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Fujioka et al.

[11] **3,880,415**

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[54] **CANTILEVERED INTERNAL SHORING**

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[52] **U.S. Cl.** ..... **269/48.1**; 264/45; 269/272; 425/110; 425/817 R

[51] **Int. Cl.**..... **B29d 23/00**; B29d 27/00

[58] **Field of Search** ..... 29/200 J, 200 P; 425/110, 425/123, 817 R; 264/45; 269/47, 48.1, 49, 52, 272; 249/93

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Assistant Examiner—Neil Abrams
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[57] **ABSTRACT**

A trailer body of elongated rectangular cross section with inner and outer thin sheets over the top, sides and front end is insulated and reinforced by the application of foamable plastic between the sheets after assembly. To prevent the sheets from moving out of spaced parallel planes, shoring in the nature of backup plates are applied to the inner and outer wall, floor and roof surfaces to resist any tendency to expand under pressure developed during the foaming operation. The inner shoring plates are carried on a cantilever frame and are moved upwardly and sidewardly to cover the internal roof sheets and those at the sides and front end of the body.

7 Claims, 6 Drawing Figures

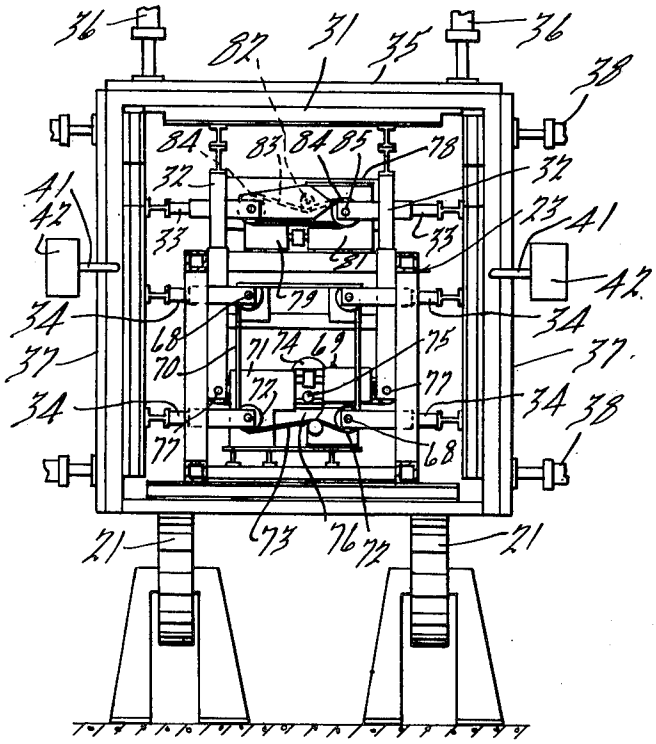


Fig. 1.

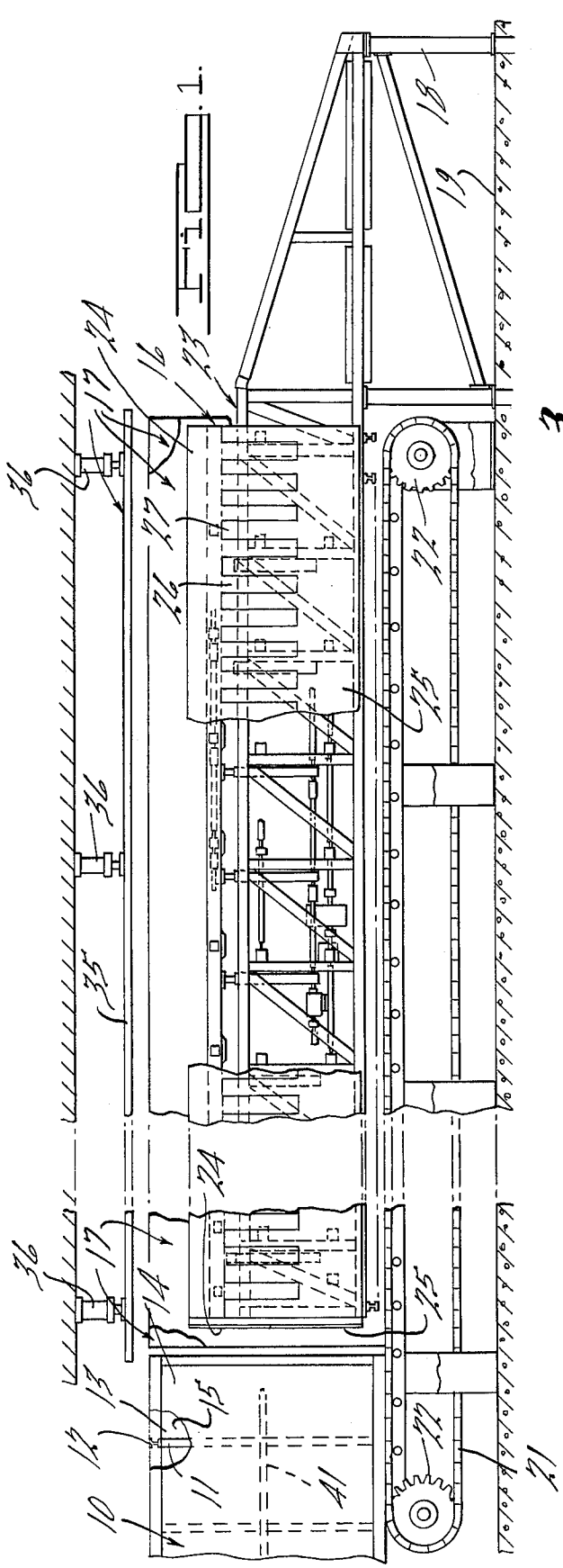
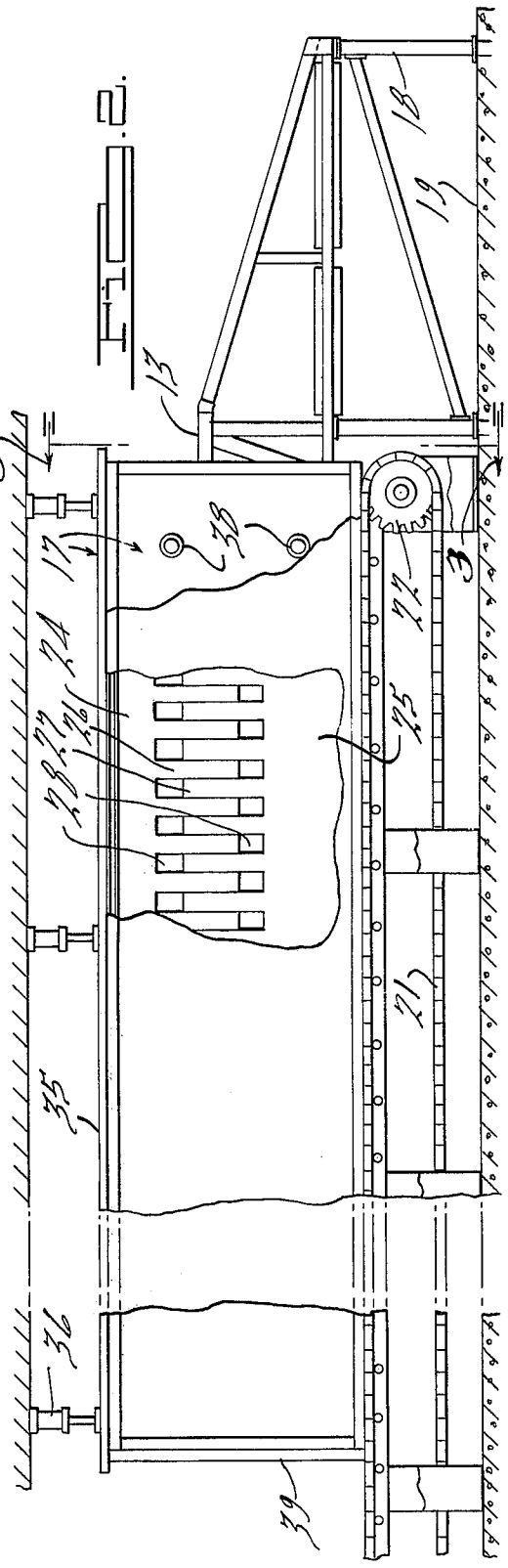


Fig. 2.



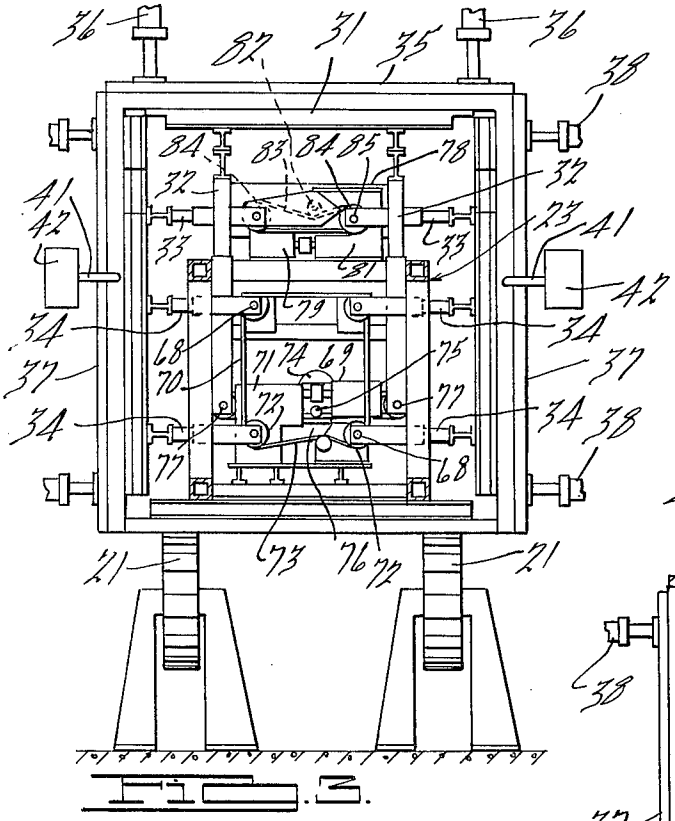


FIG. 3.

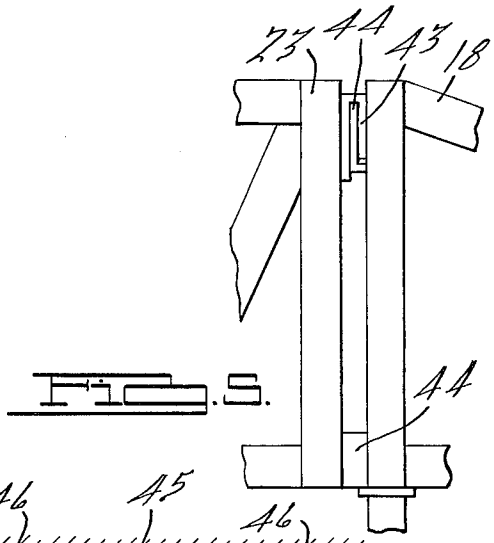


FIG. 5.

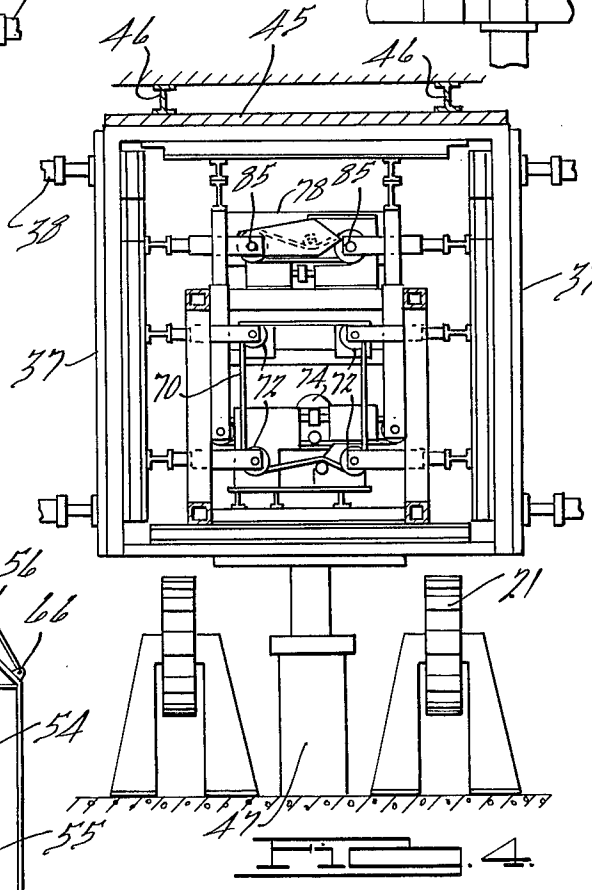


FIG. 4.

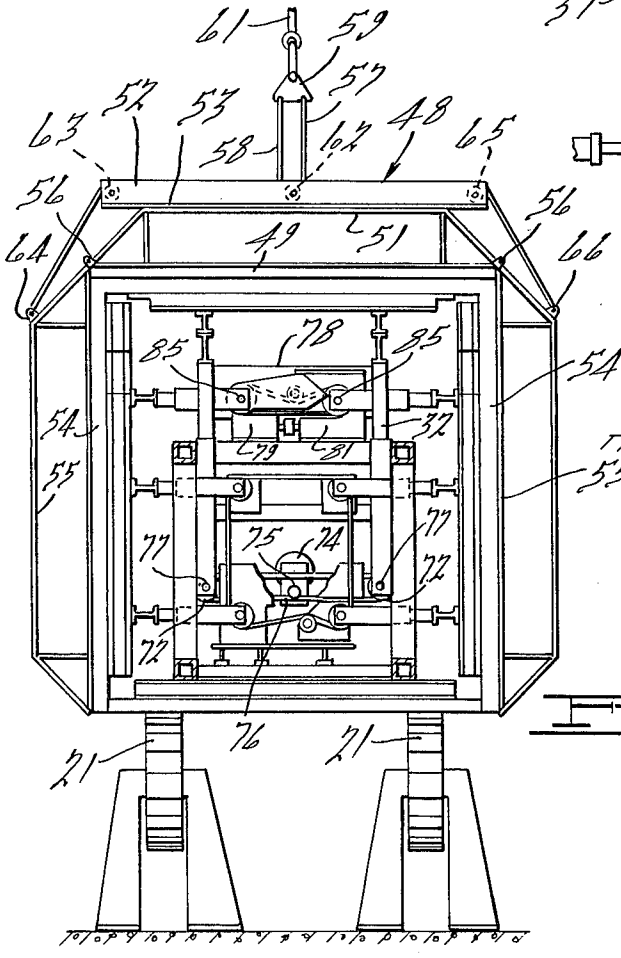


FIG. 6.

CANTILEVERED INTERNAL SHORING

BACKGROUND OF THE INVENTION

Reference may be had to the patent to C. J. Slayman, U.S. Pat. No. 3,177,271 and to C. R. Morris, U.S. Pat. No. 3,155,751 to show the state of the prior art.

SUMMARY OF THE INVENTION

The inner and outer roof, side and front walls of a trailer body are assembled on a floor structure. Thin sheets are secured to the outer edge of spaced upright posts with the inner liner sheets unattached thereto. This provides areas between the posts in which foamable material is delivered and expanded to form solid walls at the top, sides, floor and front end. The plastic foam material is delivered by hoses which extend from the rearward to the forward end of the body, the ends of which are moved to the rearward end of the body, from area to area, to have the proper quantity of material delivered to each area which will expand to fill the side, the floor and top spaces. This provides insulation as well as reinforcement between the inner and outer sheets of the body.

The inner side, front and top shoring plates are supported on a cantilever mounted frame over which the body is advanced. The roof shoring plates are moved upwardly against the inner roof wall carrying the upper portion of the side shoring plates therewith. The side shoring plates are thereafter moved outwardly to engage the inner front and side walls of the body. In one embodiment, the outer top shoring plate is moved downwardly onto the sheets forming the top of the roof wall and front and side shoring plates are moved inward to engage the sheets on the outer walls. It is within the purview of the invention to raise the cantilever frame upwardly with the body against a fixed roof shoring plate. A clamlike structure having a suspended top shoring plate to which side shoring plates are hinged can also be used when lowered into engagement with the top roof wall to have the hinged plates swing against the outer sheets of the side walls. In any case, the inner and outer spaced parallel sheets are engaged by the inner and outer shoring plates so that the pressure developed when expanding the foam cannot distort the sheets.

The cycle of the operation requires 20 to 30 minutes. The method includes the preheating of the surfaces to 150°F which requires approximately 5 minutes. To advance the body over the cantilever frame and moving the shoring plates against the inner and outer walls requires approximately 2 minutes. To apply the foam in the various areas requires approximately 12 minutes. The cure time requires approximately 5 minutes and to retract the plates from the wall and move the insulated body from the frame takes approximately 2 minutes. The total time is approximately 26 minutes. The preheating time of 5 minutes can be eliminated if ovens are used to maintain the surfaces heated to 150°F. It is to be understood that a vertical expandable horizontally movable shoring plate is mounted on the end of the cantilever frame and that a shoring plate is movable into engagement with the outer sheets forming the front wall of the body.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in side elevation with parts broken away showing the cantilever frame and shoring plates employed during the foaming operation on a trailer body which is shown in position to be advanced thereover;

FIG. 2 is a broken view of the structure illustrated in FIG. 1, with the body in advanced position and with the shoring plates in engagement with the inner top, side and front walls and the outer top of the body;

FIG. 3 is a sectional view of the structure illustrated in FIG. 2, taken on the line 3—3 thereof;

FIG. 4 is a view of structure, similar to that illustrated in FIG. 3, with the shoring plates in engagement and the body moved upwardly against fixed roof shoring plates;

FIG. 5 is a view of the cantilever frame and its support showing the movable portions which permits the frame to be vertically moved, and

FIG. 6 is a view of structure, similar to that illustrated in FIG. 3, showing a clamlike shoring unit which is raisable from and lowerable upon the body into engagement with the roof and outer surface of the side walls.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In practicing the present invention, the trailer body **10** is constructed in the usual manner to have vertical posts, such as the I-beams posts **11**, along the sides and front end which support top I-beams **12** to which the outer and inner roof sheets are secured. The inner side sheets **13** and the outer side sheets **14** are secured to the upright I-beam posts **11**. This provides a plurality of inverted U-shaped open cells **15** which communicate at the sides and across the top throughout the length of the body. The foam material is introduced into the cells and is expanded to fill the cells and provide the insulation and reinforcement for the body. Before the foamable plastic material is delivered to the cells, the body is advanced over an internal shoring unit **16** which is located adjacent to the outer shoring units **17**.

The shoring unit **16** has an elongated frame **23** suspended in cantilever on the end of a supporting structure **18** which is embedded in concrete below the floor **19**. Any means may be provided for supporting and advancing the body **10** between the shoring units, the one herein illustrated is a pair of caterpillar type belts **21** each of which is mounted on a pair of sprocket wheels **22** one of which is driven to advance and retract the body relative to the frame. The elongated frame **23** is substantially square in section secured to the support structure **18** and constructed in a manner to overcome the natural sag or drop at the free end so that it will be approximately horizontal.

The side shoring plates are made from an upper plate section **24** and a lower plate section **25** which are in coplanar relation. The upper plate section **24** has spaced extending members **26** which are located between spaced extending members **27** on the lower plate section **25**. This permits the upper plate section **24** to be raised while maintaining a coplanar relation with the lower plate section **25** leaving spaced openings **28** which are small enough to prevent bulging of the side walls. This same construction is provided on the free end of the elongated frame **23**. The top shoring plates **31** are raised by the upward movement of posts **32** to engage the inner roof sheets of the body, carrying the upper plate sections **24** at the sides and front end upwardly therewith. Horizontal telescoping arms **33** support the upper plate sections **24** and are secured to the

posts **32** to move therewith. Similar horizontal telescoping arms **34** are supported on the frame **23** attached to the lower plate sections **25.** The arms **33** and **34** are moved simultaneously for moving the shoring plate sections **24** and **25** against the inner side walls of the body **10.** The sections **24** and **25** at the end of the frame **13** have the front inner surface of the body moved into engagement therewith.

While the upper plate sections **24** and the lower plate sections **25** have interrelated extending members **26** and **27** producing an acceptable spacing for preventing bulging of the wall sheets when the sections are extended, the same result will be obtained when using horizontally disposed slats between the top and bottom sections which move into spaced relation when the top sections **24** are raised relative to the bottom sections. This effect can be obtained in various ways, one would be by the use of pins in slots at each end of the slats. This will limit the spacing of the slats while having the plate sections fill the area required for the shoring plates.

An outer top shoring plate **35** is supported on rams **36** and moved downwardly against the outer sheets of the body roof. Side shoring plates **37** are mounted on rams **38** for moving the shoring plates **37** against the outer wall at the sides of the body. A shoring plate **39** is dropped downwardly, moved laterally or hingedly supported to move against the front outer wall of the body. This retains the sheets covering the inner front wall of the body disposed in engagement with the end plate sections **24** and **25** of the frame. In this manner, the spaced inner and outer parallel sheets forming the inner and outer walls at the two sides, the front and the roof of the body are backed up by the shoring plates so as to prevent the outward bulging thereof should excess pressure build up within the plurality of cells located along the length of the body.

The foam material is delivered into the cells by flexible hoses **41** from a plastic material dispensing device **42.** The end of the hose extends into the front wall cell from the side cells through apertures in the I-beam posts **11** and are pulled outwardly to have the ends pass from one cell to another at a predetermined time rate which introduces the required amount of foam into each of the cells. The quantity of the foamable material is sufficient to foam upwardly and across the roof section under heat to fill the cells at the front, sides and the roof area with insulating reinforcing foamed material.

As pointed out above, the shoring plates are heated to substantially 150°F so that heat will be available to foam the material delivered by the housing into the various cells and to cure the material after it had foamed. After the material is cured, the outer shoring plates **35,** 37 and **39** at the top, side and front wall are retracted as well as the inner plate **31** and sections **24** and **25** of the cantilever supported frame **23.** The body **10** is then retracted away from the shoring plate area and a new body is aligned with the caterpillar type belts **21** and advanced forwardly in position to be engaged by the inner and outer shoring plates as pointed out hereinabove.

In FIGS. **4** and **5,** a slightly modified structure is illustrated that wherein the frame element **23** is retained on the supporting structure **18** by the engaged fingers **43** and **44** which permits the upward and downward movement of the frame **23.** Blocks **44** are mounted on the bottom of the frame element **23** in engagement with the forward face of the support **18** for movement therealong. This structure is employed when the top shoring plates **45** are supported on fixed I-beams **46.** The body is raised by a plurality of rams **47** and after the bottom is engaged the further advancement of the rams move the top roof sheets of the body into engagement with the shoring plates **45** as the frame structure **23** moves upwardly with the body. Thereafter, the side shoring plates **37** are moved inwardly against the outer side walls of the body. The end shoring plate **39** is then moved into engagement with the outer sheets covering the front wall. Otherwise, the structure is the same as that illustrated and described with reference to FIGS. **1, 2** and **3.**

In FIG. **6,** another form of structure is illustrated for backing up the outer sheets of the roof and side panels which embodies a clam shell type of outer shoring units **48.** A top shoring plate **49** is supported on a frame **51** which is secured to a horizontally positioned downwardly presenting channel element **52** having side flanges **53** that are secured to the frame **51.** Side shoring plates **54** are supported on similar frames **55** with the upper edges of the shoring plates secured to the side edges of the shoring plate **49** by hinging elements **56.** A pair of cables **57** and **58** are secured to a triangular element **59** which is suspended on a cable **61.** The cable **58** passes through one of a pair of sheaves **62** over a sheave **63** and secured to a lug **64** on the lefthand frame element **55** as viewed in the Figure. The cable **57** passes over the other of the pair of sheaves **62** over a sheave **65** and secured to a lug **66** of the frame **55** on the righthand side of the Figure. When the cable **61** is drawn upwardly, the cable **57** and **58** swing the frames **55** outwardly about the hinges **56** and when so swung outwardly, the cable **61** will raise the frame **51** and the frames **55** upwardly away from the body to permit the body to be removed. The shoring plate for the front end of the body is supported in the manner pointed out hereinabove or it may be supported on the rear end of the top shoring plate **49** to be raised and lowered by the cable **61.**

The arms **34** are moved by elongated shafts **68** by a motor **69** and a gear reduction unit **71** which drives a sprocket **72** and a chain **70** which drives three additional sprockets **72** on three additional shafts **68.** This moves the arms **34** inwardly and outwardly depending on the direction in which the motor **69** is driven to move the side plate sections **24** and **25** toward and away from the inner side walls of the body **10.** A motor **74** drives a sprocket **75** which drives a chain **76** and shafts **77** to raise the arms **32** and the top shoring plate **31** against the inner roof wall of the body **10.** The arms **32** carry a cross member **78** which supports a motor **79** and a gear reduction unit **81** which drives a sprocket **82** and a chain **83** for driving a pair of sprockets **84.** The two sprockets **84** drive a pair of shafts **85** which move the arms **33** outwardly and inwardly to carry the top section **24** of the side plate sections outwardly to retain it in the plane of the bottom plate sections **25.**

The shoring mechanism has proved invaluable for permitting the trailer body to be moved thereof and insulated and reinforced in a short period of time without any distortion of the sheets forming the inner and outer wall of the body. This provides assurance that the inner and outer walls of the side, front and roof of the body are parallel and have not, in any manner, been bulged

or weakened due to excess internal pressures which could develop.

We claim:

1. In a shoring structure for backing up the inner walls of a trailer body at the sides and roof thereof, a cantilever supported horizontally extending frame, said frame being of rectangular form with the body disposed thereover from the extending end, means on the frame for supporting vertically and laterally movable arms, shoring plates on said arms at the sides and top movable outwardly against the inner surface of the walls and roof by said arms, said side shoring plates embody an upper and lower section having spaced oppositely extending members disposed in coplanar relation to each other and said sections, said upper section being connected to said vertically movable arms for upward movement therewith.

2. In a shoring structure as recited in claim **1,** wherein outer shoring plates are supported for movement into engagement with outer surfaces at the sides and roof of the body.

3. In a shoring structure as recited in claim **2,** wherein drive means are provided within the frame for moving the shoring plates outwardly and inwardly and upwardly and downwardly to and from the internal surfaces at the sides and roof of the body.

4. In a shoring structure as recited in claim **3,** wherein ram means support at least some of the outer shoring plates for moving them toward and away from the body.

5. In a shoring structure as recited in claim **3,** wherein the outer shoring plates are hinged together at the top and sides and supported for movement into and from engagement with the outer roof and side surfaces of the body.

6. In a shoring structure for backing up the inner walls of a trailer body at the sides and roof thereof, an elongated frame, support means at one end of said frame, a base supporting structure for said support means which supports said frame in cantilever, means for raising said frame relative to said base supporting structure, side and top shoring plates supported on said frame at the sides and top thereof for movement outwardly and upwardly thereof, said side shoring plates having top and bottom sections containing nested extending coplanar sections, and means supporting said top sections for movement upwardly relative to the bottom sections as the sections move relative to each other.

7. In a shoring structure as recited in claim **6,** wherein said supporting means for the top sections has outwardly moving members, and outwardly moving members on said frame for supporting the bottom sections of the side plates, said top sections of the side shoring plates being movable outwardly and upwardly simultaneously.

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