METHOD AND APPARATUS FOR FORMING AND REFORMING OPERATIONS

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The invention relates generally to a method and apparatus for forming and reforming operations, particularly in connection with large objects such as vehicles and the like, and is an improvement on the methods and apparatus illustrated in prior U.S. Letters Patents 2,792,046 and 2,792,047 both issued on May 14, 1957.

Both of the patents above referred to disclose, as examples, pivoted beam structures for utilization of the novel method, and as illustrated in Patent No. 2,792,047 the possible relationships were diagrammatically illustrated, such relationships as illustrated in FIG. 9 of the patent taking the form of spherical segments with geometric limitations resulting from the limitations imposed by the operative travel of the beam structure.

The present invention has among its objects the utilization of a novel method, and production of novel apparatus, wherein beam structures are not required and a cubicle work area is provided to achieve complete flexibility of point relationships throughout the cubicle area, thereby resulting in substantially unlimited choice of operation throughout the entire work area.

Another important object of the invention is the utilization of a novel method and apparatus which is extremely simple, eliminating during the forming operation major movement of the object, such as a vehicle, of the type required in the previous patents, simplifying the operations and facilitating observation of the work in progress as a result of its relatively stationary position. However, the apparatus is capable of performing functions similar to the previous patented constructions without the utilization of a rigid pivoted beam.

A further object of the invention is the production of a novel apparatus which is so designed that it may be readily adapted to installations of various sizes and shapes, whereby efficient installations may be readily made in existing structures without material and expensive changes.

Many other objects and advantages of the invention will be obvious to those skilled in the art from the disclosure herein given.

To this end our invention consists in the novel construction, arrangement and combination of parts herein shown and described and more particularly pointed out in the appended claims.

In the drawings wherein like reference characters indicate like or corresponding parts:

FIG. 1 is a perspective view of an apparatus embodying the present invention;

FIG. 2 is a sectional view through the work surface or floor area, illustrating the details of one of the anchors or dromets; and,

FIGS. 3 to 11 illustrate examples of typical operations which may be performed with the apparatus.

The present invention employs the same general mathematical and geometrical basic relationships of the prior patents but employs a different method of utilizing the same as well as a different and simplified apparatus for performing the apparatus, however, being capable, if desired, of usage generally corresponding to that of the prior patents.

Thus, in the prior patented constructions, the object to be operated upon was elevated and connected at the desired points to one or more anchors and to a suitable element illustrated in the patents as being a rigid extendable beam pivoted adjacent one end to the supporting floor or other similar structure. As clearly described in the reference patents, the main forces were obtained when the elevated object and beam to which it was operatively connected were permitted to move downwardly, thus creating tension forces on the object, the nature and direction of which was dependent upon the points of connection of the object.

The present invention is directed to a novel method which combines the selection of fixed connections to the object in combination with the application of an upward force to the connected assembly, whereby static forces on the object may be at least partially relieved and simultaneously therewith tension stresses are created in the object as determined by the connections thereto. Thus, while the object may be elevated during forming operations, extensive elevation is normally not required and the object therefore remains relatively stationary during the forming operations, as compared with the operations described in the previously referred to patents.

The present invention contemplates the utilization of a cubic area as, for example, a room or enclosure of suitable dimensions which is provided with suitable anchoring means at selected points and is provided with an overhead traveling hoist structure which is movable both longitudinally and laterally whereby it is capable of being positioned above substantially any point within the work area. The arrangement is such that desired forces may be derived in substantially any suitable direction and at any point within the cubic area of the apparatus.

Referring to the drawings and particularly to FIGS. 1 and 2, FIG. 1 illustrates in semi-diagrammatic form an area which, for example, could be in the form of a room having a supporting surface or floor 1, and one or more side and end walls 2 and 3, respectively, one of each of which is illustrated in FIG. 1. Suitably supported overhead at the top of the work area is a traveling hoist indicated generally by the numeral 4 and comprising longitudinally extending rails 5 which may be in the form of I beams, rigidly supported by suitable means as, for example, from the ceiling (not shown) of the structure defining the work area. Movable along the rails 5 is a transversely extending beam which is supported from the respective beams 5 by connecting wheeled carriage members 7. Movable along the transverse beam 6 is a hoist structure indicated generally by the numeral 8 which may be suitably powered and provided with suitable wheeled connections 9 to the beam 6 whereby the hoist may travel longitudinally along the beam 6. The construction thus is such that the hoist 8 may traverse the horizontal area of the floor 1 with the elevating chain or cable 11 overlying substantially any point within the work area.

In some cases it may be desirable, as illustrated, to employ two hoist structures in which case a second transversely extending beam 6' and hoist 8' may be provided so that substantially the entire work area is effectively covered by either of the two hoists.

Mounted on the floor 1 at spaced intervals are a plurality of anchors or dromets 12, one of which is illustrated in detail in FIG. 2, comprising a suitably formed cylindrical member 13 terminating at its outer end in a radially extending cylindrically shaped flange 14 and an intermediate portion 15 of lesser diameter forming a shoulder 16 which seats on the floor surface.

In the particular embodiment illustrated, the tabular portion 13 is provided with a bottom wall 17 having a hole adapted to receive an upwardly extending bolt 18...
which is embedded in cement 19. In assembling the structure, the cement 19 may be poured first with the bolt 18 being threaded thereto by means of the nut 21. The resulting structure provides an efficient anchor for connecting means such as a chain, which may be readily wrapped around the intermediate portion 15 with the free end of the chain hooked back upon itself to form a loop which encircles the anchor, the flange 14 of the latter retaining the links of the chain in anchored relation.

While we have found that the size of the work area may vary, a suitable size, which for most work could be considered a practical minimum, would be a length of approximately sixty feet, width of thirty feet and height from the floor surface to the bottom of the transverse beam approximately twelve feet. The height may of course vary particularly dependent upon the vertical space taken up by the hoist structure but we have found that with current types of hoist structures, a minimum of approximately twelve feet from the floor surface to the bottom of the transverse beam is generally desirable.

Likewise, the size of the elements of the hoist structure may vary. For average constructions the longitudinal crane rails or tracks 5, which will normally be supported at spaced intermediate points thereon, may comprise eight-inch I beams, while the transverse beam which likewise may be an I beam, may run from ten inches to fifteen inches depending upon the length of the particular span involved. The specific details of the hoist structure may vary widely and consequently the details thereof form part of the present invention. Preferably the elevating structure of the hoist is mechanized, numerous types of electrical and other hoists being available.

In some cases it may also be desirable to provide anchors or dromets 12 on the end and side wall structures, as illustrated in FIG. 1, although for most installations suitable geometric relationships can be derived from anchor points on the floor surface. Where wall dromets are utilized, they will be anchored to suitable reinforcing beams or other members capable of withstanding the loads to which they may be subjected.

It will be appreciated that substantially an infinite variety of combinations of connections and applications of force to a connected assembly may be derived, depending upon the end result desired, so that generally each case will require its own particular arrangement, and the ability to properly set up the connections will be gained from actual experience with the apparatus. It might be mentioned however, that those skilled in straightening and rebuilding operations have had little difficulty in acquiring the ability to readily analyze the requirements and provide a corresponding set up to achieve the desired results.

FIGURES 3 through 8 thus merely semi-diagrammatically illustrate some of the possibilities of the invention and are not to be considered as limiting the possible connections which may be achieved or restricting the disclosure. Likewise the nature of the connections to the object will vary with the particular operation of the chain or other member and no details thereof are illustrated. Hooks, clamps and other devices may be employed as required or desirable.

FIG. 3 illustrates the application of a rolling side draft, with a slightly forward angle, the left side of the vehicle as viewed in FIG. 3 being connected by a chain a to an anchor and dromet A, and the chain b being anchored at one end to the opposite side of the hood of the vehicle as illustrated, with the other end of the chain being looped around a dromet A'-A", which is disposed to the left of the vehicle as viewed in FIG. 3 and forward from the vehicle toward the viewer. The hoist chain c is connected to the chain b at the point B. Thus upon elevation of the chain c as indicated by the arrow, the chain b will tend to move the point C upwardly and slightly to the left, to the point C'. At the same time the chain a will prevent the left hand side of the vehicle from moving toward the left whereby the vehicle, of necessity, must pivot as indicated in the dotted lines. It might be mentioned that this action will also move the point of connection B to the left as indicated at B', this being readily accomplished automatically by the movement of the hoist laterally to the left as the latter is free to move along the beam 6.

It will be noted that the operation results in both a relieving of some of the static forces on the object and at the same time creates tension stresses in the object as desired.

FIGURE 4 illustrates applications of the present invention, one involving stretch of the vehicle and the other adjustment through the car of the opposite side door pillar. Thus, by fastening a chain a to the anchor A at the front of the vehicle, and a chain b to the anchor A'-A", applying vertical force as indicated adjacent the middle of the chain b, tension forces are created by an upward pull on the chain to stretch the vehicle. It will be apparent that a relatively fine adjustment of the applied force may be achieved by the positioning of the hoist chain, as for example, by positioning the chain closer to the vehicle as indicated in the broken lines.

In the second application, the chain a is connected to the pillar 5 of the car, with a chain C-C', and at the opposite end to the anchor A-A' with the hoist chain c being connected to the chain a at the point B. Upon the application of force to the chain c, the connections will assume the position illustrated in dotted lines with the point B moving to the point B'.

In FIG. 5 is illustrated the adjusting of windshield clearance at a cowl wherein the chain a is secured at one end to the cowl structure as illustrated at C, and at the opposite end to the anchor A-A' with the hoist chain c being connected to the chain a at the point B. In this operation, the cowl is reinforced in a longitudinal direction by a brace or prop P which extends from adjacent the rear of the car to the cowl thus insuring that upon application of forces through the chain c, the cowl will move in the desired outward direction.

FIGURES 6 and 7 illustrate further applications, FIG. 6 illustrating how a center forward force may be applied to the top of a vehicle while FIG. 7 illustrates the relieving of roof and center posts and it will be noted that in both of these instances the hoist is free to move and adjust itself to a position directly vertically above its connection in the assembly.

FIGURE 8 illustrates an arrangement for producing a side angle pull wherein the point C is drawn forward and at the same time a lateral tension is placed on the vehicle body.

It will be noted from the above description that the weight and leverage of the vehicle may be effectively used and that in this respect the present invention, while utilizing the weight of the vehicle in many applications, does not require the large movement of the vehicle as illustrated in the previous patents, so that the operator may readily observe the action of the apparatus with the vehicle relatively stationary.

It will be apparent, however, that the present construction may perform operations similar to those performed by the prior devices, as for example, considering the stretch operation of FIG. 4, the chain b could be connected at its free end to an anchor which is elevated, generally corresponding to the elevation of the beam of the prior devices with the hoist positioning the adjacent end of the vehicle in a desired position, following which the hoist could be lowered permitting the vehicle to move downwardly, tensioning the chain and resulting in a stretch on the vehicle.

It will be obvious from the above description that we have provided a novel method and apparatus in which a pull or tension may be effected from substantially any
angle to any angle, or combination of angles, or points in the cubic area involved, which operations may be readily and easily effected. Likewise, while the elevating chain and its connection are illustrated as being movable along the chain to which it is connected, for establishing desired point relations, in some cases it may be desirable to fixedly connect the elevating chain to a specific point on the cooperative chain which can be accomplished by any suitable means.

It will also be appreciated that the present invention reduces the mechanical equipment to a minimum as well as the utilization of a minimum of operations resulting in operations which may be readily understood and put into use by those reasonably skilled in the art, and in which the apparatus is so designed that it may be readily adapted to substantially any required installation limitations.

Having thus described our invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of our invention; hence, we do not wish to be understood as limiting ourselves to the exact form, construction, arrangement and combination of parts herein shown and described or uses mentioned.

What we claim as new and desire to secure by Letters Patent is:

1. An apparatus for performing, forming and reforming operations comprising a supporting surface, an overhead hoist structure comprising laterally spaced longitudinally extending rails, longitudinally spaced movable beams, each beam including spaced wheeled carriages operatively mounted on the aforesaid laterally spaced rails, said overhead hoist structure adapted for operatively mounting an overhead traveling elevating hoist structure for each beam and including wheeled connections operatively mounted and movable upon each movable beam and also including a vertically movable object engageable hoist element, each of said object engageable hoist elements for each traveling hoist structure movable in longitudinal and transverse directions in a plane extending substantially parallel to said supporting surface, the longitudinal and transverse movement of said traveling elevating hoist structure substantially defining the horizontal extent and the vertical movement of said hoist element defining the vertical extent of a cubical work area, anchor means disposed on the supporting surface, and tie elements adapted to be connected to the hoist element and the object to be used upon and to selected anchor means, and said anchor means comprising cylindrical members including radially directed outwardly extending flanges adapted to overlie and thereby anchor tie members engaged therewith.

3. Apparatus as set forth in claim 2, wherein said anchor means for non-rigid tie members, such as chains, comprises a cylindrical base member including means by which it may be secured to a supporting structure with the free end of the base member extending outwardly from such a supporting structure, and a circularly shaped radially extending flange carried by the base member at the free end portion thereof and extending laterally outwardly therefrom.

4. An apparatus as set forth in claim 3, wherein said base member is hollow and provided with a transversely extending apertured wall at the inner end portion thereof, for engagement with a securing element.

5. An apparatus as set forth in claim 4, wherein the outer portion of said base member is provided with an annular enlargement of a diameter less than that of the flange portion.

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