the travel of the carrier are uninterrupted.

What I claim is:

1. A pneumatic dispatch tube apparatus comprising a dispatch tube line having a carrier sending terminal and a carrier discharge terminal spaced therealong; normally inoperative compressor means to force air into the tube line at the sending terminal; normally inoperative suction means to withdraw air from the tube line at a point adjacent the discharge terminal; a normally inoperative injector device having a restricted injector port of material length opening into the tube line at an intermediate point between said terminals and disposed at a sharply acute angle to the line to inject air into the line, positively direct it along the line toward the discharge terminal and cause a forward suction between the sending terminal and the injection point; normally inoperative means to withdraw air from the tube line at a point between the sending terminal and said injector port and compress the withdrawn air and deliver it to the port for forcible injection; and means to render the compressor means, suction means and injector device operative simultaneously for cooperation to set all of the air between the terminals in rapid motion at once to cause an uninterrupted carrier-propelling flow of air from the sending terminal to the discharge terminal, the carrier passage

of the line being constantly open and unobstructed between the terminals for uninterrupted air flow and carrier travel.

2. A pneumatic dispatch tube apparatus comprising a dispatch tube line having a carrier sending terminal and a carrier discharge terminal spaced therealong; normally inoperative compressor means to force air into the tube line at the sending terminal; normally inoperative suction means to withdraw air from the tube line at a point adjacent the discharge terminal; a normally inoperative injector device having a restricted injector port of material length opening into the tube line at an intermediate point between said terminals and disposed at a sharply acute angle to the line to inject air into the line, positively direct it along the line toward the discharge terminal and cause a forward suction between the sending terminal and the injection point; normally inoperative means to deliver air under pressure to said port for forcible injection; and means to render the compressor means, suction means and injector device operative simultaneously for cooperation to quickly set in rapid motion the entire column of air between the terminals to cause an uninterrupted carrier-propelling flow of air from the sending terminal to the discharge terminal, the carrier passage of the line being constantly open and unobstructed between the terminals for uninterrupted air flow and carrier travel.

3. A pneumatic dispatch tube apparatus comprising a dispatch tube line having a carrier sending terminal and a carrier discharge terminal spaced therealong; normally inoperative compressor means to force air into the tube line at the sending terminal; normally inoperative suction means to withdraw air from the tube line at a point adjacent the discharge terminal; a normally inoperative injector device having a restricted injector port of material length opening into the tube line at an intermediate point between said terminals and disposed at a sharply acute angle to the line to inject air into the line, positively direct it along the line toward the discharge terminal and cause a forward suction between the sending terminal and the injection point; means to deliver air under pressure to said port for forcible injection; and means to render said compressor means, suction means and injector device operative simultaneously for cooperation to quickly set the column of air between the terminals in rapid motion to cause an uninterrupted carrier-propelling flow of air from the sending terminal to the discharge terminal.

4. A pneumatic dispatch tube apparatus comprising a dispatch tube line having a carrier sending terminal and a carrier discharge terminal spaced therealong; normally inoperative compressor means to force air into the tube line at the sending terminal; a normally inoperative injector device having a restricted injector port of material length opening into the tube line at an intermediate point between said terminals and disposed at a sharply acute angle to the line to inject air into the line and positively direct it along the line toward the discharge terminal and cause a forward suction between the sending terminal and the injection point; means to deliver air under pressure to said port for forcible injection; and means to render said compressor means and said injector device operative simultaneously for cooperation to quickly set the column of air between the terminals in rapid motion to cause an uninterrupted carrier-propelling flow of air from the sending terminal to the discharge terminal.

5. A pneumatic dispatch tube apparatus comprising a dispatch tube line having a carrier sending terminal and a carrier discharge terminal spaced therealong; normally inoperative suction means to withdraw air from the tube line at a point adjacent the discharge terminal; a normally inoperative injector device having a restricted injector port of material length opening into the tube line at an intermediate point between said terminals and disposed at a sharply acute angle to the line to inject air into the line, positively direct it along the line toward the discharge terminal and cause a forward suction along the line between the sending terminal and the injection point; normally inoperative means to withdraw air from the tube line at a point between the sending terminal and said injector port and compress the withdrawn air and deliver it to the port for forcible injection; and means to render said suction means adjacent the discharge terminal and said intermediate air withdrawal means and injector device operative simultaneously to quickly set the column of air between the terminals in rapid motion to cause an uninterrupted carrier-propelling flow of air from the sending terminal to the discharge terminal, the carrier passage of the line being open and unobstructed between the terminals for uninterrupted air flow and carrier travel.

6. A pneumatic dispatch tube apparatus comprising a dispatch tube line having a carrier sending terminal and a carrier discharge terminal spaced therealong; normally inoperative suction means to withdraw air from the tube line at a point adjacent the discharge terminal; a normally inoperative injector device having a restricted injector port of material length opening into the tube line at an intermediate point between said terminals and disposed at a sharply acute angle to the line to inject air into the line, positively direct it along the line toward the discharge terminal and cause a forward suction along the line between the sending terminal and the injection point; and means to render said suction means adjacent the discharge terminal and said injector device operative simultaneously to quickly set the column of air between the terminals in rapid motion to cause an uninterrupted carrier-propelling flow of air from the sending terminal to the discharge terminal, the carrier passage of the line being open and unobstructed between the terminals for uninterrupted air flow and carrier travel.

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