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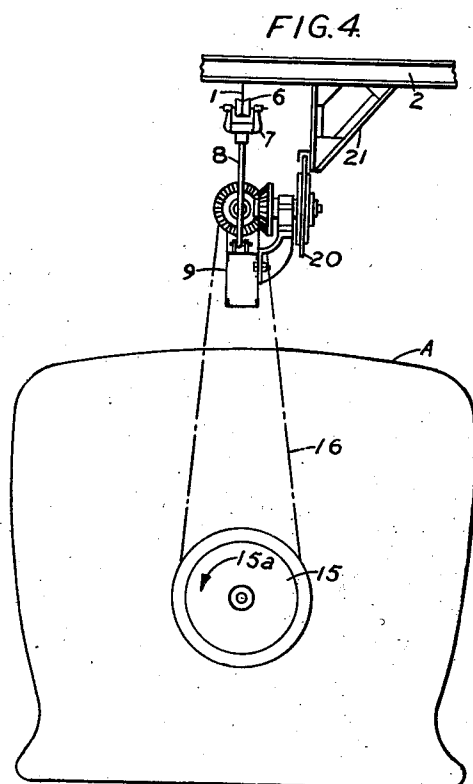
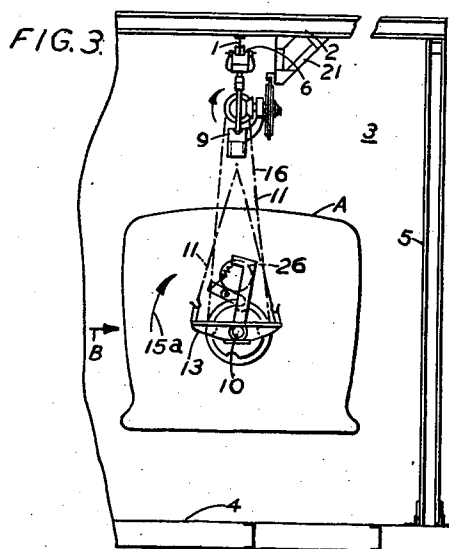
S. J. L. WHITWORTH ET AL

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APPARATUS FOR SPRAY PAINTING VEHICLE BODIES

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3 Sheets-Sheet 2



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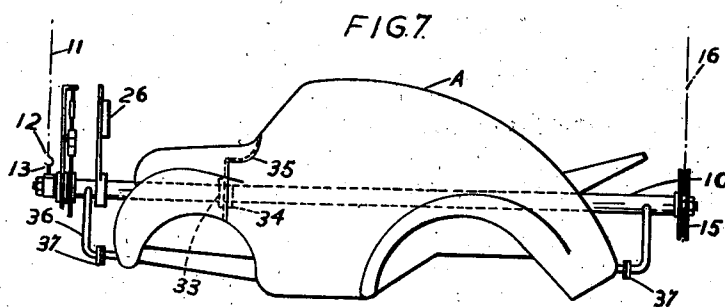
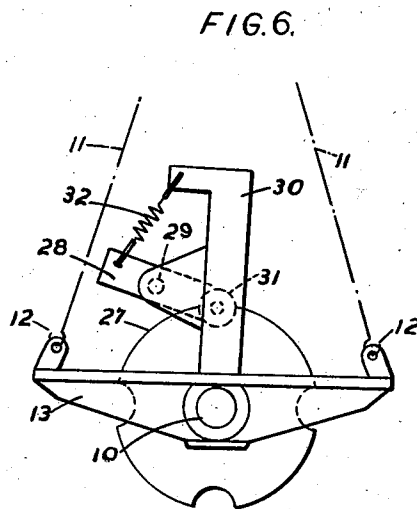
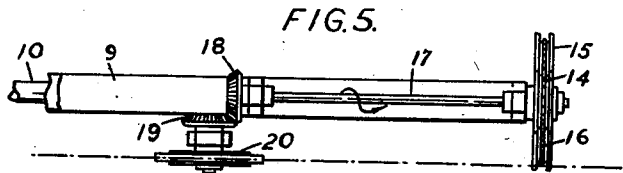
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APPARATUS FOR SPRAY PAINTING
VEHICLE BODIES

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5 Claims. (Cl. 118—502)

1

This invention relates to apparatus for spray painting vehicle bodies.

In the processing of motor car bodies, the bodies are conveyed through a spray booth in which, four successive treatment stages are effected, that is to say, (1) dust is removed from the vehicle body, (2) the edges of doors are sprayed and other such special operations are effected, (3) a paint coat is sprayed on the outside of the vehicle and (4) a second coat is applied. The dust removing stage is sometimes referred to as the tack rag section.

The main object of the present invention is to provide an improved form of apparatus for conveying vehicle bodies through a spray booth.

A spray booth for spray painting vehicle bodies according to the present invention comprises in combination, an overhead rail running lengthwise of the booth, wheels adapted to run along the rail, a boom suspended under the rails from the wheels, a sprocket carried by the boom, an interrupted rack disposed longitudinally of the booth in the path of and to be engaged by the sprocket, a spindle carried by the boom for relative rotation therewith, said spindle being adapted to intersect a vehicle body longitudinally thereof; gearing connecting said spindle and sprocket whereby as the boom is displaced longitudinally the spindle is rotated and means operatively associated with the spindle for obstructing uncontrolled reverse rotation of the spindle when the sprocket is disengaged from the said rack.

Each car body to be treated in the spray booth is threaded on the spindle and secured thereto as particularly described in co-pending United States patent application No. 81,768, filed 16th March, 1949 and takes part in the longitudinal movement and angular movement of the respective spindle so that the body is disposed in the section of the booth allotted to the respective stage treatments already mentioned so that the body can be easily and quickly treated at each stage. In particular during the paint stage, the top and underside of each body is in due course presented to the operators for spraying with the same facility and efficiency as is achieved on the walls of the body.

In one practical embodiment according to the invention the spray booth comprises in combination, an overhead rail running lengthwise of the booth, groups of stirrups carrying pairs of coaxial wheels which run along the lower flange of the rail and suspend the stirrups below the rail, a boom which is slightly longer than a vehicle body intended to be treated in the booth, suspended under the rail longitudinally thereof, a spindle suspended under each boom from the

2

ends of each boom, an intermittent rack running lengthwise of the booth parallel with the rail and near the booms, a pinion mounted on each boom to be actuated by the rack as the respective boom and spindle are advanced along the rail, a conveyor running lengthwise of the booth operatively connected to each boom, gearing for transmitting angular movement from each pinion to the respective spindle when the pinion is actuated by the rack, and adjustable locking means associated with each spindle, said locking means obstructing uncontrolled reverse rotation of the respective spindle during movement of the spindle when the pinion is out of engagement with the rack.

With such form of apparatus, each vehicle body can be turned at will by hand, about the axis of the spindle, by an operator during the first two treatment stages in the booth; the operator always turning the body away from him while the body is locked against accidental reverse rotation after the operator has moved the body to continue his particular operation. During the spraying stage, the rack and pinion take control of the spindle and enforce at predetermined points an angular rotation so that the whole body is progressively presented to the spray operators who preferably are disposed on one side only of the booth.

In order that the invention may be more clearly understood a preferred embodiment will now be described by way of example with reference to the accompanying diagrammatic drawings, which show the manner of mounting one car body.

Figure 1 is a part elevation, which arrangement is repeated in identical form to accommodate at least the number of bodies passing through the booth at one time.

Figure 2 shows in elevation a part of the apparatus shown in Figure 1 but to a larger scale for the sake of clarity.

Figure 3 is an end view of the apparatus shown in Figure 1 taken from the left hand end thereof;

Figure 4 is a view similar to Figure 3 but taken from the right hand end of Figure 1.

Figure 5 is a fragmentary plan view of the mechanical device carried by the boom.

Figure 6 is a fragmentary view to an enlarged scale showing the spindle locking mechanism shown in Figure 3, and

Figure 7 shows one method of securing a vehicle body to the supporting spindle.

In the drawings like references designate the same parts.

An overhead rail 1 of I section is supported on rafters 2 which form part of the roof of the

3

spray booth 3, of which latter the floor is indicated at 4, and the stanchions for the rafters indicated at 5, the walls (not shown) of the booth being fixed to the stanchions.

The rail 1 runs lengthwise of the booth and pairs of wheels 6 run on the bottom flange and to each side of the web of the rail. The wheels are mounted in coaxial pairs, two such pairs being carried on each of two stirrups 7, which are also each provided with a depending part 8 hingedly connected at the bottom to a boom 9, which thus is slung by the appropriate group of stirrups from the respective wheels, under the rail 1. As clearly shown, the boom is slightly longer than a vehicle body, indicated at A, which is to be sprayed in the booth, and from each end of the boom flexible means depend and are connected to a horizontal spindle 10, which is accordingly suspended under the boom.

As viewed in Figure 1, the left hand end of the boom supports a pair of chains 11 and each of said chains have a hook 12 at the bottom which engages a bracket 13 on the spindle, comprising a bearing in which the spindle can rotate. At the other end of the boom is mounted a sprocket 14 and at the similar end of the spindle is keyed a sprocket 15, a chain 16 passing over both sprockets. Thus the chains 11 and 16 flexibly suspend the spindle from the boom.

The sprocket 14 is keyed on a shaft 17, on the other end of which is a bevel 18 which gears with a bevel 19, and to the latter is connected a pinion 20; the bevels 18, 19 and the pinion 20 being mounted in bearings carried by the boom 9.

From the rafters 2 depend brackets 21, to which is secured a rack 22, this rack being intermittent for the purpose already explained, and is disposed to be engaged by the pinion 20 at predetermined locations in the spraying stage, so that as the wheels and boom are travelled along the rail the spindle is moved lengthwise of the rail and is partially rotated at the predetermined location.

The boom is moved in the direction of the arrow 9a (Figures 1 and 2) by a towing chain indicated at 23 (see Figure 2), which at suitable intervals carries forked elements 24, which carry wheels 25 disposed to run on the rail 1 for giving support at sufficient intervals to the chain, the towing chain being connected to the members 24. The spindle 10 may be provided with an adjustable counterbalance 26 for the body A.

In operation, a car body is threaded on the spindle 10 so that it rotates, in the direction of arrow 15a in Figures 3 and 4 with the spindle when the latter is actuated from the pinion 20 on the boom, or when the pinion 20 is not engaged with the rack 22 the body is turned by hand as desired while the spindle is towed through the booth.

In the first section of the booth, dust is removed, and the operators turn the body on the spindle by hand. After this operation the vehicle arrives in the second section of the booth, where the edges of doors are sprayed and other special operations are effected. Here again, the body is actuated by hand by the operators.

The body is then towed to the section in which the first spray coat is applied and during the travel of the vehicle body through this section of the booth the body is partially rotated at intervals, so that successive longitudinal zones are progressively presented to the operators until the whole body has passed the sprays. The same intermittent rotation is effected in the second coating section of the booth.

4

Although reference has been made to booth sections, these are not necessarily physically defined in the booth and the term "section" is merely intended to refer to a predetermined area in the booth in which the operation described is being effected, and it will therefore be seen that the intermittent rack 22, which angularly actuates the spindle, runs lengthwise of the sections in which spraying is effected.

The rack and pinion control of the spindle and the towing means secures the body against a reverse rotation which might cause serious injury to operatives and locking means, now to be described, are provided to prevent uncontrolled reverse rotation when the pinion is out of engagement with the rack.

This locking means comprises a notched plate 27 fixed to the spindle 10, and a ratchet arm 28 pivoted at 29 on an arm 30 emanating from the bracket 13; the operating end of the arm 28 carries a roller 31 held towards the plate 27 by a spring 32 so that when the roller engages a notch in the plate the spindle is locked to the bracket and the chains 11 prevent rotation of the bracket. The notches are spaced apart so that the body can be rotated to a limited extent as is usual and locked while either dust removing and detail painting operations are effected, or at any time that the spindle is not under the mechanical control of the rack and pinion.

As described in the aforesaid United States patent application No. 81,768, filed 16th March, 1949, the body A may be secured to the spindle 10; as shown in Figure 7, by making the spindle in two parts each having a flange 33, 34 which flanges are suitably bolted together through the dash bulkhead 35 of the body A, and brackets 36 emanating from the spindle 10 are bolted to the bumper strong points 37 of the body; thereby the body is secured to the spindle so that rotation of the latter is rigidly imparted to the body.

By arranging the rail so that operatives work on one side only thereof as indicated by the arrow B in Figure 3 optimum lighting conditions may be provided in an economical manner for the whole length of the booth.

The rail is preferably extended beyond the booth at both ends to loading and unloading stations respectively and may pass through a drying oven so that the painted bodies are dried before unloading.

By the present invention the whole body is readily accessible to workmen in the spray booth, and optimum conditions obtain for producing highly efficient results in an economical manner, whilst the apparatus from which each body is slung beneath the overhead conveyor system described, is simple to erect and maintain.

In this specification, the term "spray booth" is intended to comprise a booth in which there are only spraying sections as well as a booth in which the tack rag section and the adjacent section in which operations such as painting the edge of doors, are effected and the invention also comprises an installation in which the overhead rail runs through a booth comprising only the spray sections as well as separate tack rag and detail painting sections.

It will also be understood that instead of using a rack which is engaged by a pinion vertically disposed that the rack may be so disposed and the co-operating pinion arranged in a horizontal plane.

From the foregoing it will be clearly understood that apparatus constructed according to the in-

5

vention permits a continuous production flow through a booth at a constant rate.

The overhead rail employed in constructions according to the invention may be an extension from the usual rub down section, where the surface of the undercoats is rubbed with sandpaper and water to produce a smooth even surface on which the final coats are applied, so that a body mounted on a spindle suspended from the rail as already described may be treated in the rub down section prior to passing into the spray booth, a rack being associated with the rail for suitably rotating the suspended body as it is advanced towards the booth.

We claim:

1. Apparatus for conveying vehicle bodies past a plurality of treating zones, comprising an overhead track, wheels mounted on and adapted to run along said track, a boom substantially horizontally suspended from said wheels, supporting means carried by said boom, a spindle for supporting a vehicle body by extending substantially longitudinally therethrough, said spindle being rotatably mounted in said supporting means in substantially parallel horizontal relation to said boom, means for displacing said wheels along said track for moving said boom and said spindle lengthwise, mechanical means operated by movement of said boom along said track for rotating said spindle to revolve a vehicle body thereon for predetermined intervals as it passes each treating zone, and mechanical means connected between said spindle and at least one of its supporting means for locking said spindle against rotation between said predetermined intervals.

2. Apparatus for conveying vehicle bodies past a plurality of treating zones, comprising an overhead rail, wheels adapted to run along said rail and connected with means for advancing said wheels along said rail, a boom suspended from said wheels in substantially parallel relation with the rail, a pinion journaled on said boom, an interrupted rack disposed longitudinally of the rail in the path of movement of said pinion, a spindle for supporting a vehicle body by extending substantially longitudinally therethrough, supporting means carried by said boom, said spindle being rotatably supported by said supporting means in substantially parallel relation to said boom, means connected with said spindle and operated by said pinion upon engagement with said rack for rotating said spindle about its longitudinal axis, and locking means operatively connected between said spindle and said supporting means for locking said spindle against rotation when said pinion is disengaged from said rack.

3. Apparatus for conveying vehicle bodies past a plurality of treating zones, comprising an overhead rail, a group of stirrups, a pair of co-axial wheels journaled on each stirrup and mounted on said rail to run along the rail and suspend the stirrups below the rail, a boom which is slightly longer than a vehicle body and suspended from said group of stirrups under the rail and longitudinally thereof, a spindle substantially parallelly suspended under said boom from the ends of said boom, a pinion journaled on said boom, an intermittent rack extending lengthwise of and parallel with the rail and in the path of the pinion, moving means running lengthwise of the rail and operatively connected to the boom for advancing the boom along the rail, gearing drivingly connected between said pinion and the spindle for driving said spindle when the pinion is actuated by the rack, a ratchet fixed on said spindle,

6

and a pawl carried by the spindle suspension from said boom and cooperative with the ratchet for locking the spindle against rotation during movement of the spindle when the pinion is out of engagement with the rack.

4. Apparatus for conveying vehicle bodies past a plurality of treating zones, comprising an overhead track, a group of stirrups, a pair of co-axial wheels journaled on each stirrup and mounted on said track to run along the track and suspend the stirrups below the track, a boom which is slightly longer than a vehicle body and suspended under the track longitudinally thereof from said group of stirrups, moving means running lengthwise of the track and operatively connected to the boom to move said boom along the track, a pinion journaled on said boom, an intermittent rack extending lengthwise of and parallel with the track and in the path of the pinion, a sprocket journaled on one end of said boom and drivingly connected with the pinion to be actuated by the rack as the boom is advanced along the track by said moving means, a pair of flexible suspension lines carried by the other end of said boom, a bearing member supported by said lines, a spindle adapted to be inserted longitudinally through a vehicle body and having one end journaled in said bearing member, a sprocket keyed on the other end of said spindle, a sprocket chain trained about said boom and spindle sprockets and supporting the spindle parallel to said boom while being adapted to rotate said spindle, a ratchet fixed on said spindle, and a pawl carried by said bearing member and cooperative with the ratchet for locking the spindle against rotation during movement of the spindle when the pinion is out of engagement with the rack.

5. Apparatus for conveying vehicle bodies past a plurality of treating zones, comprising an overhead track, a carriage suspended from and movable along said track by means of a conveyor, a boom which is slightly longer than a vehicle body and suspended longitudinally under and parallel with the track from said carriage, a pinion journaled on said boom, an intermittent rack extending lengthwise of and parallel with the track and in the path of the pinion, a sprocket journaled on one end of said boom and drivingly connected with the pinion to be actuated by the rack as the boom is advanced along the track by said conveyor, a pair of flexible suspension lines carried by the other end of said boom, a bearing member supported by said lines, a spindle adapted to be inserted longitudinally through a vehicle body and having one end journaled in said bearing member, a sprocket keyed on the other end of said spindle, a sprocket chain trained about said boom and spindle sprockets and supporting the spindle parallel to said boom while being adapted to rotate said spindle, and mechanical means connected between said bearing member and spindle for locking the spindle against rotation during movement of the spindle when the pinion is out of engagement with the rack.

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The following references are of record in the file of this patent:

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