

Oct. 21, 1958

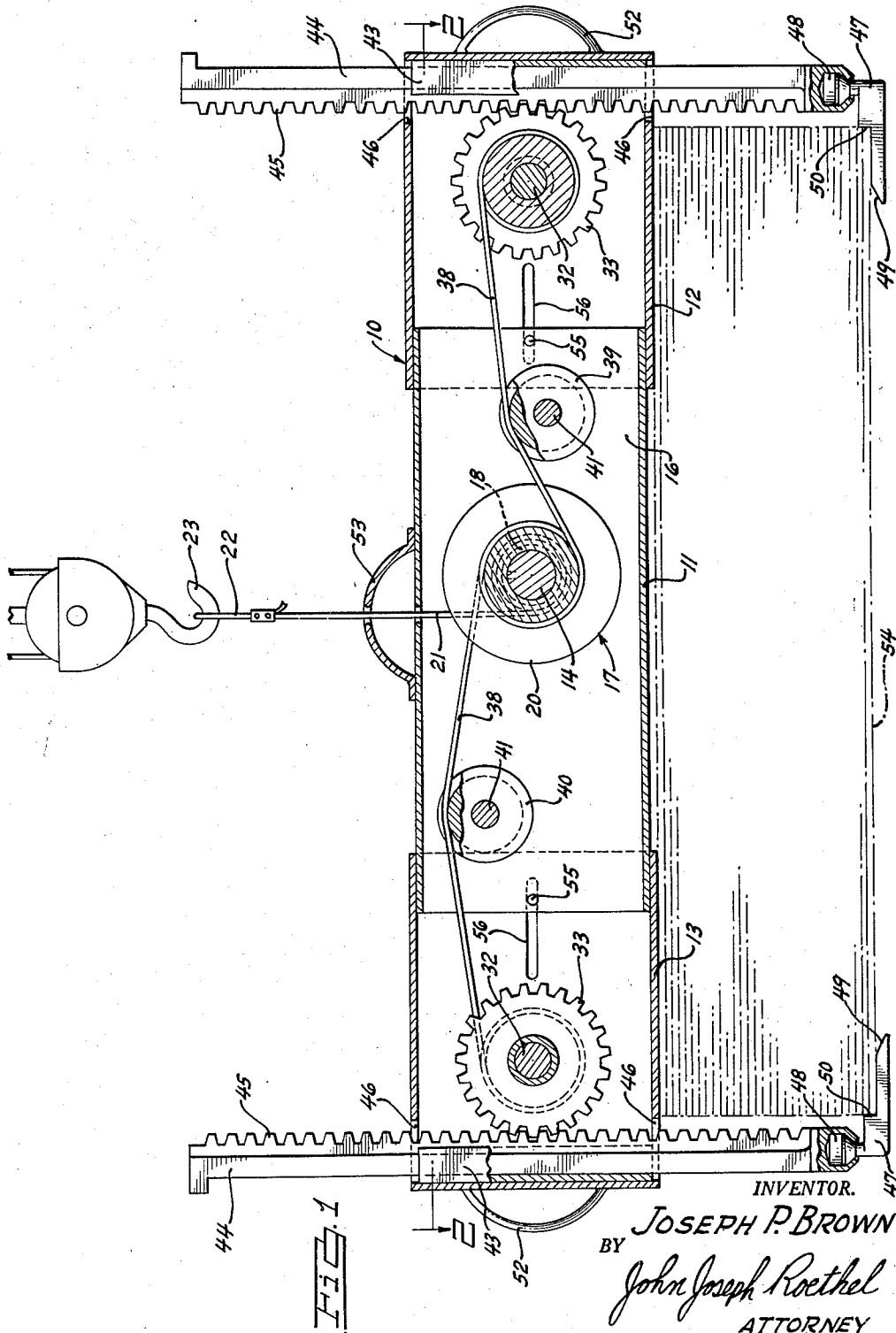
J. P. BROWN

2,857,194

MATERIAL HANDLING DEVICE

Filed June 18, 1956

2 Sheets-Sheet 1



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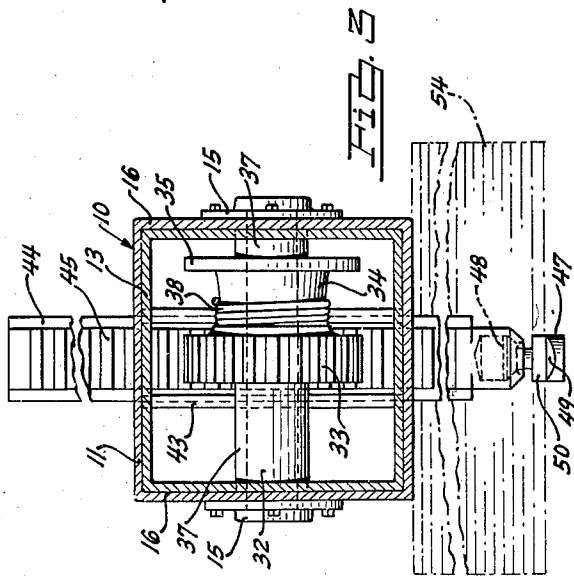
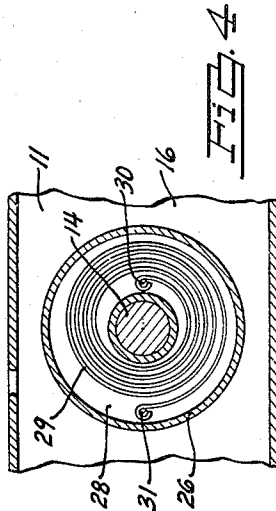
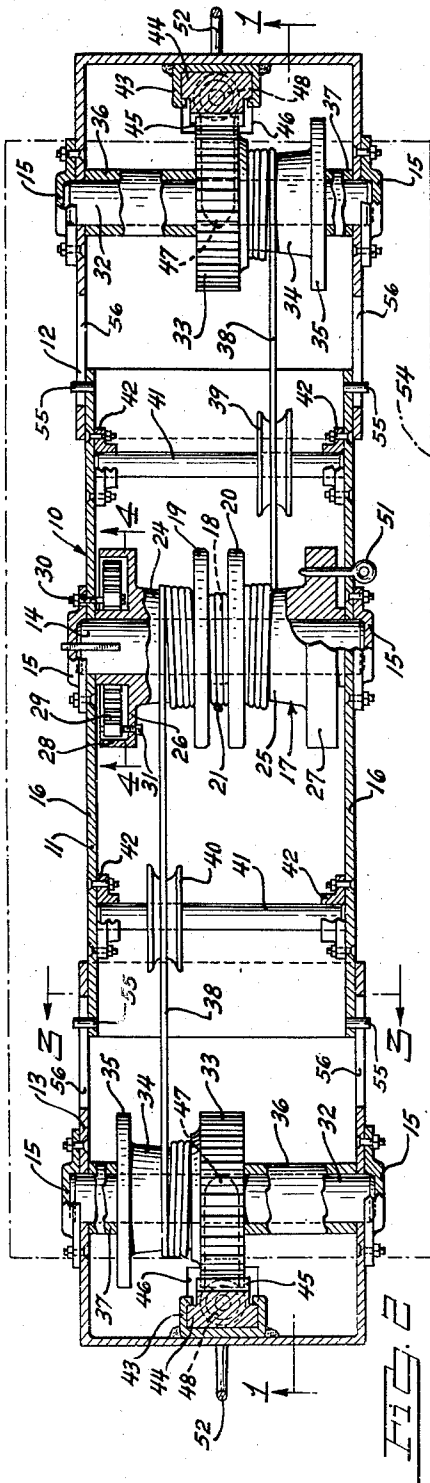
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2 Sheets-Sheet 2



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MATERIAL HANDLING DEVICE

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6 Claims. (Cl. 294—86)

This invention relates to a material handling device and more particularly to a device adapted to serve as a material gripping appendage to a load carrying hook suspended from the cable or chain of a hoisting mechanism such as a crane.

The conventional practice, when it is desired to move a load of material such as a bundle of steel sheets, structural steel, lumber or the like, is to wrap a sling around the material and then pick the load up with a crane hook. On all too many occasions the sling, which may be of rope, cable or chain, will slip causing the load to be damaged. Also, especially when handling sheet steel or soft lumber, the cable or chain will damage the edges of the material with which it comes in direct contact.

It is an object of the present invention to provide a material handling device which will take the place of the conventional sling. To accomplish this object, the present invention provides a material handling device which comprises a beam means of adjustable width, said beam means having movably mounted material engaging means at each end thereof, such material engaging means having material engaging portions, and cable operated means effective to draw the material engaging means toward the beam means to grip a load of material therebetween.

More particularly, the material handling device embodying the present invention comprises a device adapted to be suspended from a load lifting means, such as a crane hook, said device comprising a hollow beam means adapted to straddle a load of material. The beam means has a center section and two telescopic end sections slidable on the center section. Each end section has movably mounted on its outer end a load lifting member. The load lifting member is movable through a rack and pinion means arrangement, the rack teeth being carried by the member and the pinion means being rotatably journaled interiorly of the beam end section. The load lifting members are provided with load engaging means at the lower ends thereof. Rotation of the pinions is accomplished through a cable and drum arrangement, each pinion means being operatively connected to the drum by an independent cable means, that is, cable or chain, and the drum being rotatably mounted in the center section of the beam. Another independent cable means is provided which is wound about the drum and adapted to be engaged by the crane hook. When this cable is placed under tension it causes the drum to be rotated as the cable unwinds. This in turn causes the cable means attached to the pinions to wind up on the drum and unwind from the pinion means causing the latter to be rotated in a direction to cause the load lifting members to be moved. Movement of the load lifting members is in a direction such to cause the load engaging members to be drawn toward the beam thereby tightly gripping the load therebetween. With the load tightly gripped the rotation of the gears and drum will be prevented and upon the slack in the system being taken up the crane hook will lift the material handling device and the load gripped thereby.

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Further objects, advantages and the features of construction embodying the present invention will be apparent from the following description and appended claims, reference being had to the accompanying drawing forming a part of this specification wherein like reference numerals designate corresponding parts in the several views.

Fig. 1 is a section taken substantially through line 1—1 of Fig. 2 looking in the direction of the arrows.

Fig. 2 is a section taken substantially through line 2—2 of Fig. 1 looking in the direction of the arrows.

Fig. 3 is a section taken substantially through line 3—3 of Fig. 2 looking in the direction of the arrows.

Fig. 4 is a section taken substantially through line 4—4 of Fig. 2 looking in the direction of the arrows.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawing, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

In the drawings there is illustrated a preferred embodiment of the present invention comprising a beam, generally designated 10. In its normal operative position, as shown in Fig. 1, the longitudinal axis of the beam 10 extends in a substantially horizontal direction. The beam 10 consists of three hollow sections, each section being of preferably square cross section. These sections, which consist of a center section 11, a right end section 12 and a left end section 13, are telescopically arranged with the end sections exteriorly slidable on the center section.

The center section 11 has a shaft 14 rotatably mounted therein. The shaft 14 is journaled at each end in suitable bearing plates 15 secured to the beam center section sidewalls 16. The axis of rotation of the shaft 14 extends at right angles to the longitudinal axis of the beam 10. The shaft 14 has keyed thereto a drum 17. The drum 17, as best seen in Fig. 2, is provided with three cable or chain receiving or winding sections. The center section 13 of the drum 17 is located between two spaced flanges 19 and 20. The center section 13 is adapted to receive a cable 21. As shown in Fig. 1, the cable 21 is provided with a loop 22 adapted to fit over the load hook 23 of a crane or other hoisting mechanism.

At each side of its center section 13 the drum 14 is provided with tapered sections 24 and 25. As shown in Fig. 2, the section 24 lies between an outer flange 26 and the center flange 19. The tapered section 25 lies between the center flange 20 and an outer flange 27.

The flange 26 is provided with an outwardly facing cylindrical recess 28 adapted to receive a spiral spring 29. At its inner end the spring 29 is secured to a stud or anchor bolt 30 anchored to the beam side wall 16 adjacent the outer face of the flange 26. At the outer end of its convolutions the spring 29 is secured to an anchor bolt 31 anchored to the drum flange 26. As viewed in Fig. 4, rotation of the drum 17 in a clockwise direction will cause the spring 29 to be wound up tighter, as will be more fully explained.

Each beam end section 12 and 13, respectively, has a shaft 32 rotatably journaled therein. The axis of rotation of each shaft 32 parallels the axis of rotation of the center section shaft 14. The shafts 32 are suitably journaled in the sidewalls of the respective end sections 12 and 13 by suitable bearing plates 15. Each shaft 32 has journaled thereon a spur gear 33. Each spur gear 33 is provided with a tapered hub portion 34 terminating in a flange 35. Suitable cylindrical spacers or sleeves 36 and

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37 may be provided to position the gears 34 axially of their respective shafts.

Each gear 33 is operatively associated with the drum 17 by means of a connecting chain or cable. It will be noted that the hub 34 of the gear 33 mounted in the right end section 12 of the beam 10 is positioned in alignment with the drum section 25. A common cable or chain 38 is operatively associated with the hub 34 and drum section 25. At the other end of the beam 10, the hub 34 of the left end gear 33 is in alignment with the drum section 24, said hub 34 and drum section 24 also having a common cable or chain 38 extending therebetween.

Each cable 38 passes over an idler pulley 39 and 40, respectively. The idler pulley 39 is journalled on a shaft 41 rotatable in bearing plates 42 secured to the inner side of the beam center section side walls 16. The axis of rotation of the pulley 39 is located between and parallel to the axes of rotation of the drum 14 and right end gear 33 but is below the longitudinal axis of the beam 10 passing through said axes. The idler pulley 40 is also journalled on a shaft 41 rotatable in bearing plates 42 secured to the beam center section side walls 16. The axis of rotation of the idler pulley 40 is between and parallels the axes of rotation of the drum 14 and the left end gear 33 but lies above the longitudinal axis of the beam 10 passing through said axes. The reason for the specific location of the idler pulleys will become apparent when the mode of operation of the structure embodying the present invention is described.

It will be noted that at each end the beam end sections 12 and 13 are provided with vertically extending guideways 43. The guideways 43 slidably retain vertically extending rack members 44 provided with rack teeth 45 adapted to mesh with the teeth of the spur gears 33. The guideways 43 are shown secured internally of the beam end sections 12 and 13, respectively. Suitable apertures 46 provide clearance for the rack member movements.

At the lower end thereof, each rack member 44 is provided with a toe pallet 47. Each toe pallet 47 is held in place by a swivel connection at 48, the swivel connection permitting the toe pallet to swing in a plane parallel to the longitudinal axis of the beam 10. Each toe pallet is provided with a wedge tip 49 and a stop portion or shoulder 50 to prevent the material resting thereon from abutting the rack teeth 45 on the rack member 44.

Referring to Fig. 2, it will be noted that a pin 51 is illustrated as passing through the side wall 16 of the beam center section 11 and into the flange 27 of the drum 17. The pin 51 thus locks the drum 17 against rotation. It will be understood that either the sidewall 16 or the flange 27 may be provided with an annular series of pin 51 receiving apertures to provide a means for locking the drum 17 against rotation in a plurality of positions.

Each of the end sections 12 and 13 is provided with a handle 52 to be used in manually moving or telescoping the end sections inwardly or outwardly relative to the center sections 11. Suitable pins 55 operating in slots 56 may be provided to limit the closing or inward and the opening or outward movement of the end sections 12 and 13 relative to the center section 11. The center section 11 also is provided with a handle 53 particularly adapted for carrying the beam from one place to another, either manually or by the use of the crane hook 23. It will be understood that the present device may be made in any convenient size and in some sizes will be small enough and light weight enough to be manually carried.

The foregoing has described the structural features of the present invention. A statement of the mode of operation of the invention will make the reasons for some of the relationships of the parts hereinabove described more readily apparent.

The material handling device embodying the present invention is illustrated as being used to lift a bundle of sheet steel 54.

When it is desired to move a stack of metal sheets 54

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or the like, the material handling device or beam 10 is positioned so that it straddles the stack. It will be understood that the rack members 44 are normally in their lowermost position relative to the beam 10, the toe pallets 47 having been swivelled outwardly so as not to interfere with the sides of the stack. The length of the beam 10 is adjusted to accommodate the width of the stack 54 by manually pulling or pushing each of the end sections outwardly or inwardly relative to the center section 11. With the beam 10 properly straddling the stack of sheets 54, the toe pallets 47 are swivelled inwardly so as to be underneath the stack and the end sections 12 and 13 are also pushed inwardly so as to bring the stops 50 on the toe pallet in proper alignment with the edges of the stack. Next, the crane hook 23 is hooked into the loop 22 of the cable 21. As the crane hook 23 is raised the cable 22 will cause the drum 17 to rotate in a clockwise direction. This causes the cable 38 passing over the idler 39 and the right end drum 34 to unwind from the right end gear 33 causing the same to rotate in a counterclockwise direction. The right end rack member 44 will thus be moved upwardly relative to the beam 10. Meanwhile, the cable 38 passing over the idler 40 and unwinding from the drum 34 of the left hand gear 33 will cause the left end gear 33 to rotate in a clockwise direction causing the left end rack member 44 to be raised vertically relative to the beam 10. Actually, what happens is that after the toe pallets 47 engage the underside of the load 54 the beam 10 is pulled down until it rests tightly against the upper surface of the load. At this point the cables 38 will become taut and will each exert a downward force on the idlers 39 and 40. This downward force will be transmitted through the shafts 41 to the side walls 16 of the center section 11 causing sufficient deflection in the beam to tightly lock the telescoped parts against any slidable movement. Upon all of the play or slackness in the cables 38 being taken up, the drum 17 will resist further rotation in a clockwise direction and the cable 21 will then also become taut. Further upward movement of the crane hook 23 will cause the beam 10 and the stack of metal sheets or the like to be raised where they may be transported to any desirable location.

Upon arrival at the desired location, the hook 23 will be lowered to set the load down and thus release tension on the cable 21. The spring 29 which has been tightly wound as the result of the clockwise rotation of the drum 17 will cause the drum 17 to unwind in a counterclockwise direction thereby causing the cable 21 to re-wind around the center section 18 of the drum 17. This, of course, will result in a slacking of tension in the cable 38 and the rack members 44 may be moved vertically downwardly so as to permit the rack members to be manually lowered relative to the material load. The release of tension in the cables 38 will permit the rack members 44 to be pushed downwards a sufficient distance so that the toe pallets 47 may be kicked out from under the sheets of material. Likewise, the end sections 12 and 13 may be pulled outwardly to provide clearance so that the beam may be lifted away from the stack.

The foregoing construction and arrangement has the advantage that it may be utilized to hold and lift a single sheet of steel or a bound or unbound stack of sheets without damaging the edges of the sheet or sheets. The foregoing structure may be utilized to handle coiled sheet steel by changing the contour of the toe pallet to conform to the contour of the coil. The device is readily adaptable for handling logs, barrels, structural steel, building blocks, brick, Sheetrock and numerable articles of manufacture.

It will be understood that the main hoist chain 21 is of sufficient strength to accommodate any anticipated load that the beam or material handling device 10 may be called upon to handle. The cables or chains 38 may be somewhat lighter because they will be only called upon to handle the proportionate part of the load. However,

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should one of the cables 38 break the material will still be tightly enough gripped by the remaining load lifting or rack member 44 to prevent the sudden dumping or dropping of the load. This provides a safety factor the ordinary chain or cable sling does not have.

I claim:

1. A material handling device adapted to be suspended from a load lifting means and comprising a hollow beam means adapted to extend across the material to be handled, said beam means having a center section and two telescopic end sections slidable thereon, a material lifting member movably mounted on the outer end of each end section, each lifting member having material engaging members at its end thereof below and spaced from the telescopic end section in which mounted, rack means on each material lifting member, gear means rotatably carried by each end section in engagement with said rack means, rotatable drum means carried by said center section, a cable system operatively connecting said drum means to each of said gear means whereby rotation of the drum means will drive the gear means and cause the latter through engagement with said rack means to move the material lifting members in a direction to draw said material engaging members toward said beam means, said drum means being rotated through the action of a cable means unwinding therefrom, said cable means being attached to said load lifting means whereby tension is exerted thereon when the load lifting means is operated to raise said material handling device, said unwinding action continuing until all slack in the cable system has been taken up.

2. A material handling device adapted to be suspended from a load lifting structure, said device comprising a hollow beam means adapted to extend across the material to be handled, said beam means having a center section and two telescopic end sections slidable thereon, a material lifting member journalled on the outer end of each end section for reciprocatory movement at substantially right angles to the longitudinal axis of said beam means, each lifting member having material engaging members at its end thereof below and spaced from the telescopic end section in which journalled, rack means on each material lifting member, gear means rotatably carried by each end section in engagement with said rack means, rotatable drum means carried by said center section, a cable system operatively connecting said drum means to each of said gear means whereby rotation of the drum means will drive the gear means and cause the latter through engagement with said rack means to move the material lifting members in a direction to draw said material engaging members toward said beam means, said drum means being rotated through the action of a cable means unwinding therefrom, said cable means being attached to said load lifting means whereby tension is exerted thereon when the load lifting means is operated to raise said material handling device, said unwinding action continuing until all slack in the cable system has been taken up.

3. A material handling device adapted to be suspended from a load lifting means and comprising a hollow beam means adapted to extend across the material to be handled, said beam means having a center section and two telescopic end sections slidable thereon, a material lifting member movably mounted on the outer end of each end section, each lifting member having material engaging members at its end thereof below and spaced from the telescopic end section in which mounted, rack means on each material lifting member, gear means rotatably carried by each end section in engagement with said rack means, rotatable drum means carried by said center section, a cable system operatively connecting said drum means to each of said gear means whereby rotation of the drum means will drive the gear means and cause the latter through engagement with said rack means to move the material lifting members in a direction to draw

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said material engaging members toward said beam means, said drum means having an independent cable means wound thereabout, said independent cable means being adapted to be engaged by a hook means of said load lifting means to cause said independent cable means to unwind from and thereby rotate said drum means until the load is gripped between the load engaging means and beam means and all slack in the cable operated means is taken up whereby said hook means will lift the material handling device and load carried thereby.

4. A material handling device adapted to be suspended from a load lifting means and comprising a hollow beam means adapted to extend across the material to be handled, said beam means having a center section and two telescopic end sections slidable thereon, a material lifting member movably mounted on the outer end of each end section, each lifting member having material engaging members at its end thereof below and spaced from the telescopic end section in which mounted, rack means on each material lifting member, gear means rotatably carried by each end section in engagement with said rack means, rotatable drum means carried by said center section, a cable system operatively connecting said drum means to each of said gear means whereby rotation of the drum means will drive the gear means and cause the latter through engagement with said rack means to move the material lifting member in a direction to draw said material engaging members toward said beam means, said drum means having an independent cable means wound thereabout, said independent cable means being adapted to be engaged by a hook means of said load lifting means to cause said independent cable means to unwind from and thereby rotate said drum means until the load is gripped between the load engaging means and beam means and all slack in the cable operated means is taken up whereby said hook means will lift the material handling device and load carried thereby, and spring means reacting between said drum means and beam center section for restoring the cable operated means to normal inoperative position after release of the load carried thereby.

5. A material handling device adapted to be suspended from a crane hook, comprising hollow beam means adapted to extend across the material to be handled, said beam means having a center section and two telescopic end sections slidable thereon, material lifting means movably mounted on the end of each section, each material lifting means including a material engaging member positioned below and in spaced relation to the telescopic end section mounting the respective material lifting means, rotatable drum means carried by said center section, a cable means extending from said drum means in opposite directions to each of said material lifting means, said cable means each being counterwound on said drum means so that rotation of said drum means in a predetermined direction of rotation will cause both cable means to wind up on said drum means and to drive said material lifting means in a direction to draw said material engaging members toward said beam means, said drum means being rotated through the action of an independent cable means unwinding therefrom, said cable means being adapted to be attached to said independent crane hook whereby tension will be exerted thereon when said crane hook is operated to raise said material handling device, said unwinding action continuing until all slack in the cable means has been taken up.

6. A material handling device adapted to be suspended from a crane hook and comprising hollow beam means adapted to extend across the material to be handled, said beam means having a center section and two telescopic end sections journalled thereon for axial movement relative to said center section, material lifting means including a material engaging member movably mounted on the end of each telescopic section, rotatable drum means carried by said center section, cable means extend-

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ing from said drum means in opposite directions to each of said material lifting means, said cable means each being counterwound on said drum means so that rotation of said drum means in a pre-determined direction of rotation will cause both cable means to wind up on said drum means and to drive said material lifting members toward said beam means, said drum means being rotated through the action of an independent cable means unwinding therefrom, said independent cable means being adapted to be engaged by said crane hook

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and the unwinding action being adapted to continue until the material to be lifted is gripped between the material engaging members and the slack in all the cable means is taken up, whereby said crane hook will lift the material handling device and load carried thereby.

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