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(71) Applicant
Q M D Limited

(Incorporated in Ireland)

Ardee Road, Dundalk, County Louth, Ireland

(72) Inventor
Robert Moffett

(74) Agent and/or Address for Service
F J Cleveland & Co
40-43 Chancery Lane, London, WC2A 1JQ,
United Kingdom

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(54) Conveying apparatus for the placement of materials and/or articles

(57) The present invention concerns a mobile apparatus which is to be used for the placement of concrete on a building site. The apparatus has a feed conveyor (2) and first and second placement conveyors (3, 4) which are movable between a transport position and an operating position. The second placement conveyor can be extended outwardly from the first placement conveyor. There are frames which adjoin the first and second placement conveyors to each other, movement of the second placement conveyor being achieved by means of a sprocket wheel which moves in the track of a simplex chain, the sprocket wheel being driven by hydraulic motor. As the placement conveyors are extended, their cantilever effect is counteracted by force balancing devices which include high tensile strength steel ropes (380, 480) on the upper surfaces of the placement conveyors which create a suspension effect, and a movable ballast weight (10).

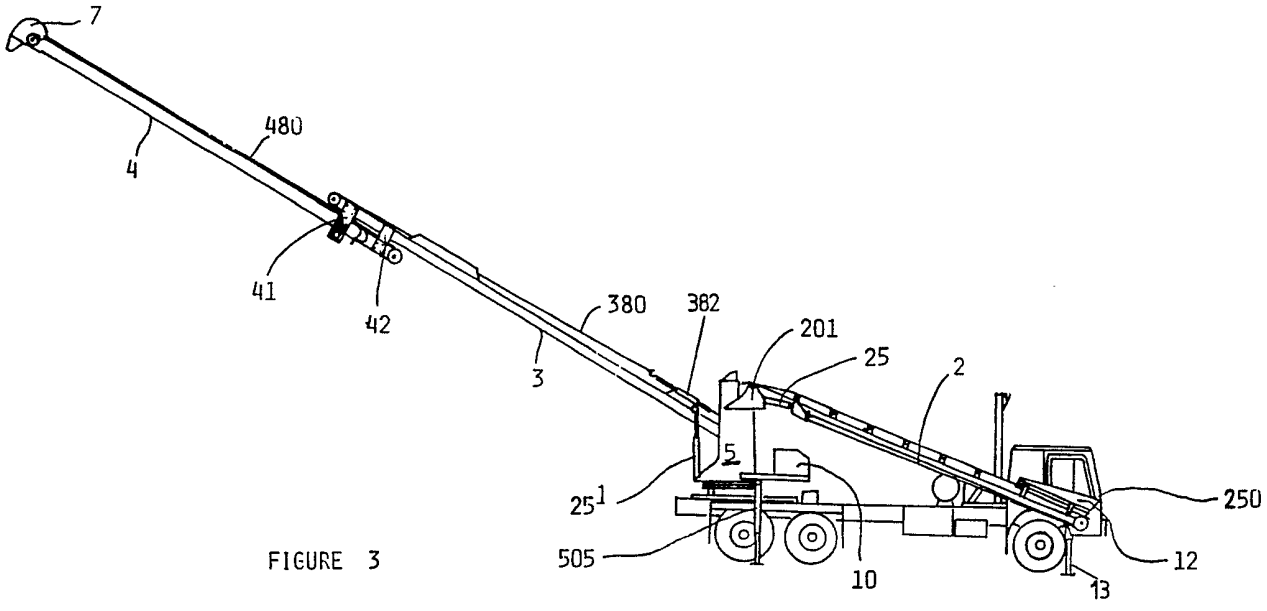

FIGURE 3

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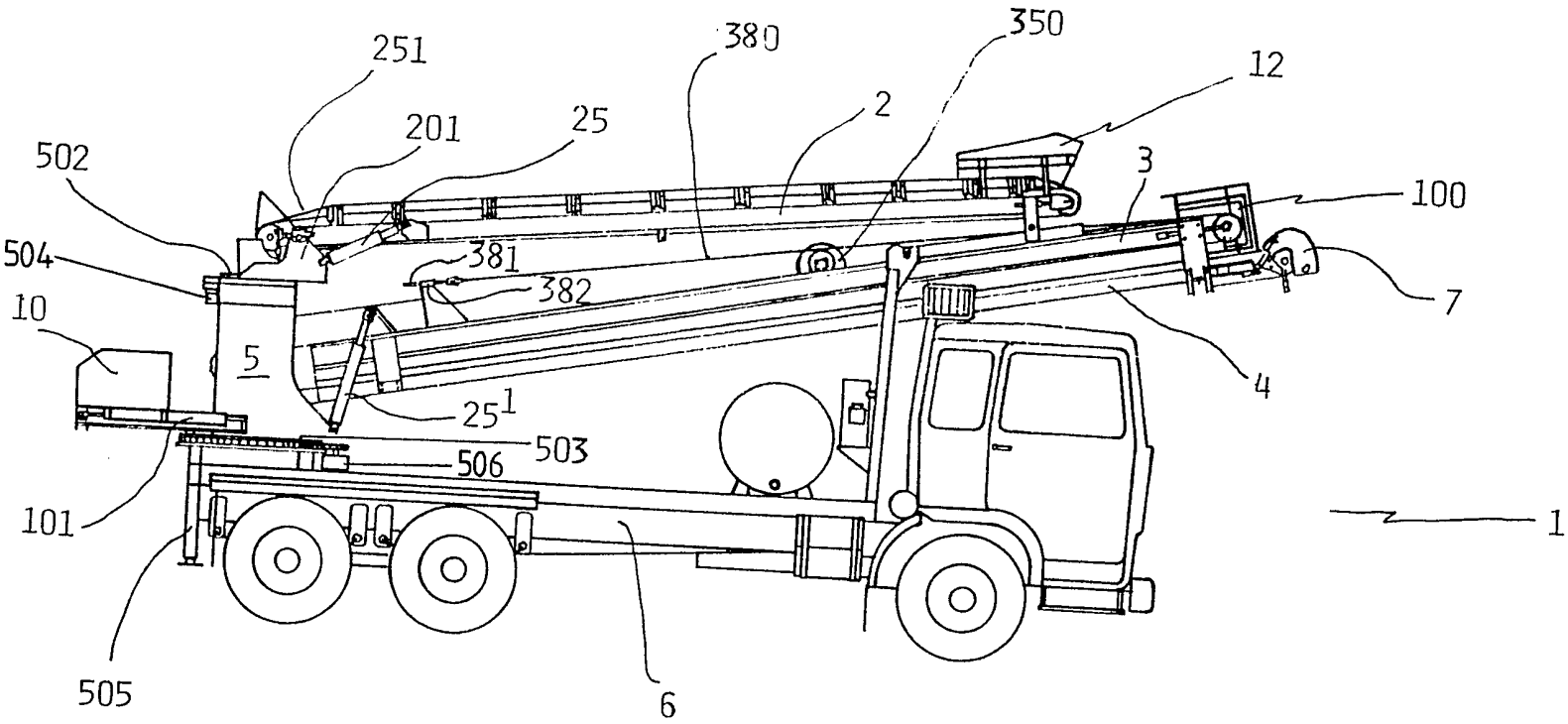
251
380
350
12
201
25
2
502
3
100
504
381
382
7
10
5
4
25¹
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506
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1
505
6

FIGURE 1

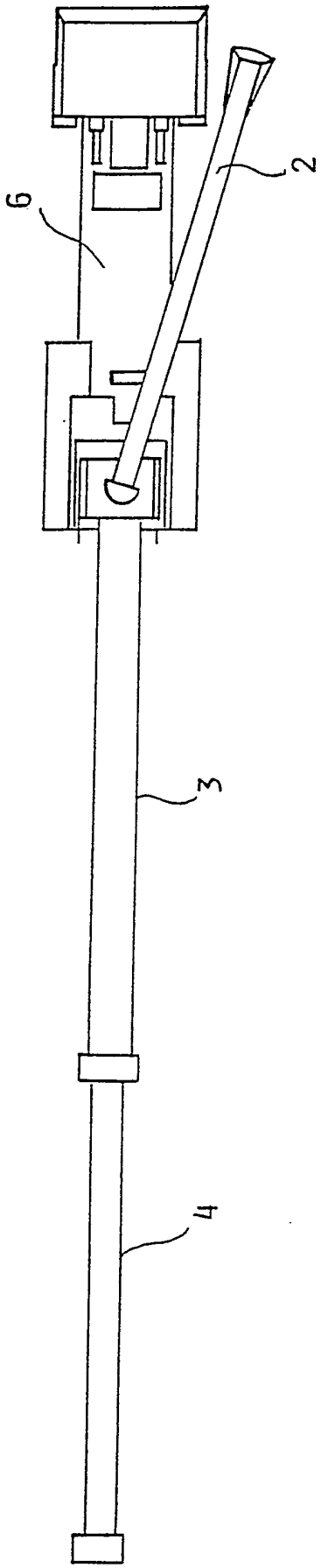

FIGURE 2

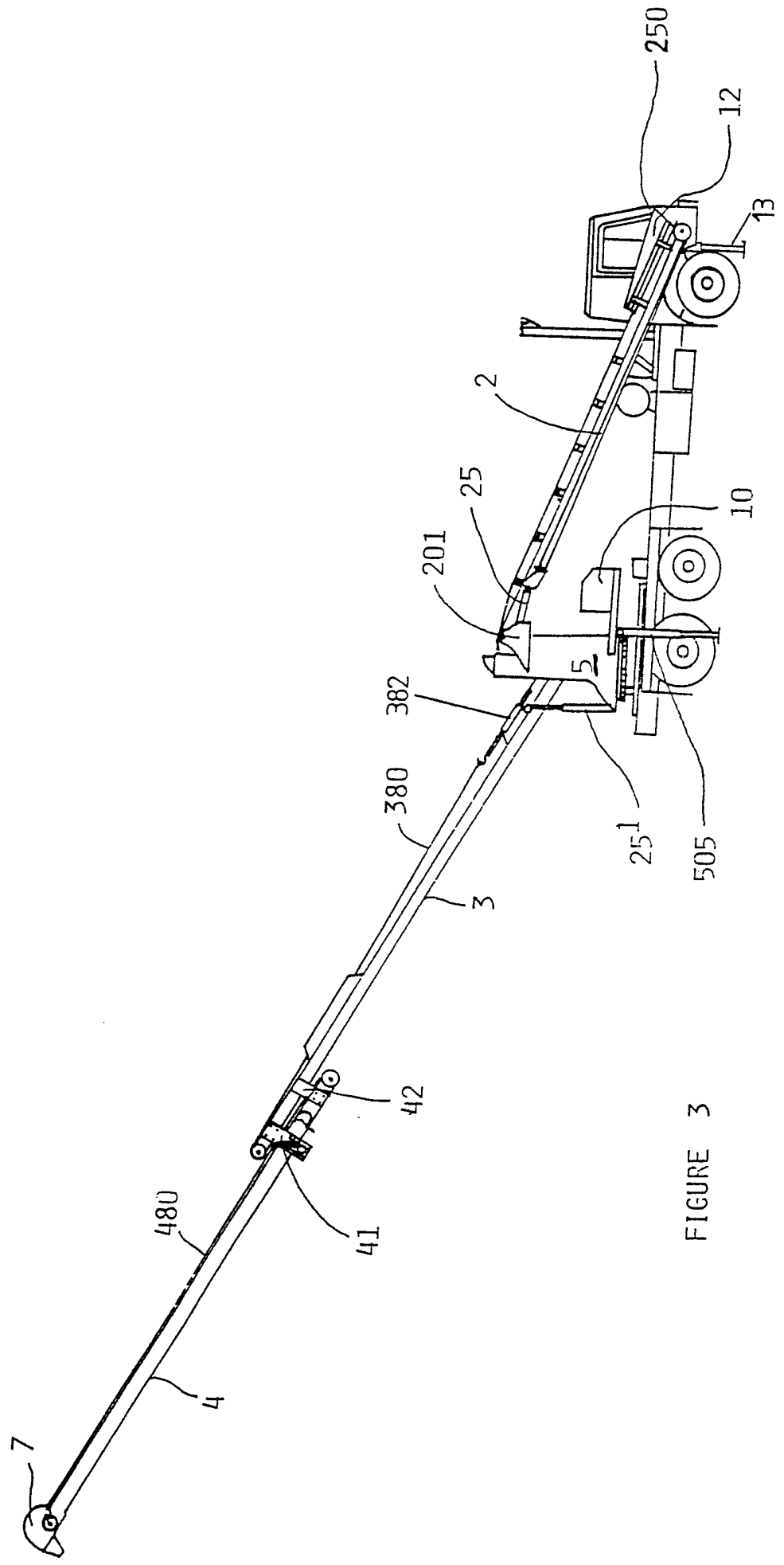

FIGURE 3

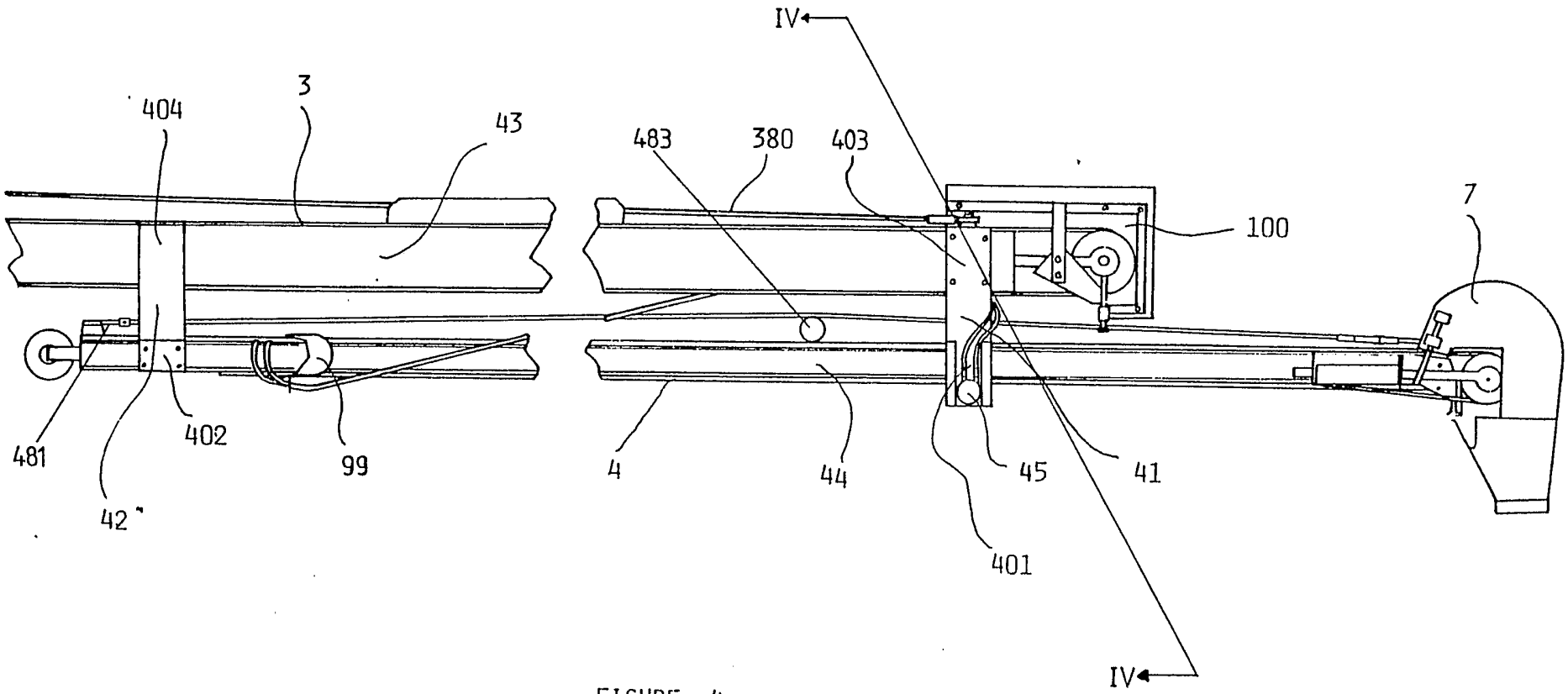

FIGURE 4

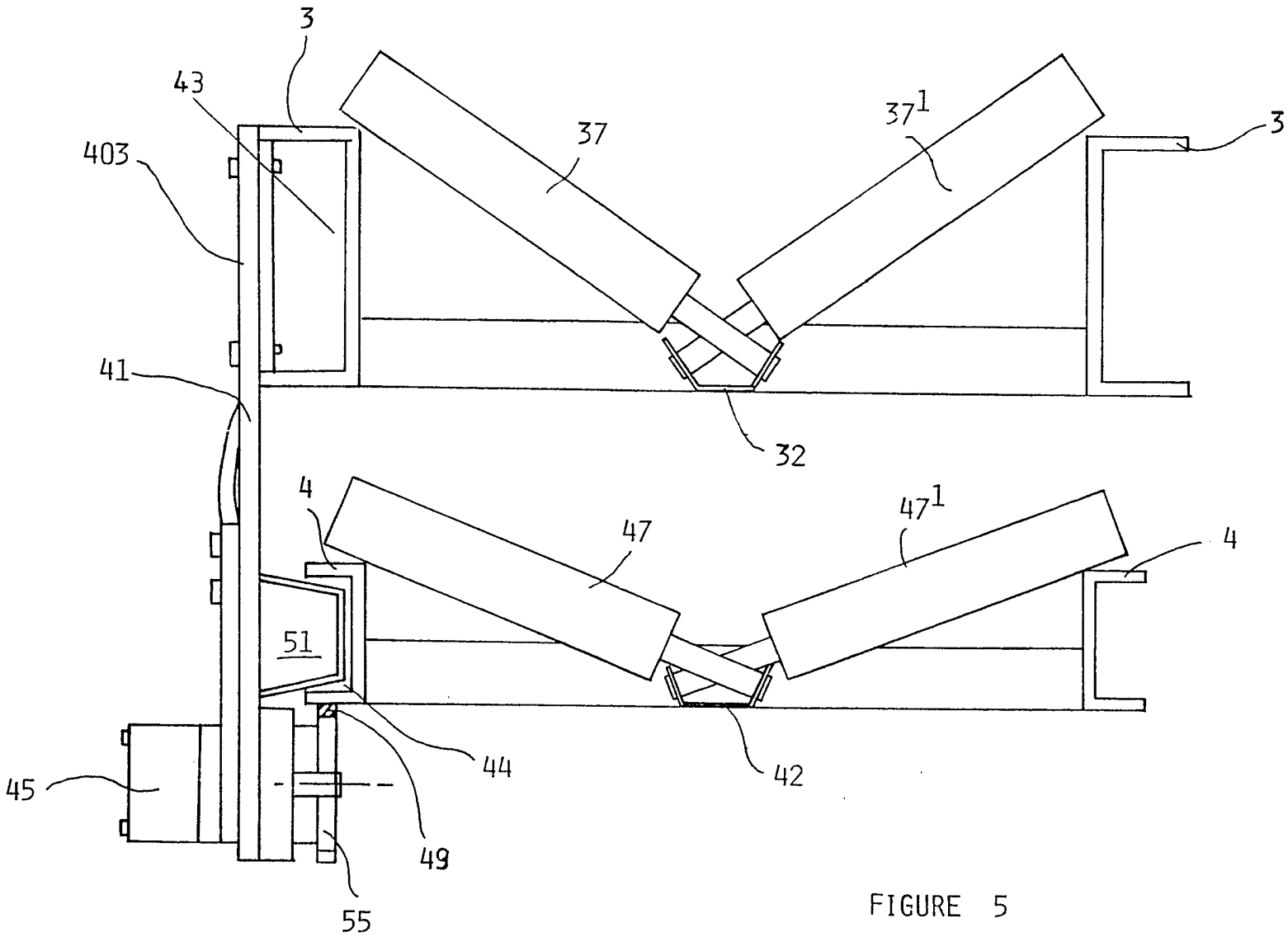

FIGURE 5

IMPROVEMENTS IN AND RELATING TO APPARATUS FOR THE PLACEMENT OF MATERIAL AND/OR ARTICLES

The present invention relates to apparatus for the placement of material and/or articles. The invention is particularly concerned with apparatus for the placement of flowable mixtures such as mortar or concrete, but it is also applicable to apparatus for the placement of other bulk materials such as gravel or ballast, or supplies of small articles delivered in bulk.

Trucks for delivery and placement of pre-mixed mortar or concrete are known in the art. Such trucks include a mixer drum for agitating the mortar or concrete and further include a conveyor belt mounted on the truck. The concrete from the mixer drum is poured onto the conveyor belt and is then dropped from the belt to a desired location. When the mixer drum has been emptied in this manner, the truck returns to a depot in order to be re-loaded with fresh concrete.

Such loaded trucks must generally travel on bumpy tracks when delivering concrete to a building site. The uneven terrain, coupled with the heavy load being transported can result in damage to the truck chassis. Furthermore, such

heavily loaded trucks quite often become stuck on the muddy ground on building sites especially during adverse weather conditions.

Additionally, such trucks are inefficiently used since it can take considerable time to empty the contents of the mixer drum onto the conveyor belt during which time the truck could be more productively employed in transporting concrete to another area.

The present invention seeks to alleviate the disadvantages associated with the prior art.

The present invention accordingly provides a placement apparatus comprising a feed conveyor, a first placement conveyor and at least a second placement conveyor, said feed conveyor and said first and second placement conveyors being movable between a transport position and an operating position, said feed conveyor capable of conveying material from a point remote from said apparatus and to deposit the material onto the first placement conveyor with the second placement conveyor being adapted to extend outwardly from the first placement conveyor characterised in that cantilever effect of the extended or partially extended placement conveyors are counteracted by force balancing

means which do not utilize supporting booms or structures provided underneath the placement conveyors.

Preferably, the feed conveyor and each placement conveyor includes a discrete conveyor belt circulating about horizontal axes.

The feed conveyor and the placement conveyors are separately rotatable about a vertical axis thereby allowing for orientation in a desired direction.

The height of the placement conveyors is conveniently adjustable by means of at least one hydraulically operated arm.

The force balancing means advantageously includes lengths of high strength rope fixed under tension to the upper surfaces of the placement conveyors so as to counteract during operation, compressive forces acting on underside surfaces of the conveyor thereby creating a "suspension" effect.

The placement apparatus advantageously comprises a plurality of outriggers, each of which is movable between a storage position and a working position and each having

locking means whereby each outrigger may be locked in a desired position.

The force balancing means ideally includes a ballast weight located remote from the delivery end of the placement conveyors along the longitudinal axis of the placement conveyors.

Preferably, the ballast weight is movable along the longitudinal axis away from the delivery end of the placement conveyors so as to create a greater counterbalancing force.

The placement apparatus conveniently includes scrapers which act to remove material from the or each conveyor belt.

The operation of the apparatus may be effected by a control panel mounted on the truck chassis or by remote control.

The apparatus will now be described more particularly with reference to the accompanying drawings which show by example only, one embodiment of an apparatus according to the invention.

In the drawings;

Figure 1 is a side view of the apparatus showing one feed and two placement conveyors in the transportation position;

Figure 2 is a plan view of the apparatus with the conveyors in the operating position;

Figure 3 is a side view of the apparatus in operation;

Figure 4 is a side view of portions of the two placement conveyors and shows how the second placement conveyor extends relative to the first conveyor;

and

Figure 5 is a sectional view of the two placement conveyors along the line IV - IV of Figure 4.

Referring to the drawings, the apparatus according to the invention is indicated generally by the reference numeral 1. The apparatus 1 includes a feed conveyor 2 having a hopper 12 and hydraulically operated arms 25, placement conveyors including a first placement conveyor 3 and a second placement conveyor 4. The second placement conveyor

4 may be extended outwardly from the first placement conveyor 3. The conveyors 2,3,4 are pivotally mounted on a yoke 5 which is itself pivotally mounted on a truck chassis 6. Extending from the yoke 5 opposite the conveyor 3,4 is an extensible ballast weight 10.

The placement conveyors 3, 4 include channels 43, 44 respectively, hydraulically operated lifting arms 25^1, hydraulic motor 45 and a simplex chain 49 which is attached along the length of the second placement conveyor 4 on its underside. A pair of frames 41,42 are mounted, one on each side of the placement conveyors 3, 4. Each frame 41 has a hydraulic motor 45 and a sprocket wheel 55 mounted thereon. A delivery hood 7 is provided at the delivery end of the second placement conveyor 4.

Located within the yoke 5 between the feed conveyor 2 and placement conveyor 3 is a transfer hopper 501, the yoke 5 being rotatable by means of slew rings 502, 503. Outrigger rams 505 are provided to stabilize the apparatus. A transfer hood 100 is located between the two conveyors 3,4. Hose reels 350 which are spring-loaded are affixed to the first placement conveyor 3 and are used to hold the extra length of hydraulic pipe needed when the second placement conveyor 4 is extended in the operating position.

Furthermore, there is an elbow 99 which this extra length of hydraulic pipe contacts so as not to put stress on the hydraulic couplings (not shown) when the second placement conveyor 4 is extended.

The end of the feed conveyor 2 underneath the hopper 12 is provided with a pivotal support frame 13 which contacts the ground to support the feed conveyor 2 during use.

The feed conveyor 2, first placement conveyor 3 and second placement conveyor 4 have conveyor belts 20, 30, 40, respectively. Each conveyor belt, 20,30,40 is supported on a plurality of pairs of rollers 27,27^1, 37,37^1, 47,47^1 respectively. The rollers 27,27^1, 37,37^1, 47,47^1 are mounted on respective frames 22,32,42 and each roller in a pair 27,27^1 or 37,37^1 or 47,47^1 is offset from the other roller of that pair. This arrangement ensures that each conveyor belt 20,30,40 is curved upwardly at its sides thus preventing loss of material from the conveyor belt. The conveyors 2,3,4 are also provided with scrapers (not shown) on their undersides and the scrapers prevent adherence and build-up of material on the conveyor belts 20,30,40.

Each frame 41 mounted between the conveyors 3,4 includes an upper section 403 and a lower section 401. The upper

section 403 is fixedly attached to the first placement conveyor 3. The lower section 401 includes slides 51 which are movable in the channel 44. Each frame 41 is therefore movable with respect to the second placement conveyor 4.

Each frame 42 mounted between the conveyors 3,4 includes an upper section 404 and a lower section 402. The upper section 404 includes slides 52 which are movable in the channel 43. Each frame 42 is therefore movable with respect to the first placement conveyor 3, the lower section 402 being fixedly attached to the second placement conveyor 4. The slides 51, 52 are manufactured from a low friction material such as for example Nylon.

Each frame 41 is powered by a hydraulic motor 45 which is mounted on the frame 41. The frame 41 also has a sprocket wheel 55 mounted thereon and the teeth of the sprocket wheel 55 engage in the simplex chain 49.

The first placement conveyor 3 is connected at one end thereof to a yoke 5 which is mounted on the slew ring 503. The feed conveyor 2 is attached to a sub-yoke 201 which in turn is arranged for rotation on the slew ring 502, the slew ring 502 being mounted on the yoke 5. Independent rotation of the feed conveyor 2 and the first and second

placement conveyors 3,4 is possible since they are mounted on respective slew rings, 502 and 503 which can be rotated by hydraulic motors 504 and 506.

Pairs of high tensile strength steel ropes 380,480 are provided on the first placement conveyor 3 and second placement conveyor 4, respectively. The ropes 380,480 are kept under tension by screw-threaded members 381,481 which are retained in brackets 382,482 at the proximal ends of the conveyors 3 and 4 with final mountings located at the distal ends of the conveyors. On the conveyor 3, the bracket 382 is spaced above the surface of the conveyor 3 and the wire 380 slopes downwardly to the distal end of the conveyor. On the conveyor 4 a bridging member 483 is located midway between the distal and proximal ends of the conveyor 4 and the rope 481 slopes downwardly from the bridging member to each end of the conveyor 4. In this way, a "suspension" effect is created to support the conveyors 3,4. The ballast weight 10 which is employed to achieve balance of mechanical forces may be extended by an appropriate amount using a hydraulic ram 101 so as to balance the cantilever arrangement of the placement conveyors 3,4.

Referring in particular to Figures 2 and 3, use of the apparatus 1 for placement of concrete mixture will be described.

The outrigger rams 505 are extended laterally from the storage position in which they are mounted on the truck chassis 6 to the working position in which they are extended vertically and in contact with the ground. The extendable arms of the outrigger rams can be locked in their laterally extended position by means of spring-loaded catches (not shown).

The first and second placement conveyors 3, 4 are manoeuvred into the operating position by turning the slew ring 503 through the desired angle by a hydraulic motor 506 (a rotation angle of 180^{0} is shown in the drawings) thereby turning the yoke 5 and placement conveyors 3, 4 through the same angle. The placement conveyors 2,3,4 are adjusted to the desired heights by means of the hydraulic arms 25, 25^{1}. The feed conveyor 2 is also turned through an appropriate angle by means of the slewing ring 504 and a hydraulic motor 506.

In order to extend the second placement conveyor 4 to a desired distance, the hydraulic motor 45 is energised and

the sprocket wheel 55 engages chain 49 to move the conveyor 4. As the sprocket wheel 55 rotates and the teeth thereon engage the simplex chain 49, the slides 51 mounted on the frame 41 move in the channel 44 of the second placement conveyor 4. Since the upper section 403 of the frame 41 is fixedly attached to the first placement conveyor 3, the second placement conveyor 4 therefore moves with respect to the first placement conveyor 3. As the second placement conveyor 4 is extended, the slides 52 move in the channel 43 of the first placement conveyor 3.

The sprocket wheel 55 continues to move the conveyor 4 until the frame 42 contacts a stop adjacent the frame 41 and the conveyor 4 is thereby prevented from further extension. The second placement conveyor 4 may be extended to any distance between the fully retracted and fully extended positions.

The extensible ballast weight 10 may be moved relative to the chassis by means of hydraulic ram 101 in order to achieve a balancing of mechanical forces. Alternatively, the ballast weight 10 may be left fully extended during the entire operating process.

A conventional concrete delivery truck having a drum for containing pre-mixed concrete is reversed towards the end 250 of the feed conveyor 2. The apparatus 1 may be positioned on or adjacent even terrain so that the concrete delivery truck does not to travel on bumpy ground. Concrete is transferred from the mixer drum of the delivery truck to the conveyor belt 2 and spillage is reduced or prevented by the hopper 12. The concrete travels on the feed conveyor 2 to the end 251 and into the transfer hopper 501. Concrete is then transferred to the first placement conveyor 3 and is directed onto the second placement conveyor 4 by means of the transfer hood 100. The concrete is then dropped from the conveyor 4 and the flow of concrete is directed to the required location by the delivery hood 7. A chute (not shown) may be fitted over the hood 7 so as to guide the flow of cement more precisely to a desired site. Use of such a chute helps prevent segregation of the concrete as it falls from a height.

In order to retract the second placement conveyor 4, the drive motor 45 is again energised and the sprocket wheel 55 again rotates with respect to the chain 49 but in the opposite direction. The slides 52 move in the channel 43 and the slides 51 move in the channel 44, the frame 42 thereby returning to its initial position with the second

placement conveyor 4 fully retracted. The conveyors 2, 3 and 4 are then manoeuvred into the transport position as shown in Figure 1 by the hydraulic rams 25 and 25^1 respectively and slewing rings 502 and 503 respectively.

CLAIMS:

1. A placement apparatus comprising a feed conveyor, a first placement conveyor and at least a second placement conveyor, said feed conveyor and said first and second placement conveyors being movable between a transport position and an operating position, said feed conveyor capable of conveying material from a point remote from said apparatus and to deposit the material onto the first placement conveyor with the second placement conveyor being adapted to extend outwardly from the first placement conveyor characterised in that cantilever effect of the extended or partially extended placement conveyors are counteracted by force balancing means which do not utilize supporting booms or structures provided underneath the placement conveyors.

2. A placement apparatus as claimed in claim 1 in which the feed conveyor and each placement conveyor includes a discrete conveyor belt circulating about horizontal axes.

3. A placement apparatus as claimed in claim 1 or claim 2 in which the feed conveyor and the placement conveyors are separately rotatable about a vertical axis thereby allowing for orientation in a desired direction.

4. A placement apparatus according to any one of the preceding claims in which the height of the placement conveyors is adjustable by means of at least one hydraulically operated arm.

5. A placement apparatus according to any one of the preceding claims in which the force balancing means includes lengths of high strength rope fixed under tension to the upper surfaces of the placement conveyors so as to counteract during operation, compressive forces acting on underside surfaces of the conveyors thereby creating a "suspension" effect.

6. A placement apparatus as claimed in any one of the preceding claims comprising a plurality of outriggers, each of which is movable between a storage position and a working position and each having locking means whereby each outrigger may be locked in a desired position.

7. A placement apparatus as claimed in any one of the preceding claims in which the force balancing means includes a ballast weight located remote from the delivery end of the placement conveyors along the longitudinal axis of the placement conveyors.

8. A placement apparatus as claimed in claim 7 in which the ballast weight is movable along the longitudinal axis away from the delivery end of the placement conveyors so as to create a greater counterbalancing force.

9. A placement apparatus as claimed in any one of the preceding claims including scrapers which act to remove material from the or each conveyor belt.

10. A placement apparatus substantially as herein described with reference to and as shown in the accompanying drawings.

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