Feb. 17, 1953 N. C. JANNSEN 2,628,734

SACK HANDLING DEVICE FOR LIFT TRUCKS

Filed March 1, 1948 3 Sheets-Sheet 1

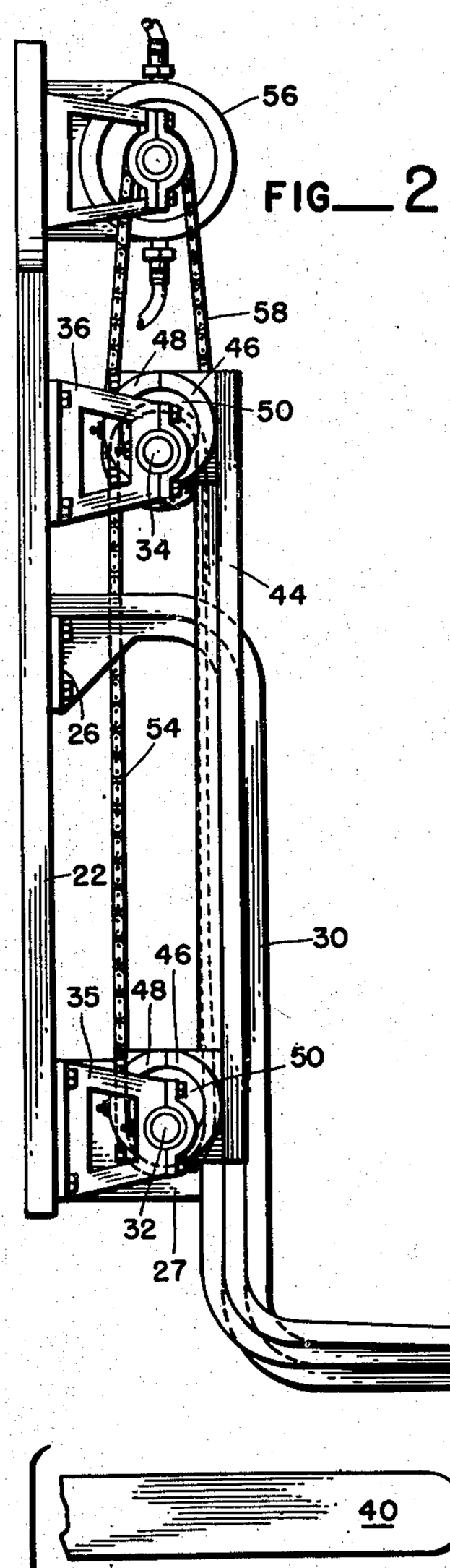

FIG. 2

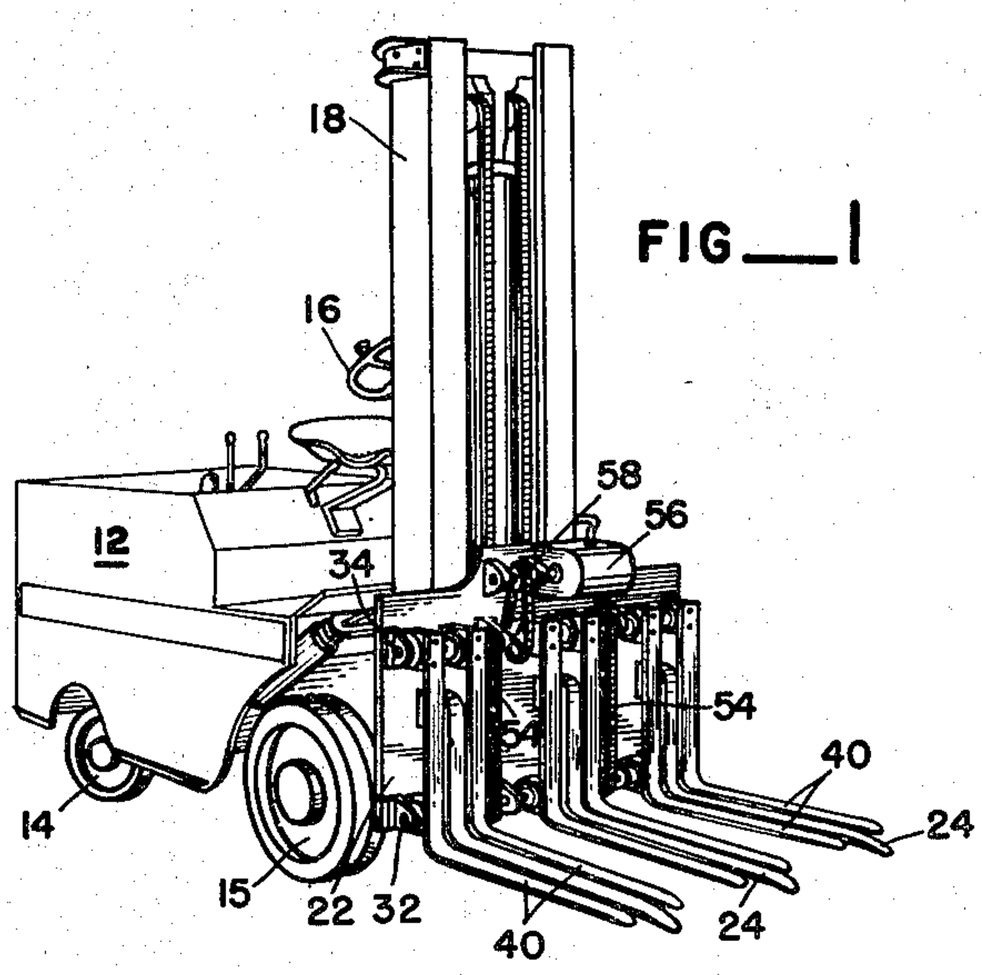

FIG. 1

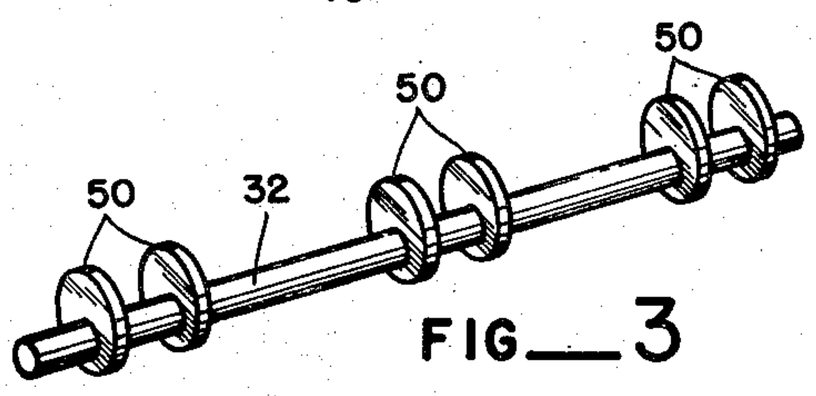

FIG. 3

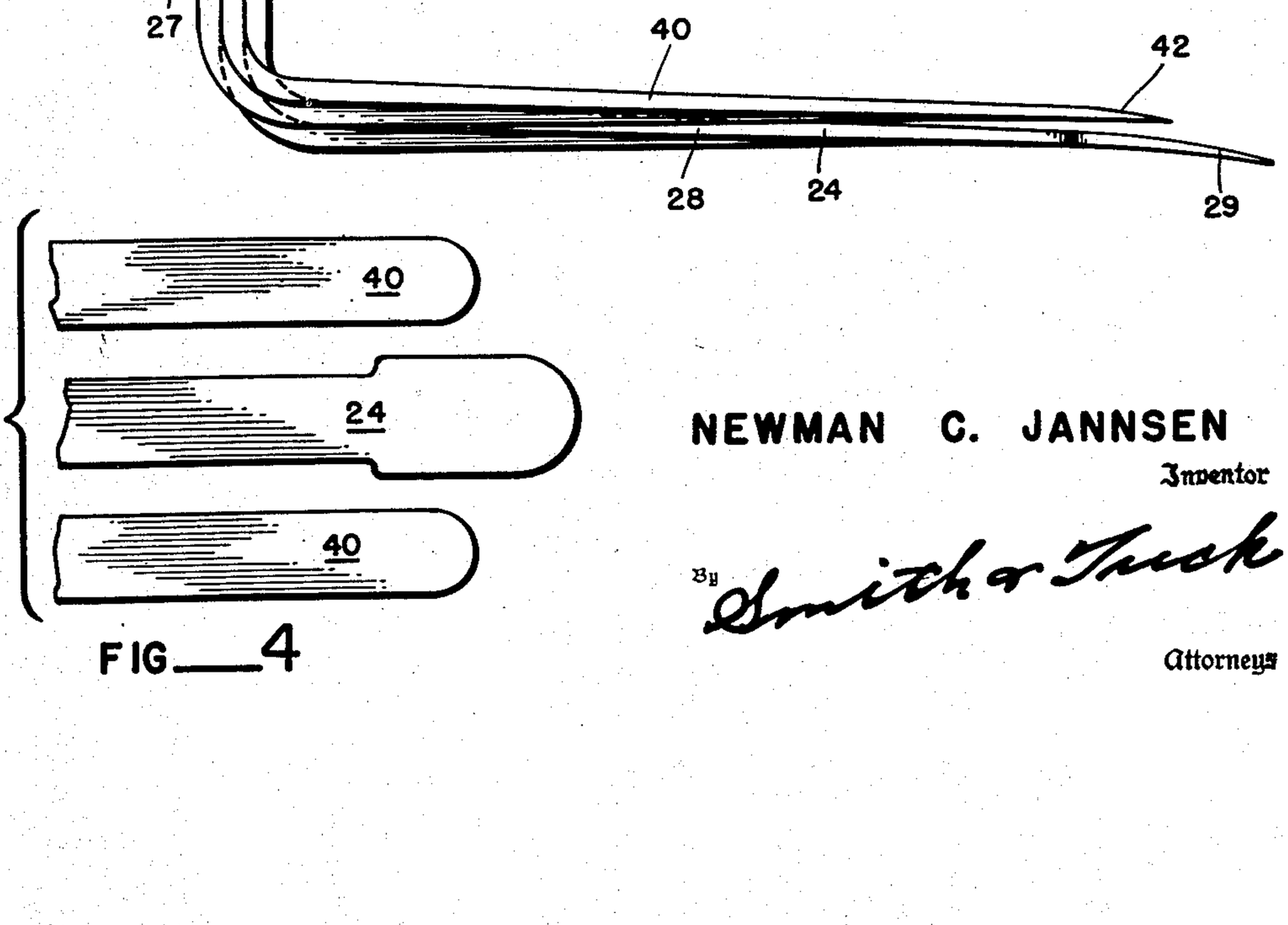

FIG. 4

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SACK HANDLING DEVICE FOR LIFT TRUCKS

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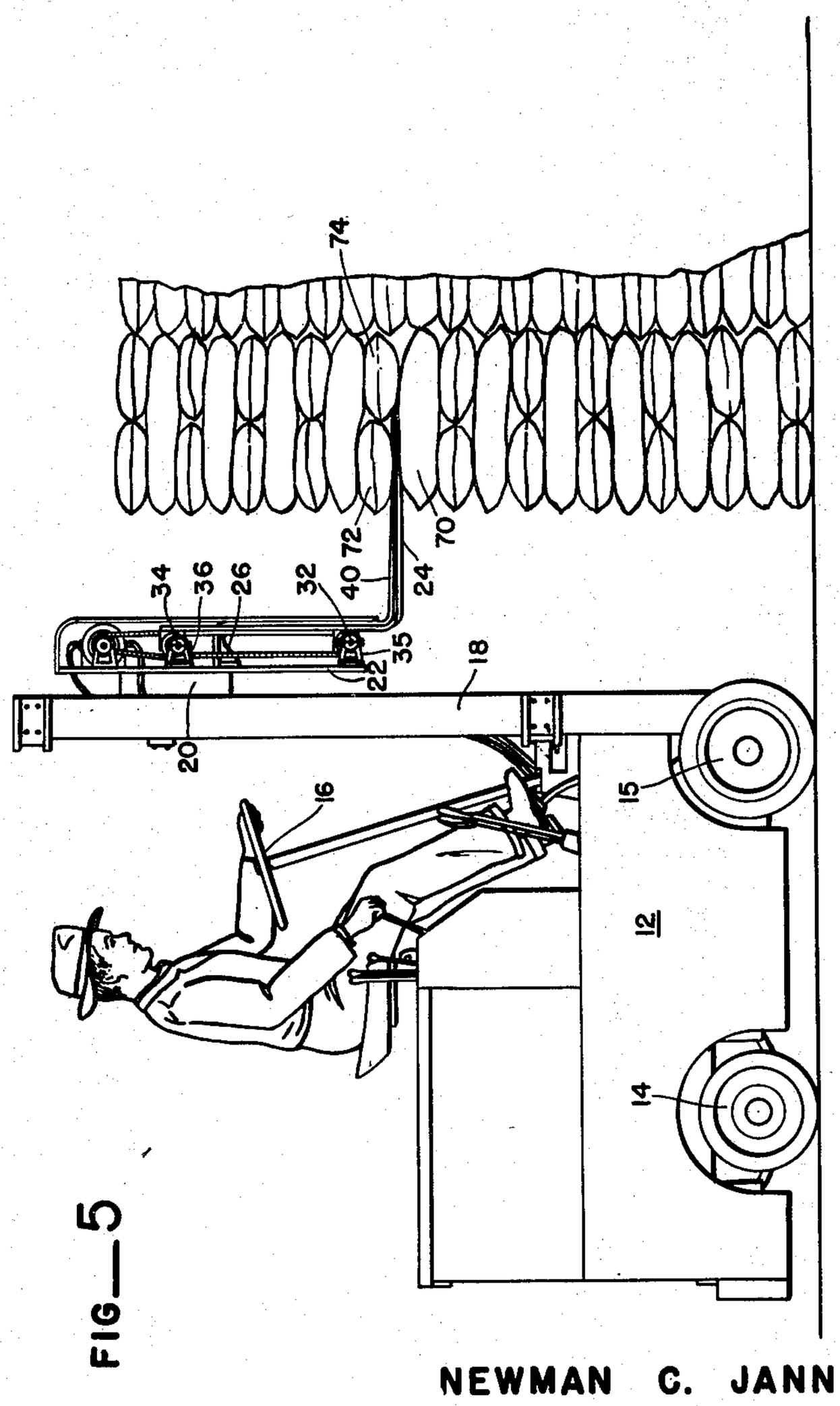

FIG—5

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FIG__6

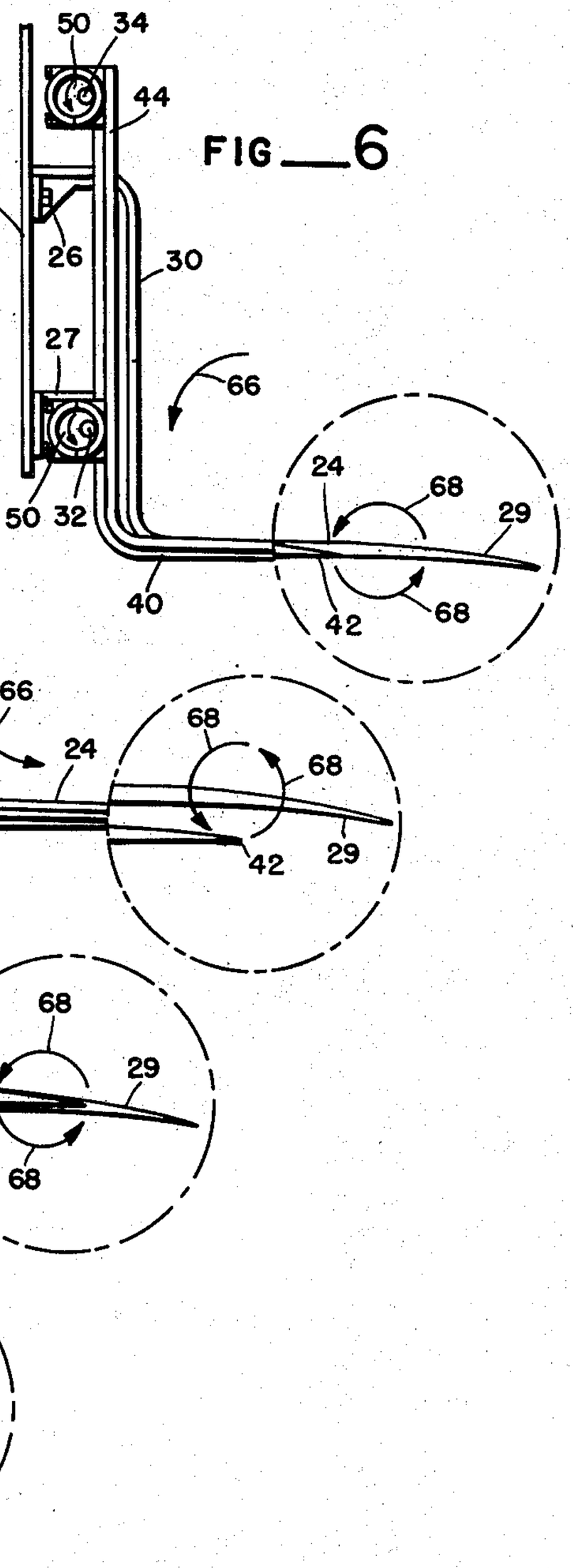

FIG__7

FIG__8

FIG__9

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Patented Feb. 17, 1953

2,628,734

UNITED STATES PATENT OFFICE

2,628,734

SACK HANDLING DEVICE FOR LIFT TRUCKS

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Application March 1, 1948, Serial No. 12,229

3 Claims. (Cl. 214—750)

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This invention relates generally to an attachment for use with the so-called fork-lift industrial trucks and which, because of its particular adaptation to certain work, I prefer to term a sack handling means.

The industrial truck which is characterized by a platform or fork arrangement that is capable of vertical movement and which is normally called a fork-lift truck, is in very general use throughout industrial plants, where it is necessary to lift packaged goods or sacked goods. These items are deposited in one place, picked up and transported to another place, and possibly raised to a higher elevation. This type of truck has been quite fully developed and for uses to which it is adapted it provides a great saving in labor.

In the handling of sacked commodities such as grain, flour, or granular materials of all kinds, none of the present equipment, that has been observed, is capable of picking up such material without constant damage to the sacks to such an extent that their use is prohibitive. The common way of handling sacked materials at this time is to use a raised platform or pallet board, by that is meant a platform of metal or wood, which is raised above the floor by transversely extending cleats so that the platform or fork tines of the industrial truck can be slipped underneath the platform. These platforms are normally loaded by hand with sack commodities and when the pallet, which has been loaded, is transported to its resting place, the sacked material must again be unloaded by hand. This is especially true in loading freight cars and the like. It is also normally true in warehousing where it is not possible to economically use the floor space by merely leaving the pallets loaded. Economical use of the floor space requires that the sacks be stacked many times higher than stacks that can be transported on the pallets.

With my sack handling means I have provided equipment that can be used to pick up sacks one at a time, or a stack of them, from the floor, for instance, and after they have been transported to their resting place, the same equipment will unload them, leaving them piled in a stack. My equipment is also capable of another and very important operation. It is possible with my equipment to reach up into a stack of piled sacks and to insert the lifting platform between the sacks without damaging them and to carry away a portion of a stack, and this portion may in turn be piled again on top of other stacked sacks, all without the use of hand labor. The fact that

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my equipment will work very satisfactorily without the use of the platform or pallet makes it ideal for the loading of box cars with sacked merchandise such as flour or grain and the like, as the device can pick up a portion of a sack, or it may pick up a sack from the floor and transport it to a box car where it can deposit the same at any point desired on the floor of a box car, or it can pile the new load of sacked material on top of sacks that have already been transported and stacked in the box car.

This is a very important use of my equipment as it saves re-shipment, handling and the money invested in the large number of pallets, or platforms, that have been found necessary for economical handling of sacked goods under present conditions.

My invention works on the premise that the loading platform, which is in turn secured to suitable elevating means on industrial tractors, can be inserted under sacks resting on the floor, or between sacks of a stack. This operation is achieved by means which presses upwardly and downwardly so as to displace the sacks and at the same time in the opening thus provided, the platform enters by means of the forward motion of the industrial truck as a whole. There are several ways in which this action can be achieved. Throughout my drawings I have shown, as an example, such a loading platform as being made of a plurality of forked tines. These are grouped in units of a fixed tine with movable tines disposed on each side of the fixed tine. In this manner the up and down action of movable tines is to move the sack above the fixed tine upwardly and to press those below down as the fixed tine is driven forwardly between the sacks by the movement of the industrial truck. It will be apparent, it is believed, that alternate fixed and movable tines, suitably driven at proper speeds, could achieve to a degree the same general operation. Further experiments have been conducted that prove that a single plate which is vibrated at a proper frequency and with sufficient amplitude of vibration can also be passed between sacks of a stack. To apparently a lesser degree of usefulness, a conveyor belt having a narrow entrant sheave can be used under certain conditions.

A good understanding of the action of this equipment can be seen by observing the workings of human hands as used in picking up a sack of material from the floor. It will be observed that it is necessary to move the sack upwardly to a slight degree in order that the fingers of the hands can be slipped in underneath the sack

sufficiently to pick up the material. In a like manner, the mucker in a mine uses what is normally termed a spring point shovel, and he is able to insert that shovel underneath broken material that he is loading into cars by a movement of the handle of the shovel which, in turn, is transmitted to the spring point of the shovel and this oscillation or vibration through a relatively great amplitude enables the mucker to force his shovel underneath a pile of broken material. It is this general principle that I employ in my equipment and for sake of clarity of illustration I have confined my drawings and description to what now appears to be the preferred form to achieve this desired end result.

The principal object of my present invention, therefore, is to provide a sack handling means so constructed that the lifting platform can be inserted between piled sacks by the action of spreading the sacks apart vertically and then advancing the lifting platform into the space thus formed.

A further object of my present invention is to provide a sack handling device which may be secured as an attachment to a commercial type of forked-lift industrial truck.

A further object of my present invention is to provide a lifting platform for use with industrial trucks which is capable of insertion under a sack lying on the floor or can be inserted between the sacks of a pile.

A further object of my invention is to provide a lifting platform for the handling of sacked material which is characterized by having a lifting place that is substantially fixed and to have means for raising and depressing sacked materials away from that plane so that the lifting platform itself can be advanced under the sacks to be lifted.

A further object of my invention is to provide a lifting platform disposed for advancement under stacked sacked material and for which a passageway is provided for the advancement of the platform by alternate sequence of lifting force applied to the sack to be lifted through a series of lifting efforts as the platform is advanced under the sacks.

A further object of my invention is to provide a method of handling sacked materials whereby the sacks are lifted a small amount by a series of lifting efforts as the lifting platform is advanced under the sacks.

A further object of my invention is to provide a method of handling stacked sacked materials whereby the upper sack is pressed upwardly and the lower sack pressed downwardly by a sequence of rapidly applied efforts as the lifting platform is advanced between the sacks into the opening thus provided.

Further objects, advantages and capabilities will be apparent from the description and disclosure in the drawings, or may be comprehended or are inherent in the device.

In the drawings:

Fig. 1 is a perspective view showing one form of embodiment of my invention as applied to an industrial lift truck.

Fig. 2 is a side elevational view of my device in the form as shown in Fig. 1.

Fig. 3 is a perspective view showing the arrangement of the eccentrices or cams of one of the operating shafts for the equipment of Figs. 1 and 2.

Fig. 4 is a bracketed view showing in enlarged scale the tips of one set of companion fork tines.

Fig. 5 is a side elevation of an industrial truck with my equipment applied thereto and showing one form of operation to which my equipment is well adapted.

Figs. 6, 7, 8 and 9 are fragmentary side elevational views, substantially diagrammatic in form and with the ends of the tines shown in each case on an enlarged scale, the enlarged portions being enclosed within circles of dash-and-dot lines.

Referring more particularly to the disclosure in the drawings, I have shown throughout one form of embodiment of my invention as previously pointed out, there are several forms of structure that will achieve my end result and, while I have elected to show a particular type of construction, I do not wish to be limited to this exact form.

Referring to the drawings, throughout which like reference characters indicate like parts, the numeral 12 indicates generally an industrial truck of the type to which my equipment is adaptable. Such a truck is normally constructed with pairs of rear wheels as 14 and front wheels as 15 adapted to be steered by conventional steering wheel 16. These trucks are variously powered usually by electric motors energized by batteries. In some instances where conditions are suitable gasoline motors are used. The trucks are characterized by considerable weight, so that a vertical standard 18 may be employed and a travelling carriage is mounted on this standard, as I have illustrated in Fig. 5. Normally, in use, a plurality of fixed fork tines is employed. Sometimes, however, a platform is formed of steel plate so that in effect a single wide tine is provided. In ordinary operation, the vertical placement of this carriage is fully under the control of the operator and the loads are picked up and transported and re-deposited at any elevation within the range of standard 18.

With my present sack handling device, the functioning of the industrial truck is as outlined, it being understood that my equipment in no way modifies the normal function and use of the truck except that it greatly increases its utility.

The equipment making up my device is preferably mounted upon a backing plate 22 which is fixedly secured to the vertically movable carriage 20 of standard 18. Upon plate 22 I mount fixedly the fixed tines 24 of my present fork arrangement by means of upper and lower brackets 26 and 27, respectively, as will probably be best observed in Fig. 2. When so constructed the tine consists of the horizontal portion 28, the tip portion 29 and the vertical back portion 30. It is to be noted that there is preferably a slight downward dip to the extreme point 29 of the tine.

Disposed in spaced parallel relationship transversely of plate 22, are two cam or eccentric shafts 32 and 34. These shafts are journaled in suitable bearings outwardly extending from the back plate 22. These bearings are referred to in Fig. 2 by reference numerals 35 and 36 respectively.

Complementary to the fixed tine 24 is one, or as I have illustrated, two mating movable tines. These tines as 40 have the point portions 42, and the vertical back portions 44. Secured to the back portions 44 of the movable tines are eccentric collars or seats, one portion as 46 being fixedly secured in each case to portion 44 of the tine, and suitable caps as 48 co-act with bearing portions 46 so as to fully enclose the eccentrics 50.

This enclosure provides a running fit so that, as eccentrics **50** are driven by the rotation of shaft **32** and **34** to which they are fixedly secured, they compel a corresponding movement in the eccentric enclosures and, in turn, this movement is transmitted to tine **40** through the back portion **44**.

As will be observed in Fig. 2 I employ two shafts, a lower shaft **32** and an upper shaft **34** and connect these two shafts by suitable means which will insure that they turn accurately in step and at the same speed. In the drawings, I show this as accomplished by the roller chains **54** which operate over suitable sprockets, each having an equal number of teeth and being secured to the upper shaft **34** and the lower shaft **32**.

Suitable drive means is provided to drive shafts **32** and **34**. One convenient means of achieving this which permits of a nicety of control is to employ a fluid motor at **56**, which is suitably connected in this instance to the upper shaft **34** and by chain **58**. Through the use of suitable sprockets one driven by motor **56** and the other fixedly secured to shaft **34**, any desired speed ratio can be achieved. It will be apparent that an electric motor may be substituted for fluid motor **56**, or actually in a full mechanical drive unit as where the truck itself is driven by a gasoline motor, a mechanical drive could be used, deriving its power from the power of the motor driving the truck.

It is desired to point out at this time that I find it convenient to use a plurality of groups of tines. Thus I may employ two or more of the fixed tines **24** and one or more of the movable tines **40** in close spaced position with each of the fixed tines. In Fig. 1, I have shown three such groups, each composed of one fixed tine and two movable tines. It can well be understood that for certain uses it might be necessary to have the tines in close abutting relationship rather than spaced as I have shown in Fig. 1. It is to be noted in this arrangement that eccentrics **50** on the upper and lower shafts must be employed in the same angular relationship otherwise binding would occur due to the fact that the raceways for the eccentrics are fixed in their centers.

Method of operation

The method of operating a typical embodiment of my present invention will probably best be understood from a study of Fig. 5 in conjunction with Figs. 6, 7, 8 and 9. In Fig. 6 it is to be noted that eccentrics **50** are at the mid-point of their travel on a vertical plane and at the extreme left limit of their horizontal travel. Therefore, fork members **40** are retracted fully to the left as viewed in Fig. 6 and are on the same plane or level as the fixed tines **24**. Under such conditions, my time arrangement becomes, in effect, one straight plane much as though it were formed of a sheet of steel for instance. In this condition it could handle pallets, for instance, in the normal manner or be used to move about cases of merchandise and other items of that order. It would, however, have no advantage over the conventional form of tines for the purpose of lifting sacks. In this view though a continuation of travel shows the movable forks following the direction of arrow **66** and the orbit of tip **42** of the movable fork **40** is shown by the arrows **68**.

In Fig. 7 the downward movement of tine **40** has reached its maximum and the position of

the eccentrics shows the horizontal movement in its mid-position or in other words the extreme tip **42** of tine **40** is directly below the center of the circle described by the tip, and as indicated by the arrow **68**. In this operation, referring back to Fig. 6, the effect will be to press downwardly on sack **70**, in the area immediately adjacent to the fixed tine **24**, with which the movable tine is a companion. This will permit advancement or forward movement of the fixed tine **24** under urgence of the motion of the truck **12**.

Fig. 8 shows a continuation of the movement of the various parts in the direction of the arrows, with the eccentrics shown in their extreme right position with the two forks again aligned in the same horizontal plane.

In Fig. 9 there is shown just the opposite of Fig. 7, in that the eccentrics are so positioned that the movable tine **40** is in the extreme upper extent to its travel. The end of the tine **42** is again directly above, in this case, the center of its orbit shown by arrows **68**.

Referring now to Fig. 5, it will be understood that the action will be to raise the under surface of sacks **72** and **74** in the area immediately adjacent to the fixed tine **24**. This will provide a relief or passage so that the fixed tine **24** can again be advanced underneath sacks **72** and **74** and above sack **70**.

It must be understood that there is a certain amount of give, or resiliency, or possible displacement of the sacks, due to the fact that they contain powdered or granular materials and that, as the movable tines are being driven at considerable speed, the effect in use is a continuous forward movement of the fixed tines with the relief or passage-way being provided by the movable tines moving the materials away, above or below the plane of the fixed tines. The frequency of this operation is relatively immaterial. However, the frequency must be matched with the amplitude of movement of the movable tines. In the drawing I have shown considerable movement of the movable tines. However, if a vibrating arrangement were to be employed with the tines, it will naturally follow that the amplitude or extent of the up and down movement would not of necessity be very great.

It therefore follows that, if vibration of sufficient frequency should be arranged for, the tines would need but very little vertical movement. The logical conclusion from such reasoning is, and experiments have proven it to be true, that a single plate, which is vibrated with sufficient frequency, will first move the upper material away from the plate and the next cycle of the vibration will press down on the sacked material below the plate so that again the plate in this instance can be passed between the tiers of sacked material, as in a form having less amplitude and greater frequency the same cycle of operation takes place as takes place with the plurality of tines. In other words, we have the movement of the materials above in an upwardly direction from the plane of the lifting surface, followed in the next cycle by a movement of the materials away from and below the plane of the lifting surface.

The alternate arrangement of tines as indicated throughout my present showing has a further desirable effect, and an effect that could be achieved if the plate just referred to were mechanically vibrated, but which would be lost no doubt in case of higher-speed vibration, such as would be obtained from electric vibrators. This

second capacity of my sack handling means is that of "walking" a load onto the lifting platform and then "walking" it off the platform. To understand the "walking" of cargo, as used in this sense, reference is again made to Figs. 6, 7, 8 and 9. Let it be assumed that a sack is partially on, or resting on the tip portions of tines **24** and **40** as viewed in Fig. 6. In Fig. 7 tine **40** moves downwardly so that it disengages the load, which in turn must be fully carried by tines **24**. As the cycle is completed however, in Fig. 8 we have tine **40** re-engaging the load and in Fig. 9 we have tine **40** lifting the load again. Progressing onwardly from Fig. 9 we come back again to Fig. 6, in which it will be noted that actually tine **40** has raised upwardly and then to left as viewed. Consequently, in each cycle of operation the tines **40** will lift the load, move it toward the carrying strut and lower it again onto the fixed tines **24**. As this operation is at the same speed as previously described and at considerable speed the effect is to simply "walk" the material onto the lifting platform until it comes up against the back portion **30** and **44** of tines **24** and **40**. When the material has been carried to its resting place, a reversal of the drive through motor **56** will have the same corresponding action of the fixed and movable tines which will be in a reverse direction. In other words, tines **40** will pick up the load and move it a short way toward the end of the tines, lay it down again on the fixed tines **24** and repeat that operation as many times as is required to "walk" the load entirely off the tines. This feature is considered a very important one because without this operation, it would still be impossible to get the full measure of value from my equipment.

With my equipment then I believe it will be clear that as the operator approaches a stack of sacks, he has the means under his control to insert the lifting platform under or between sacks as desired, and then to "walk" that load onto the carrying platform. He transports the load to its resting place then reverses the drive and the load is "walked" off of the carrying platform and deposited at will.

It is believed that it will be clearly apparent from the above description and the disclosure in the drawings that the invention comprehends a novel construction of sack handling means.

Having thus disclosed the invention, I claim:

1. A sack handling device for use with an industrial truck of the lift or fork type, consisting of: a backing plate adapted to be secured in a vertical position to the elevator carriage of an industrial truck; a plurality of fixed fork tines secured to said backing plate and extending outwardly therefrom to form a substantially level load carrying platform; a plurality of movable fork tines disposed between and adjacent said fixed tines; two shafts disposed in spaced parallel

relationship one above the other adapted to position said movable tines; bearings secured to said backing plate adapted to revolvably support said shafts; reversible drive means for said shafts; eccentrics secured to said shafts all in the same angular relationship and adapted to operatively engage said movable tines and move them alternately above and below the plane of the fixed tines and to move them back and forth longitudinally of said fixed tines.

2. A sack handling device for use with an industrial truck of the lift or fork type, consisting of: a supporting frame adapted to be secured to the elevator carriage of an industrial truck; a plurality of fixed fork tines secured to said frame and extending outwardly therefrom to form a substantially level load carrying platform; a plurality of movable fork tines disposed between and adjacent said fixed tines; a shaft adapted to position said movable tines; bearings secured to said frame adapted to revolvably support said shaft; reversible drive means for said shaft; cams, secured to said shaft and adapted to operatively engage said movable tines and move them alternately above and below the plane of the fixed tines and to move them back and forth longitudinally of said fixed tines.

3. A sack handling device for use with an industrial truck of the lift or fork type, consisting of: a backing plate adapted to be secured in a vertical position to the elevator carriage of an industrial truck; a plurality of fixed fork tines secured to said backing plate and extending outwardly therefrom to form a substantially level load carrying platform; a plurality of movable fork tines disposed between and adjacent said fixed tines; a shaft adapted to position said movable tines; bearings secured to said backing plate adapted to revolvably support said shaft; reversible drive means for said shaft; eccentrics secured to said shaft and adapted to operatively engage said movable tines and move them alternately above and below the plane of the fixed tines and to move them back and forth longitudinally of said fixed tines.

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