Aug. 15, 1950 E. J. STOECKLIN 2,519,203

PNEUMATIC CONVEYER TUBE JOINT

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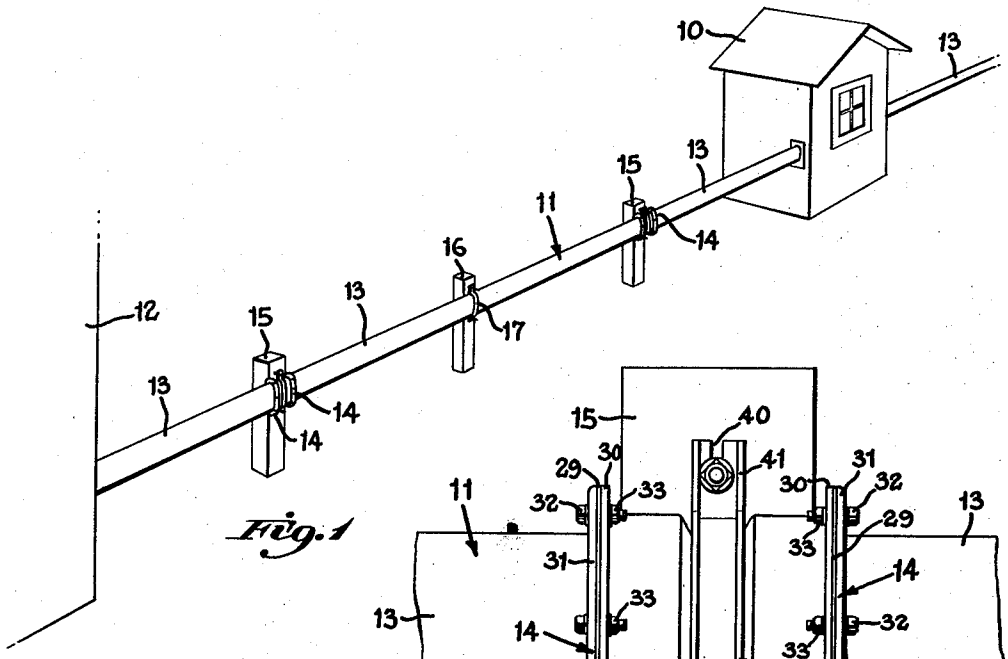


Fig. 1

Fig. 2

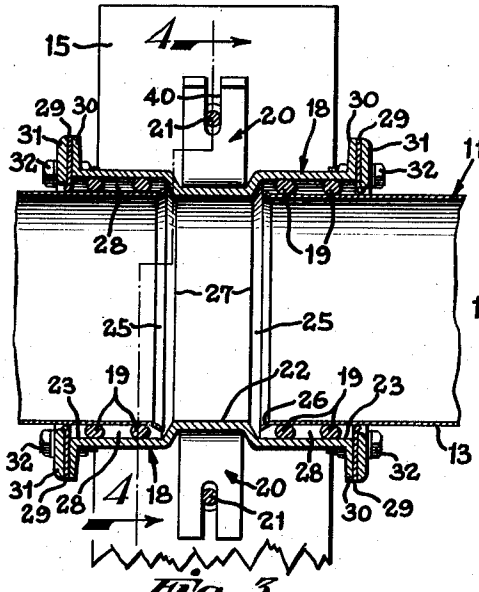


Fig. 3

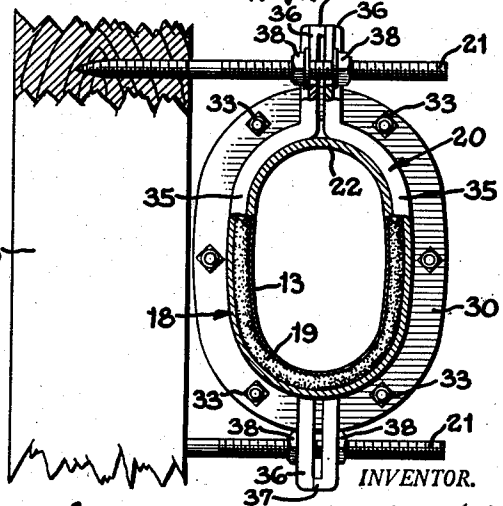


Fig. 4

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PNEUMATIC CONVEYER TUBE JOINT

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5 Claims. (Cl. 285—193)

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This invention relates to pneumatic tube systems of the type used to convey or dispatch papers and other articles by air pressure or vacuum from a dispatching to a receiving station. Such systems usually are made up of individual tube sections having their ends joined together to form a continuous airtight conveyor tube extending between the stations.

The present invention is directed in particular to an improved connector to provide an airtight joint and permit relative or full floating movement of the tube sections by reason of contraction and expansion. While intended primarily for pneumatic tube systems, the connector also is adapted for similar applications, particularly where contraction and expansion due to temperature changes is encountered.

Expansion and contraction of the tubing is an important problem in outdoor dispatch systems and the present structure has been developed primarily to solve this difficulty. As disclosed, the system is installed in a railway yard to exemplify a typical application of the principles involved. It will be apparent that it may be applied with equal facility to other outdoor uses such as a conduit between separated buildings such as office and factory buildings and to industrial uses generally to convey messages, papers and the like between various points.

As applied to railway usage the system serves to dispatch waybills and other papers between a central office building and remote parts of the yard. The system may be a mile or more in length and permits rapid transmission of papers to and from the trainmen as freight trains are made up, usually a considerable distance from the office. Thus waybills and other papers used in the record system and bearing information relative to each car, may be sent rapidly to or from the scene of operations and the office. The papers are placed in carrier units which are inserted in the tube system and propelled rapidly by air pressure or vacuum to their destination.

When installed out of doors the system is exposed to temperature variations of considerable magnitude. By way of example the temperature of the tube may reach 100° F. or higher in summer and may drop to 0° F. or lower during the winter season. If the ends of the tube sections are rigidly joined together a noticeable change in length occurs due to expansion. This presents a problem which becomes more troublesome as the length of the system increases. If there is an angular section such as a rise or fall, the length increase tends to accumulate at this point,

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stressing and tending to rupture the tube, and if the tube is straight it tends to buckle. The difference between day and night temperatures also causes daily contraction and expansion which tends to fatigue the metal even though the degree of expansion is considerably less than that due to seasonal temperature changes.

The sections from which the system is constructed preferably consist of a commercial grade of tubing, formed of aluminum or similar corrosion resistant metal which has a relatively high coefficient of expansion. Also to reduce costs such tubing has fairly high limits of tolerance which makes more difficult the establishment of an airtight joint between the sections.

A primary object of the inventor therefore has been to provide an expansion joint or connector for such tubes which compensates for tolerances in size and contour to provide an airtight joint and which permits the adjoining ends of the tubes freely to shift longitudinally due to contraction and expansion without loss of air pressure, thereby making each tube section individually expansible and eliminating expansion problems regardless of the length of the system.

The system usually is installed above ground, being supported by posts at spaced intervals to provide a continuous conduit. Additional problems encountered in a system of this kind, include the difficulty of maintaining the tube in a straight line. When the tube is made up of sections rigidly secured together and rigidly secured to these posts, the posts are stressed due to expansion and contraction and over a period of time this tends to disturb the alignment of the posts and tube, leading to potential failures in the system. An important feature of the present structure is the manner in which each tube section is mounted loosely at its center leaving its opposite ends slidably supported by the expansion joint so that there is no stressing of the posts. In other words each individual tube section floats relative to its adjacent sections and posts, consequently there is no accumulation of expansion lineally which normally would tend to displace the posts and case tube damage.

Another object of the inventor, therefore, has been to provide an improved mounting arrangement which makes each of the tube sections independently expansible whereby stressing and displacement of the system and posts are eliminated and the alignment of the tube is maintained accurately.

Another object of the present inventor has been to provide a continuous conduit system,

made up of tube sections as above set forth, which includes mounting and coupling means for maintaining the system in proper alignment and which does not permit the transmission of noise because of the sound insulating means included in the connections.

Further objects and advantages of the invention will be more fully disclosed in the detailed description with reference to the accompanying drawings in which:

Figre 1 is a general diagrammatic perspective view illustrating a pneumatic tube system employing the improved expansion joint and mounting arrangement.

Figure 2 is an enlarged fragmentary side elevation, illustrating a portion of the tube system with the improved expansion joint assembly secured to and supporting the ends of the tubes relative to a mounting post.

Figure 3 is a fragmentary view in cross section illustrating the structural details of the expansion joint in assembled relationship with the ends of the tubes.

Figure 4 is a cross section taken on line 4—4, Figure 3, further illustrating the joint structure, its mounting bracket and manner of attachment to a post.

Referring to Figure 1, the dispatching system is illustrated generally as applied to a railway freight yard or similar use. One terminal of the system, indicated at **10**, is connected by means of the conduit or tube **11** to a central building such as an office building indicated at **12**. These buildings may be located at considerable distances apart, for example in the instance of a railway yard, the central office building may be located a mile or more from the yard office which the system serves. The installation shown in Figure 1 is purely diagrammatic and is not intended to represent actual distances between the several points, the stations being shown relatively close together for convenience of illustration. Also the system may extend to several yard stations or offices as required by particular service conditions.

In pneumatic dispatch systems of this nature, the paper or article to be dispatched is placed within a carrier unit which fits snugly within the tube and air pressure or vacuum propels the carrier rapidly to its destination. The air pressure or vacuum may be in the neighborhood of three pounds per square inch depending on operating conditions, and since the tubes are made up of sections the ends of the sections must be joined together in an airtight manner. Special devices are installed at the dispatching and receiving ends of the system to admit the carrier unit and to deliver the unit at its destination without undue loss of air pressure. The structural details of the carrier unit, air pressure supply apparatus and entry and exit devices for the carriers forms no part of the present invention, therefore these structures are not disclosed.

As previously noted, the tube system is made up of individual tube sections which may be, for example, thirty feet in length, indicated at **13** in Figure 1. The adjoining ends of the sections are connected together to provide airtight joints by means of the improved connector or expansion joint indicated at **14**. The connectors are supported above ground upon a series of posts **15** preferably of wood which are set in the ground in the usual manner. If desired, the lower ends of the posts may be embedded in concrete. In the present instance these posts are set at fifteen

foot centers and upon alternate posts are mounted the connector units **14**. The intermediate post, indicated at **16** in Figure 1, serves as a support and is not provided with an expansion joint. Secured to each of the posts **16** is a hanger **17** engaging tube section **13** intermediate its length. The tube section **13** is carried slidably by post **16** and is free to expand in opposite directions and its opposite ends are confined slidably within the connectors **14**. Therefore each tube section floats and may expand and contract individually, thereby avoiding the effect of cumulative expansion which otherwise may be concentrated at one or more points.

Described in greater detail with reference to Figure 3, the expansion joint structure comprises a connector or sleeve **18** having elastic gasket rings **19—19** disposed in pairs at opposite ends thereof. The gaskets **19** are circular in cross section and are formed from rubber or a plastic or synthetic material such as neoprene. The sleeve **18** is secured to post **15** by means of a split bracket **20** secured to the post by means of lag screws **21—21**. With reference to Figure 3, it will be noted that sleeve **18** includes a necked portion forming a throat **22** of reduced diameter, centrally of its length. The endwise portions **23** of the sleeve are sufficiently large to receive telescopically the ends of tube section **13** and to provide space for the sealing gaskets **19** between the tube and end portion **23**. In the present disclosure, as viewed in Figure 4, the tube **13** and sleeve **18** are oval in cross section although the same structure may be applied to tubes having round or other cross sections.

It will be noted in Figure 3 that a clearance space **25** is provided between the flared end **26** of the tube **13** and the flared connecting portion **27** between the throat **22** and the enlarged end portions **23—23**. The clearance may be in the neighborhood of ⅜ of an inch to insure maximum expansion without the danger of jamming the end of tube **13** against the flared portion **27** under extremes in temperature ranges. In the course of experiment with aluminum tube sections under extreme temperature ranges it has been found that this amount of clearance is more than sufficient to accommodate maximum lineal expansion with a substantial safety margin.

In order to permit shifting of the end of the tube relative to the connector with minimum resistance, it has been found that the use of the gasket ring **19** of circular cross section is most advantageous. These sealing rings normally are somewhat greater in diameter in cross section than the space **28** between the tube and connector. Thus, there is a slight degree of flattening which develops sealing pressure and forms substantially a line seal. When the tube section expands or contracts the gaskets **19** roll and change their position due to the creeping of the end of the tube relative to the connector.

In order to prevent deterioration of these yieldable sealing rings, a weather seal **29** is provided. This seal preferably takes the form of a flat strip of pliable material and may be of the same material as the sealing rings **19**. Strip **29** is clamped between a flange **30** formed at opposite ends of connector **18** and a clamping ring **31**, the clamping ring being secured to flange **30** by means of screws **32** extending through the assembly and preferably secured by nuts **33**. The loose edge of strip **29** contacts and establishes a weather seal with tube **13** and prevents the entry of dirt and moisture into the area occupied

by the sealing rings and consequently improves performance and lengthens the life period of the sealing rings. By virtue of its accessibility the weather seal 29 may readily be replaced when it becomes badly worn or deteriorated by the weather.

The connector preferably is in the form of an aluminum casting although other methods of fabrication may be employed. It has been found however that cast connectors are somewhat cheaper and more rigid and substantial than those formed of rolled sheet metal and may be held more readily within specified limits of contour and dimension. The interior of the connector may be smoothed somewhat by sand blasting if desired but it is not necessary to machine finish the surface in order to establish an airtight seal. It is believed that by virtue of the narrow line contact established by the sealing ring 29 under compression, the yieldability of the ring causes it to conform to and embrace closely the slight irregularities of the metal surfaces to establish the seal. It has been determined that the seal is capable of withstanding air pressure many times greater than the service pressure, without leakage.

As previously noted, the connector 18 is slidably carried by its post 15 while the ends of the tube sections are free to slip longitudinally relative to the connector. The connector is secured by means of the split hanger bracket 20 which engages the connector in its throat portion 22. Hanger 20 is comprised of two identical loop-shaped pieces 35—35 each having outwardly extending ears 36—36. As illustrated in Figure 4, one of the ears of each member 35 includes an angular foot 37. In the present disclosure the left hand member has a foot 37 at the top and the right hand member has a foot at the bottom, both elements 35 being identical. This arrangement spaces the loop-shaped pieces 35 relative to the throat 22 to prevent undue clamping pressure from being applied to the connector. The loop members 35 are secured together in clamping engagement and mounted upon the post 15 by means of nuts 38 in screwthreaded engagement upon the elongated shank of screw 21. The bracket loops 35 preferably are stiffened by flanges or beads 41—41 formed along opposite edges as shown in Figure 2.

The nuts 38 permit the connector to be accurately adjusted toward or from the post 15. By virtue of this arrangement the posts need not be as accurately located to align the tube system as normally would be required. In order to facilitate attachment of the hanger brackets upon the screws 21, the ends of the brackets are slotted as at 40 (Figure 2). Slots 40 permit the position of the connector to be adjusted vertically. Thus the tube line conveniently may be adjusted vertically and horizontally relative to the posts at the time of installation to establish alignment.

By virtue of the throat portion 22 which has a slightly greater outside diameter than the tube section 13, the same hanger loop brackets 35 may be used for supporting the center of the tube section on post 16 as shown in Figure 1. The brackets are secured to posts 16 in the same manner as disclosed with reference to the connector but being slightly larger than the tube, do not bind the tube. The throat portion 22 establishes a uniform inside diameter between the adjoining ends of the tube sections 13 as shown in Figure 3. This is of importance due to the velocity at which the carrier units pass through the

tube system. It has been found in practice that any substantial obstruction or variation in diameter tends to damage the carrier and sometimes results in breakage of the carrier unit and loss of papers carried in it. By virtue of the flared end 26 of tube 13 and the flared section 27 of the connector, abrupt changes in diameter are eliminated and a more gradual, non-interfering juncture line is established.

From the foregoing it will be apparent that the connector and expansion joint structure greatly improves the performance of the tube system. By permitting unrestrained lineal expansion, breakdowns caused by stresses and fractures are substantially eliminated and by the adjustable mounting of the individual tube sections, the alignment of the sections relative to each other can be held within very close limits. This improves performance and by virtue of adjustability reduces installation and maintenance costs since the posts need not be set as accurately as otherwise required. The clearance provided by the connectors between the tube sections further expedites installation since lineal variations do not affect the overall length of the system and any variations are taken up locally by the end clearance provided by the connectors.

Having described my invention, I claim:

1. An expansible joint for dispatch tubes comprising; a connector sleeve arranged to receive telescopically the ends of the adjoining tubes, said connector sleeve having a restricted central portion substantially of the same diameter as said tubes and having endwise portions larger in diameter than said tubes to provide annular spaces, and resilient sealing rings normally of circular cross section disposed in compression in said annular spaces to establish rolling seals between the tubes and said connector sleeve.

2. A joint for tube systems comprising; a connector sleeve, a tube section having an end disposed within said connector sleeve, a gasket formed of resilient material having substantially a circular cross section disposed between the end portion of said tube and said connector sleeve, said gasket being under compression radially to provide a seal between the tube section and connector sleeve and being substantially unconfined in a coaxial direction relative to said connector sleeve to provide a rolling seal having relatively unrestricted axial movement between the tube section and connector sleeve.

3. An expansion joint for pneumatic tube systems comprising; a connector sleeve, tube sections having their ends telescopically disposed within opposite ends of said connector sleeve, the connector sleeve being arranged to provide uninterrupted annular spaces surrounding the ends of the tube sections, respective sealing rings in said annular spaces formed from resilient material substantially circular in cross section, the sealing rings being under compression radially in said annular spaces and being free to roll longitudinally upon relative longitudinal shifting between the tubes and sleeve, and weather seals constituting flat flexible strips secured to the opposite ends of the connector sleeve and having unsupported marginal edges yieldably engaged aginst the tube sections, said resilient rings providing a rolling pressure seal and the weather seals providing a yieldable skirt movable with the tube sections to enclose and protect the rolling seals.

4. An expansible joint for pneumatic dispatch systems employing a plurality of tubular sec-

tions comprising, a connector sleeve adapted to receive the ends of adjoining tube sections, said connector sleeve having a central throat portion substantially of the same inside dimension as said tube sections and having enlarged endwise portions adapted to receive telescopically the end portions of said tube sections, a plurality of sealing rings formed of resilient material and disposed under compression between the telescoping portions of said tube sections and the enlarged endwise portions of the sleeve to seal the tube sections relative to the sleeve, the sealing rings being normally circular in cross section to provide rolling seals in line contact with said sleeve and tube sections adapting the tube sections to shift axially relative to the connector sleeve, and a plurality of duplicate mounting brackets adapted to encircle the connector sleeves and nest within said throat portion to lock the sleeve against axial movement, the said brackets being interchangeably adapted to encircle said tube sections loosely whereby the tube sections are free to float axially with respect to the connector sleeve.

5. An expansion joint for pneumatic tube systems comprising a connector sleeve, tube sections having their ends telescopically disposed within the opposite ends of the connector sleeve, the connector sleeve and tube sections respectively being of complementary oblong-cylindric shape in cross section, the cross section of the connector sleeve being substantially larger than the complementary tube cross section to provide annular spaces between the telescopically disposed sleeve and tube sections, a plurality of sealing rings in said annular spaces formed from resilient material substantially circular in cross section, the said sealing rings being normally larger in diameter than the width of the annular spaces to maintain the sealing rings under compression radially in said annular spaces, the adjoining surfaces of the respective sleeve and tube sections within the annular spaces being substantially parallel axially whereby the said sealing rings are free to roll longitudinally in response to longitudinal shifting of the tubes relative to the sleeve, and weather seals secured to the opposite ends of the connector sleeve engaging the surface contour of the tube sections to enclose and protect the rolling seals.

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