

July 15, 1958

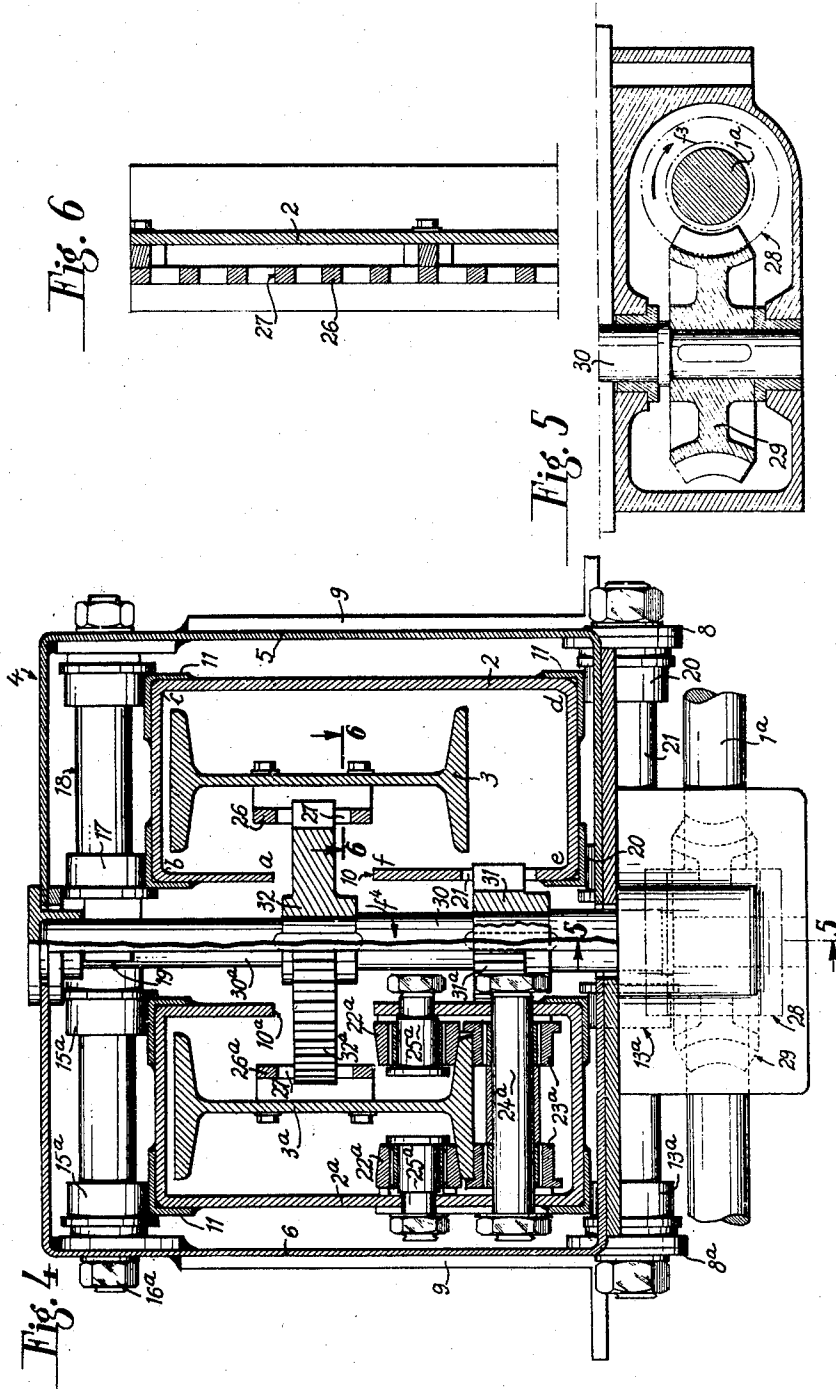
D. P. A. HOUDART

2,842,972

VEHICLES WITH EXPANDING BODIES

Filed June 20, 1956

3 Sheets-Sheet 2



July 15, 1958

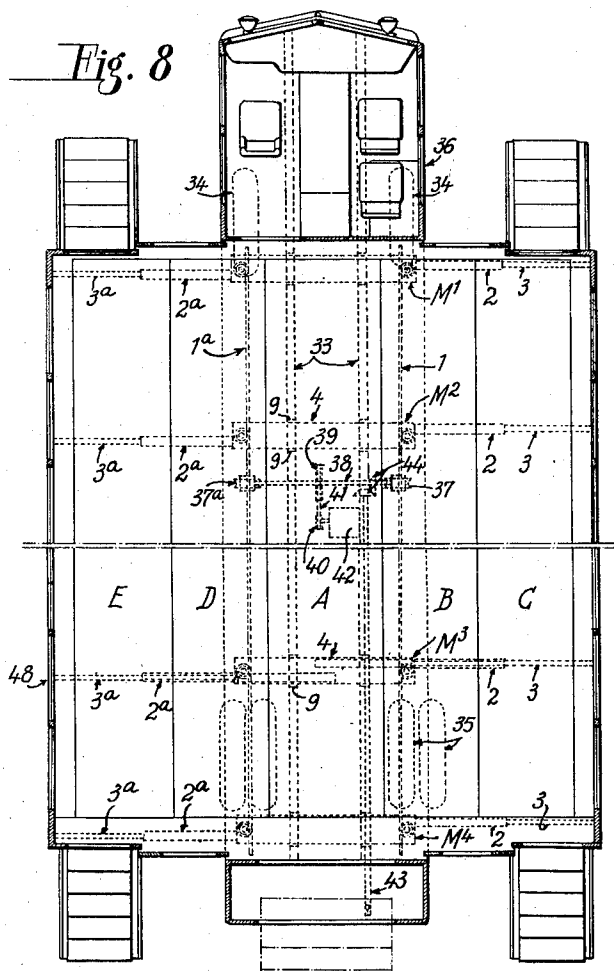
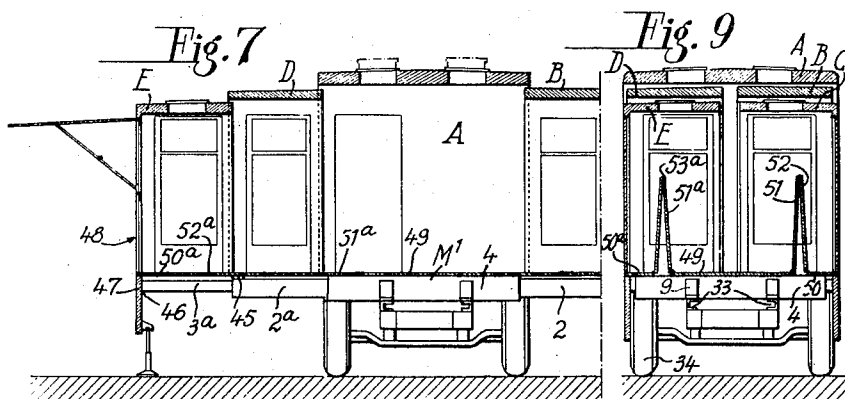
D. P. A. HOUDART

2,842,972

VEHICLES WITH EXPANDING BODIES

Filed June 20, 1956

3 Sheets-Sheet 3



1

2,842,972

VEHICLES WITH EXPANDING BODIES

Dominique Paul Albert Houdart, Dijon, France, assignor to Etablissements Deplirex, Dijon, France, a French body corporate

Application June 20, 1956, Serial No. 592,625

Claims priority, application France June 23, 1955

11 Claims. (Cl. 74—91)

This invention relates to expansible vehicles and other devices or installations, and more particularly to motor vehicles and their trailers whereof the body or similar structure supports at least one expansible moving part.

This moving part is usually transverse to a fixed part of the associated body with which it constitutes a telescopic or telescope-like assembly in order to permit a controlled expansion of the space provided by the body and it is an object of the invention to provide an improved, extensible control mechanism for such expansible vehicles or similar contrivances.

It is known that, for the unfolding of such a telescope-like assembly, a mechanism may be employed comprising a casing having the shape of an elongated box and as many extended members slidably mounted in said box as there are moving portions in the telescope-like assembly, each of such members being connected to one respective moving portion, and comprising, furthermore, a driving member for extending or retracting the mechanism which, in itself, constitutes a telescope-like device.

In known solutions, the driving member is connected by a driving shaft to the outside portion of the telescope-like assembly which is to be moved, thus assuring a positive extending and retracting of the outside portion. Each of the intermediate portions is, however, moved with the aid of the outside portion by means of a chain or a link connection operating, for example, by traction so that there is no positive, direct drive acting on each of the intermediate portions.

Furthermore, the pulling in of each or all of the intermediate portions is merely effected by a thrust exerted thereon by the adjacent outside portion which first must fold in with respect to the associated intermediate portion before it can exercise its pressure thereagainst.

Consequently, during the extending operation as well as during the retracting of the expansible portions, impacts, jams and abnormal stresses may occur because the various telescope-like portions may not fold into each other with an exactly lateral motion.

Accordingly, another object of the invention is to eliminate such drawbacks by providing a positive, direct drive for the various moving portions of the telescope-like assembly of a vehicle body or similar traveling or stationary structure.

In achieving its improvements, the invention provides an improved control mechanism for a telescope-like assembly comprising a box wherein a telescope-like unit moves in the manner of a telescope with respect to each telescope-like assembly which is to be driven and is provided with as many elongated, moving members as there are moving portions in said assembly.

In accordance with one embodiment of the invention, an improved mechanism is characterized in that each of the elongated, moving members of a telescope-like unit is provided with a toothed rack, the racks engaging with pinions mounted on the same driving shaft and perpendicularly to the longitudinal axis of the moving mem-

2

bers. These pinions have pitch circles which, in relation to each other, have the same proportion or proportions as the desired range of movement of the moving portions of the corresponding telescope-like assembly as will hereinafter be described in detail.

For the provision of a telescope-like assembly having, for example, two moving portions which are to have the same travel path, the telescope-like unit is provided with two elongated members having toothed racks which mesh with two pinions whereof the pitch circle ratio is 1 to 2.

Another object of the invention is to provide vehicles or other contrivances and installations having expansible bodies with one or a plurality of mechanisms of the aforedescribed improved type.

Other objects and structural details of the invention will be apparent from the following description when read in conjunction with the accompanying drawings showing preferred embodiments of the invention, wherein:

Fig. 1 is a perspective fragmentary sectional view of an improved, boxed control mechanism, according to one embodiment of the invention, for driving a telescope-like section with two moving portions,

Fig. 2 is an elevational view of the mechanism of Fig. 1 in extended position,

Fig. 3 is a plan view of the mechanism of Figs. 1 and 2,

Fig. 4 is a large-scale, vertical sectional view of the mechanism taken along line 4—4 of Fig. 3,

Fig. 5 is a vertical fragmentary sectional view taken along line 5—5 of Fig. 4,

Fig. 6 is a horizontal fragmentary sectional view taken along line 6—6 of Fig. 4,

Fig. 7 is a vertical fragmentary sectional view of a vehicle with an extended expansible body provided with a plurality of improved control mechanisms of the type shown in Figs. 1 to 6,

Fig. 8 is a plan view of the vehicle according to Fig. 7, and

Fig. 9 is a vertical sectional view of the vehicle of Fig. 7, however, the vehicle body is shown in the retracted position.

Referring now to the embodiment shown in Figs. 1 to 6, the indicated control mechanism is double-acting. In effect, it is so designed as to permit a longitudinal motion in the direction of arrows *f1* and *f2*, respectively (Figs. 1 to 3), and includes two shafts 1 and 1a which are perpendicular to the directions of the unfolding of two respective and independent telescope-like assemblies. Consequently, the mechanism is provided with two units of telescope-like longitudinal members 2—3 and 2a—3a moving in an elongated casing or common box 4 which constitutes the housing of the mechanism and with which members 2—3 and 2a—3a themselves form devices in the manner of a telescope.

The box 4 has the shape of a parallelepiped sheath with a rectangular cross section, with open ends. Preferably, it consists, as shown, of two U-shaped members 5 and 6 welded together at the seam 7 (Figs. 1 and 3) along the edges of their wings.

On the outside, the box 4 is reinforced on the two large sides thereof, on the one hand, by two pairs of flat iron bars 8—8a at the ends of the sides, and, on the other hand, by means of a plurality of angle irons 9 serving to fasten the box to the vehicle frame or to any other appropriate support. To give a clear illustration, the angle irons are not shown in Fig. 1, however, they can be seen in Figs. 2 to 4.

The units of members 2—3 and 2a—3a are arranged and driven in a similar manner. Therefore, only the operation relating to the unit including members 2—3 will be described; and in the drawings, the corresponding elements in the unit including members 2a—3a are indi-

3

cated by the same reference numbers, with the addition of the letter "a."

The elongated member 2 consists of a hollow-shaped girder of C-shaped cross-section with a rectangular cross-section (Fig. 4) formed, for example, by a flat iron bent to a shape indicated by points *a—b—c—d—e—f*. The two longitudinal edges *a* and *f*, facing each other, are spaced from each other in order to provide a longitudinal opening 10. It will be noted that the two openings 10 and 10*a*, of the two respective girders 2 and 2*a*, face each other. In other words, they are turned toward the longitudinal vertical middle plane of the box 4.

On each of the four corners, the iron 2 is reinforced by means of four longitudinal angle irons 11. Furthermore, at each end the member 2 has its opening 10 closed by a plate 12 (Figs. 1 and 2). The member 2 is guided at the two ends and the center of the box 4.

The guides of member 2 at the end of box 4 consist of a set of bottom rollers 13 idling on a shaft 14, and a set of top rollers 15 (Fig. 1) idling on another shaft 16.

At the center of the box the members 2 are guided by a pair of top rollers 17 (Figs. 1, 3 and 4) idling on shaft 18 which is mounted on one of the side walls of the box and a middle partition 19 as shown in Fig. 3.

Finally, at the other end of the box, on the left side in Figs. 1 and 3, member 2, when it is about to be completely drawn into the box, is guided by another pair of bottom rollers 20 which can be seen in Fig. 4 mounted on a shaft 21.

Hence, each of the members 2 or 2*a*, respectively, is always maintained at the same elevation regardless of whether it is partially projecting from box 4 as shown in Figs. 1 to 3, or is totally drawn into the box.

It should be, furthermore, noted that the lower portion of the inside wing *e—f* of the member 2 constitutes a toothed rack including a row of perforations 21 (Figs. 1, 2 and 4).

The second member 3, moving inside of the member 2, is of an I-shape or double T-shape. It is guided, inside of the coordinated member 2, by means of two pairs of rollers being mounted on the member 2 and enclosing the base of inside member 3.

Thus, in Fig. 2, the pairs of rollers 22—23 and 22*a*—23*a*, respectively, may be seen while the two pairs of rollers for member 3*a* are shown on the left side of Fig. 4. The two bottom rollers 23*a* are mounted on one and the same shaft 24*a*, whereas the top rollers 22*a* are provided on two separate trunnions 25*a*.

Furthermore, to the right of the opening 10 of the corresponding outside member 2, the inside member 3 is provided with a bar 26 having perforations 27 so as to constitute a rack (see particularly Figs. 1 and 6).

The unit of telescope-like members 2—3 is coupled to drive or stub shaft 1 which enables it to unfold or retract by direct actuation. To that end, wedged to the shaft 1 is a worm screw 28 (Figs. 3, 4 and 5) meshing with worm wheel 29. The wheel 29 is keyed to a vertical shaft 30 whereon are wedged two pinions 31—32 respectively located to the right of racks 21—27 so as to engage therewith. Preferably, the pitch diameter of pinion 31 is one half the pitch diameter of pinion 32.

Under these circumstances, when shaft 1 is rotated, for example, in the direction of arrow *f*3 (Figs. 1, 2, 5), the corresponding vertical shaft 30 will itself be rotated, for example, in the direction of arrow *f*4 (Figs. 1 and 4), and the two corresponding pinions will bring forth a travel of members 2—3, in the direction of arrow *f*1. Owing to the difference in the pitch diameters of the two pinions, the inside member 3 will be driven at twice the speed of that of member 2, which is communicated to the latter by pinion 31.

Consequently, the two telescope-like members 2—3 (or 2*a*—3*a*) will move at the same speed, the former in relation to box 4, and the latter relative to the former.

When shaft 1 rotates in the reverse direction of arrow

4

*f*3, the telescope-like members 2—3 will be shifted reversely to the direction of arrow *f*1, at the same speeds as described above, so that, simultaneously, member 2 will be drawn into box 4 with the member 3.

All of the foregoing statements apply as well to members 2*a*—3*a*, except that they move in an opposite direction to that of the members 2 and 3.

Reference will now be made to Figs. 7 to 9, showing an application of the described mechanism in an expansible motor vehicle.

According to this embodiment of the invention, the vehicle has the usual chassis, in the drawings merely indicated digrammatically by means of two frame side members 33 which rest, with the aid of known suspension, upon the usual wheel trains, one in front at front wheels 34, and the other at the rear at rear wheels 35, and including the front cab 36.

Upon side members 33 are transversely mounted, by means of the side brackets 9, boxes 4 of four mechanisms M1, M2, M3 and M4 of the aforedescribed type, each being provided with four sliding members 2—3, 2*a*—3*a*. Drive shafts 1 and 1*a*, respectively, of these mechanisms are mounted parallel to the side members 33 of the chassis, and are driven through the reduction gears 37 and 37*a* by an intermediate transversal shaft 38 (Fig. 8) connected by means of a transmission, for example, with pulleys 39 and 40, and belt 41 to an electric motor 42 for rotation in two directions.

It will be noticed that, preferably, the intermediate shaft 38 drives shafts 1 and 1*a* from points located between the two mechanisms in the middle, M2 and M3, i. e., at about the center of said shafts, in order to permit as synchronous a drive as possible of all telescope-like members without any danger that this operation will be to any substantial degree influenced by a resilient torsion of shafts 1 and 1*a*, respectively, as could occur if these shafts were to be controlled at the front or rear ends thereof, as had been previously customary.

Furthermore, in the event of a lack of electric power, the shaft 38 could be driven from the crankshaft, from the rear of the vehicle, by means of an auxiliary shaft 43 connected to the shaft 38 through a pair of bevel gears 44.

The expansible vehicle body rests on mechanisms M1 to M4, the body being of a well known construction, having a fixed center portion A and two telescope-like assemblies B—C and D—E, respectively, which may be extended laterally, as shown in Figs. 7 and 8, or retracted into the fixed center portion as shown in Fig. 9.

It suffices to say that the center portion A is directly fastened upon boxes 4 of the four mechanisms, whereas the two adjacent portions B and D are respectively attached on the ends of members 2 and 2*a* of each drive mechanism by means of a customary linkage, diagrammatically indicated at 45 in Fig. 7. Finally, members 3 and 3*a* are each attached at linkage 46 (Fig. 7) to the downward extending projections 47 of side walls 48 of the outside body portions C and E.

It will be noted that the floors of the various body portions are arranged in any known manner, in order to permit the extending and retracting of the body portions. For example, as shown, center portion A may be provided with a fixed center floor portion 49 connected to the small outside floor portions 50 and 50*a* by means of portions 51—52, 51*a*—52*a* being hingedly mounted about longitudinal axes in relation to each other and in relation to the outside portions.

As can be readily seen, in order to produce the expansion and/or the retracting of the body, it is only necessary to have the electric motor drive, through the shaft 38, shafts 1 and 1*a*, respectively, in one or the other direction.

It is understood that the invention is in no way limited to the described and shown embodiments thereof, they

being merely examples indicating the spirit and scope of the invention as defined in the following claims.

Although various of the features of the invention have been described above, particular attention should be further directed to some of the details of the apparatus which are shown in the drawing, but which have not been specifically noted.

Thus, for example, in the preferred embodiment of the invention the members 2 and 3, as well as 2a and 3a, are so coupled (as seen in Fig. 2) that when fully extended, the members 2 are still engaged by one half of their respective lengths within the box 4 thereby insuring the rigidity of the structure. The members 2 are controlled to extend only to this degree by providing the perforations only along one half of the lengths thereof. Accordingly, the pinions can drive the racks no further.

Furthermore, it will be noted that the members 3, in fully extended position, retain half of their respective lengths within the extended members 2. This result is achieved by limiting the number of apertures 27 which constitute the associated rack. Stops (not shown) may also be provided and the 1:2 gear ratio also contributes to the retaining of the various members in engagement along one half of their lengths. It is therefore assured that a very rigid inflexible system is provided with a good bearing surface ratio.

It is also to be noted that, by providing the aperture 10, the invention enables the use of a single shaft 30 for driving the pinions 31 and 32. Not only does this present a simple and uncomplicated structure with respect to maintenance and assembly, but it further assures an accurate control of the gearing ratio with respect to driving the members 2 and 3 since the related physical dimensions, the diameters of the pinions, are readily determined and provided.

A further advantage of the structure provided is that, if desired, a plurality of units can be arranged in a vertical stack arranged with the units in parallel or transverse. It will be clear from an inspection of Fig. 1 that the single shaft 30 can readily be adapted to drive the proposed multiplicity of units.

What is claimed is:

1. A telescopic assembly comprising a casing, beams telescopically arranged within and extendable from said casing, one of said beams encasing the other of said beams but defining a longitudinal opening for access to the encased beam, an axle on said casing adjacent said beams, rack means on said beams for the driving thereof, and pinion means rotatable on said axle for engaging the rack means on said beams; the pinion means comprising separate driving pinions of different pitch diameters for engaging the rack means and driving the beams at different speeds.

2. An assembly as claimed in claim 1 wherein the one beam encasing the other of said beams has a C-shaped cross-section.

3. An assembly as claimed in claim 2 wherein the pitch diameter of the driving pinion engaging the encased beam is twice the pitch diameter of the other driving pinion.

4. An assembly as claimed in claim 3 wherein, with the beams fully extended, the encasing beam is engaged by substantially half its length by said casing and the encased beam is engaged by substantially half its length by the encasing beam.

5. An assembly as claimed in claim 4 wherein said axle is perpendicular to the longitudinal axes of said beams.

6. An assembly as claimed in claim 5 comprising rollers enabling relative motion between said beams and casing and positioned at the extremes and central portions of said casing and on the encasing beam.

7. An assembly as claimed in claim 5 comprising duplicate sets of beams extendable in different directions out of said casing and driven by duplicate sets of pinion means.

8. An assembly as claimed in claim 5 wherein the number of beams corresponds to the number of parts in the telescopic assembly.

9. An assembly claimed in claim 5 comprising a drive shaft arranged at substantially a right angle to said axle, a source of power coupled to said drive shaft and gears coupling said drive shaft to said axle for extending said beams from and withdrawing said beams into said casing.

10. An assembly as claimed in claim 5, for an expandable vehicle, comprising a plurality of casings and associated beams arranged transverse to the longitudinal axis of the vehicle, the vehicle having a power source and a drive shaft operatively coupled between said source and said beams.

11. An assembly as claimed in claim 10 wherein said drive shaft extends substantially the length of the vehicle and is coupled intermediate its ends to the power source.

References Cited in the file of this patent

UNITED STATES PATENTS

120,543	Smith	Oct. 31, 1871
1,661,016	Smith	Feb. 28, 1928
1,964,894	Rohme	July 3, 1934
2,306,084	Rollo	Dec. 22, 1942
2,675,277	McClellan	Apr. 13, 1954
2,704,223	Houdart	Mar. 15, 1955

FOREIGN PATENTS

485,330	Great Britain	May 18, 1938
725,918	Great Britain	Mar. 9, 1955