July 25, 1967 J. M. LEACH 3,332,360

POWER AND FREE CONVEYORS

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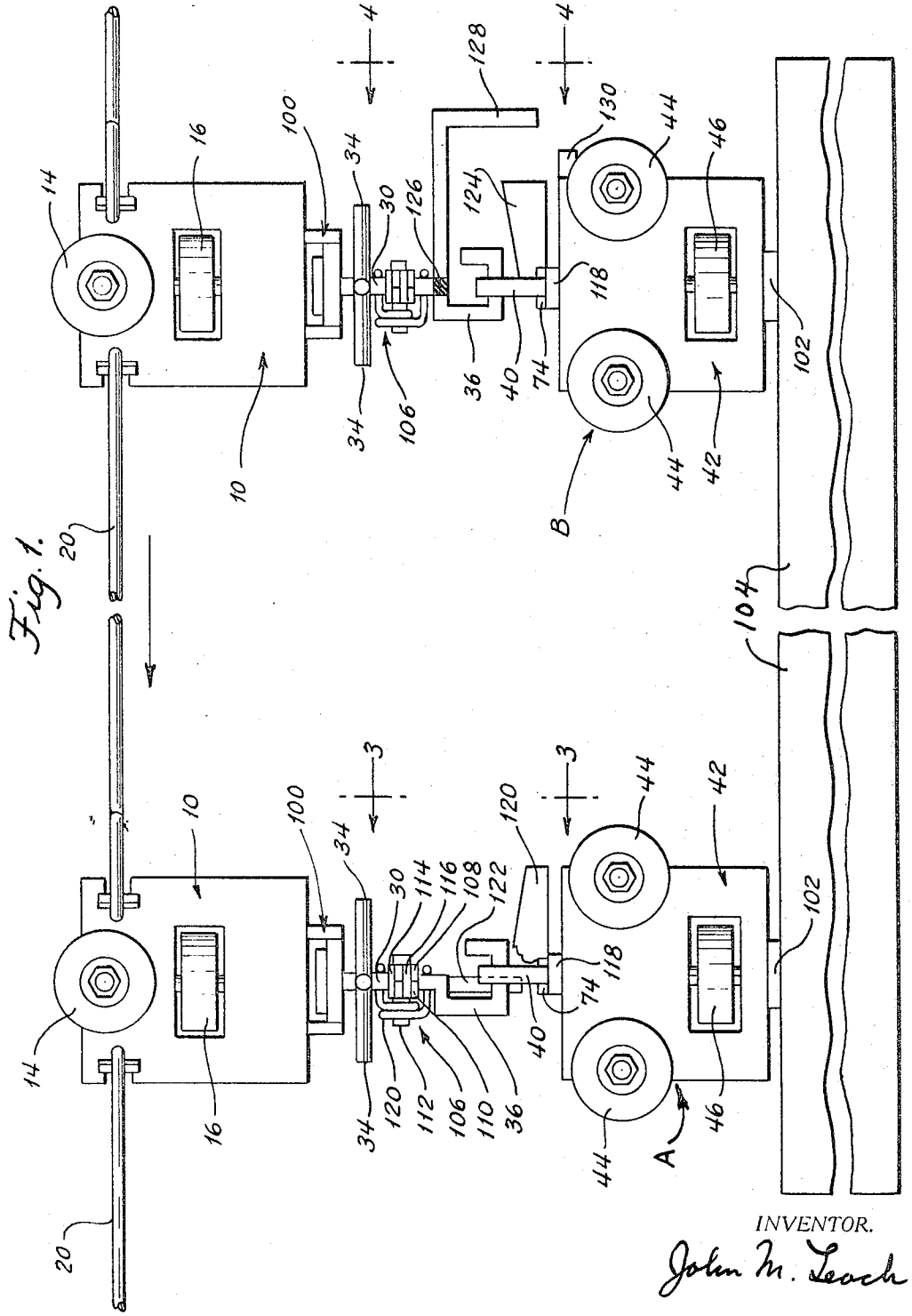


Fig. 1.

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Fig. 3.

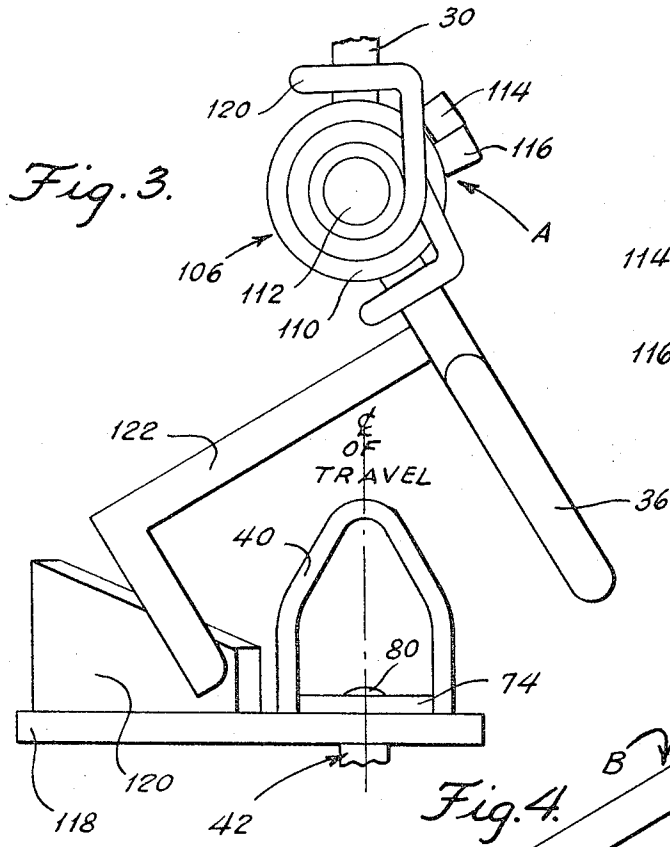


Fig. 2.

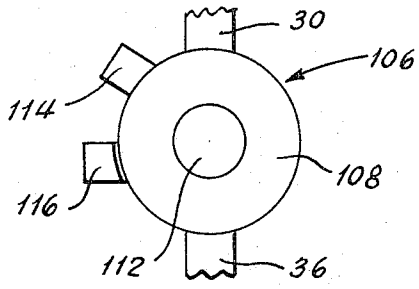
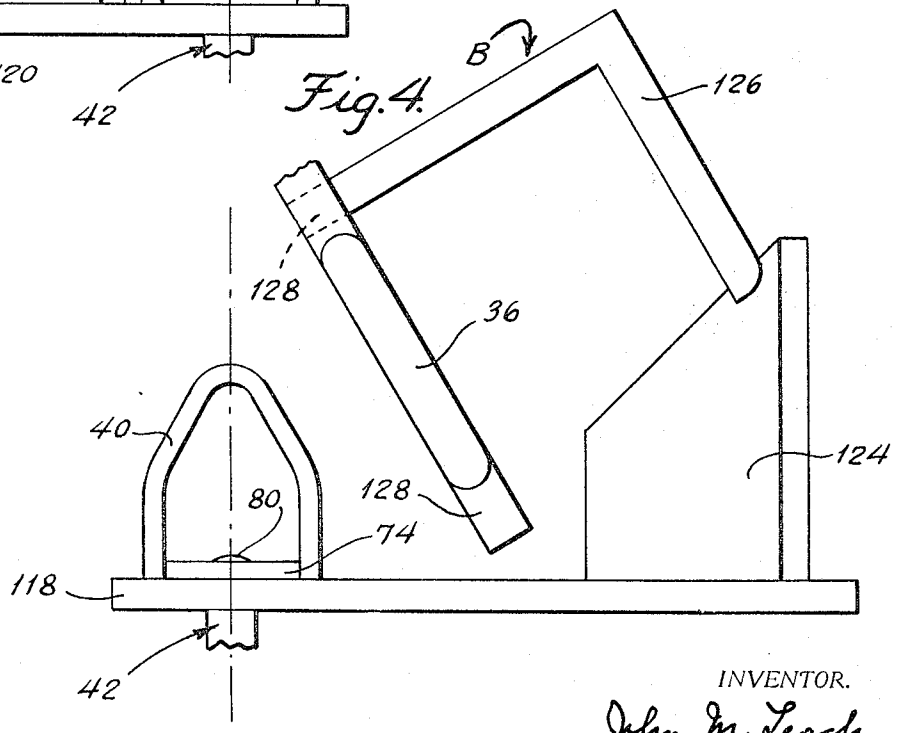


Fig. 4.



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POWER AND FREE CONVEYORS

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ABSTRACT OF THE DISCLOSURE

This invention relates to power and free conveyors in which the free trolleys are each carried by a powered trolley and in which two free trolleys are connected for operation together so as to support a common load. Means are provided whereby two connected free trolleys can be picked up at selected points by the powered trolleys and also released from the powered trolleys at selected points.

The present invention relates to conveyors. More particularly, it relates to conveyors of the overhead type commonly referred to as "power and free."

This application is in part a continuation of application Ser. No. 449,516, filed Apr. 20, 1965. All of the objects and advantages of the invention set forth in the aforementioned application are also objects and advantages of the present invention. Additional objects and advantages of the present invention will be hereinafter set forth.

It is an object of the present invention to provide multiple free trolleys supporting a common load which can be completely automatically connected to or disconnected from supporting or powered trolleys either at will or in accordance with some preselected schedule or plan.

Other objects and advantages of the present invention will become obvious to those skilled in the art upon recourse to the following disclosure of the present invention including the drawings, in which:

FIG. 1 is a side view of two powered trolleys carrying two free or supported trolleys which in turn between them support a common load;

FIG. 2 is a fragmentary detailed view of a support for the hook on each powered trolley;

FIG. 3 is a fragmentary detailed view of the cooperating hook and hanger arrangement existing on a fore or leading power and free trolley assemblage, and

FIG. 4 is a fragmentary detailed view of the cooperating hook and hanger arrangement existing on an aft or following power and free trolley assemblage.

In all of the views all track as well as switch or diverter or connector structure has been omitted in order to more clearly describe the structure of the present invention, but it is to be understood that the track, side track, diverter and connector structures disclosed in the previous application are likewise used with the powered and free trolleys of the present invention.

Referring to FIG. 1, the powered trolleys **10**, each having vertical wheels **14**, horizontal wheel **16** and connected by a linkage **20** as in the previous application are shown. Each trolley **10** has a rotatable support **100** for the hook **36** and rotation arms **34**. Each hook **36** connects into a hanger **40** which is in turn connected to a free or supported trolley **42** by a swivel **74**. Each free trolley has vertical wheels **44** and at least one horizontal wheel **46**. Each free trolley **42** is connected by a suitable swivel support **102** to any desired type of load carrier or rack **104**.

The load carrier **104** can take the form of a bin, cargo box, tote box, tank, parts cabinet, parts rack, hanger, or any other form of load carrier desired. It can be carried by free trolleys connected to powered trolleys which are in immediate sequence or separated by one or more intervening trolleys which do not carry free trolleys.

It can be seen from the structure thus far described that the hooks **36** can be rotated into position as shown in FIG. 1 so that a diverter **54** (not shown) can disconnect each hook **36** from its respective hanger **40** exactly as described in the previous application, or rotated 180 degrees from the position shown in FIG. 1 so that each hanger **40** can be placed back onto its respective hook **36** by a connector **82** (not shown). It will be necessary to make both the diverters **54** and the connectors **82** somewhat longer than those shown in the previous application in order for them to accommodate two free trolleys instead of just one each. It may also be necessary when the distance between two carrying free trolleys is large to place a horizontal dwell at the point **82** in the diverter between the up and down runs to avoid making the up runs too long to be practical.

With the structure thus far described it can be seen that it would not be possible to merely position two load carrying or empty free trolleys on a connector to be picked up by the next two powered trolleys which pass by because the fore or leading one of the two powered trolleys would hook into the hanger of the aft or trailing free trolley and thus carry the two free trolleys connected together by the load carrier **104** with the fore or leading free trolley hanging down and not connected to any powered trolley.

In order to avoid such an occurrence it would be necessary to position the load carrying or empty free trolleys upon the connector just as the powered trolleys which are to pick them up for carriage approach and so that the fore free trolley is just in front of the fore powered trolley and the aft free trolley is in between the two powered trolleys. This would require either time-consuming care on the part of an operator or expensive and complicated control mechanism.

In order to simplify the connecting operation, the following features are utilized in the present invention. Each hook **36** is connected from above to the swivel support **100** by a spring-biased hinge **106** as shown in detail in FIGS. 2 and 3.

Each hinge **106** comprises a disc **108** connected to the rotation shaft **30** and a concentric disc **110** connected to the hook **36**. A double headed pin **112** extends through concentric openings in the two discs to hold them in adjacent positions and capable of relative rotation about the pin **112**. A lug **114** is suitably attached to the periphery of disc **108** and a lug **116** is similarly attached to disc **110** and the two lugs overlap as shown so as to limit relative rotation of the discs when the two lugs are brought into contact as shown in FIG. 3.

A suitable spring clip such as that shown at **120** is snapped over the pin **112** and around the shaft **30** and the shank of the hook **36** so as to lightly urge rotation of the discs into position to hold the lugs **114** and **116** together as shown in FIG. 3.

Each of the free trolleys **42** has a plate **118** suitably connected to it and positioned between the trolley plate and the swivel connection **74** with the hanger **40**. It will be necessary to suitably incerase the distance between the track supports, etc. to accommodate the plates **118**.

With the conveyor moving in the direction shown by the arrow in FIG. 1, the fore free trolley is shown at A and the aft free trolley at B.

The plate **118** of fore trolley A carries a cam **120** which cooperates with a follower arm **122** connected to the hook **36** as shown in FIGS. 1 and 3.

The plate **118** of aft trolley B carries a cam **124** which cooperates with a follower arm **126** connected to the hook **36** of the aft trolley as shown in FIGS. 1 and 4. The follower arm **126** has been cut off in FIG. 1 as shown in order to better illustrate other parts. The aft trolley

B hook **36** also carries an arm **128** as shown in FIGS. 1 and 4 for a purpose to be described later.

As shown in FIG. 1 the hooks **36** have been rotated by the arms **68** and **70** shown in FIG. 7 of the previous application so that they are in position for release of the free trolleys **42** when the next diverter is reached. The release action in the diverter will be exactly the same as described in the previous application except that two free trolleys will release simultaneously and will be caught and moved ahead until they move down the decline **64** (see FIG. 3 of the previous application) by the arm **128** which is carried by the hook **36** instead of the arm **60** carried by the powered trolley plate **12**. When the arm **128** contacts the trolley plates of the aft free trolley **42** it will be positioned between two lugs **130** (see FIG. 1) which form a bifurcation and prevent the arm **128** from being deflected sidewise and out of contact with the trolley plates when the hook **36** moves out of the hanger **40** which could happen if the lugs **130** were not present because of the force of the spring **120** tending to deflect the hook **36** to one side. When the free trolleys move ahead of the arm **128** down the decline **64** the lugs **130** will release the arm **128** and permit the hook **36** to deflect to the side. The free trolleys move on down the decline to a suitable side or other track.

As the powered trolleys **10** pass the arms **68** and **70** on the diverter (see FIG. 3 of the previous application) the hooks **36** will be rotated 180 degrees from the position shown in FIG. 1 to the position shown in FIGS. 3 and 4. The hooks will also be deflected to one side by the springs **120** as shown.

Under the conditions just described regardless of what time the free trolleys are placed in position upon a connector, they will be properly picked up by the next set of fore and aft powered trolleys that come along for the following reasons: Let it be assumed that the two free trolleys carrying the load carrier come into position upon the connector **82** just ahead of the next pair of fore and aft powered trolleys. The fore trolley will pass over the aft free trolley without touching it because the deflected hook **36** will pass to the right of the hanger **40** and the follower arm **122** will pass to the left of hanger **40** as viewed in FIG. 4. Just before the fore and aft powered trolleys reach their respective fore and aft free trolleys the follower arm **122** will contact the cam **120** and start moving the connected hook **36** into line with its hanger **40**, and the follower arm **126** of the aft powered trolley will contact the cam **120** and start moving its connected hook into line with its hanger **40** on the aft free trolley. Continued movement of the two powered trolleys will position each of the hooks **36** in its respective hanger **40** on a free trolley which will cause the two free trolleys and the supported load carrier to be moved off of the connector and thus carried along completely supported by the powered trolleys until again removed by a selected diverter as previously explained. To that end, each of the hooks **36** on the powered trolleys so carrying the free trolleys will be rotated 180 degrees by the rotation arms **68A** and **70A** carried by the next operative diverter so as to bring them into the position shown in FIG. 1 which is the diverter or disconnect position of the hooks.

Now let it be assumed that the two free trolleys are positioned onto a connector with the fore free trolley in between a fore and aft moving set of powered trolleys. The hook **36** and connected follower arm **126** of the aft powered trolley B will move or pass to the right of the hanger **40** of the fore free trolley and the two free trolleys will merely remain on the connector until the next pair of fore and aft powered trolleys come along when the connection action will be as above explained because the two free trolleys will then be in the proper position for a normal pick-up.

It will be understood that whereas the load carrier **104** will usually be an element which supports the ultimate load, it can also represent the ultimate load itself where the load is too large to be accommodated on one hook or clamp or other type of hanger.

It is also to be understood that the hooks **36** and hangers **40** can be interchanged in regard to upper or lower relative positions where the nature of the load or other considerations make such an interchange desirable.

It is to be further understood that whereas the free trolleys **42** have been shown as wheeled trolleys, slider shoe or any other desired well known type of free trolley can be used.

It can be seen from the foregoing that the present invention makes it possible to discharge and pick up loads supported by multiple trolleys with the same ease and flexibility as loads supported by single trolleys can be discharged and picked up by the invention disclosed in the above mentioned application.

The foregoing description of what is now considered the preferred physical embodiment of the present invention is to be construed as explanatory only and not limitative as many changes and modifications of the physical structure can be made without departing from the scope and spirit of the invention.

The invention having been described what is claimed is:

1. A conveyor comprising a load carrier, two non-powered, fore and aft trolleys supporting the load carrier, each of said trolleys having a hanger, structure supporting said trolleys for rest or travel in a given direction line, two powered, fore and aft trolleys, a movably supported hook carried by each powered trolley, structure supporting the two powered trolleys for movement above and in substantially the same direction line as the non-powered trolleys, co-operating means effective on the fore powered and fore non-powered trolleys only to move the hook on the fore powered trolley into position to pick up the hanger on the fore non-powered trolley when the fore hook and fore hanger move into proximity to each other, and co-operating means effective on the aft powered and aft non-powered trolleys only to move the hook on the aft powered trolley into position to pick up the hanger on the aft non-powered trolley when the aft hook and aft hanger move into proximity to each other.

2. A conveyor comprising two non-powered, fore and aft trolleys for supporting the load, a hanger on each of said trolleys, structure supporting said trolleys for rest or travel in a given direction line, two powered fore and aft trolleys, a movably supported hook carried by each powered trolley, structure supporting the powered trolleys for movement in substantially the same direction line as the non-powered trolleys, co-operating means effective on the fore powered and fore non-powered trolleys only to move the hook on the fore powered trolley into position to pick up the hanger on the fore non-powered trolley when the fore hook and fore hanger move into proximity to each other, and co-operating means effective on the aft powered and aft non-powered trolleys only to move the hook on the aft powered trolley into position to pick up the hanger on the aft non-powered trolley when the aft hook and aft hanger move into proximity to each other.

3. A conveyor comprising two non-powered fore and aft trolleys for supporting the load, a hanger on each of said trolleys, structure supporting said trolleys for rest or travel in a given direction line, two powered fore and aft trolleys, a movably supported hook carried by each powered trolley, structure supporting the powered trolleys for movement in substantially the same direction line as the non-powered trolleys, co-operating means effective on the fore powered and fore non-powered trolleys to move the hook on the fore powered trolley into position to pick up the hanger on the fore non-powered trolley when the fore hook and fore hanger move into proximity to each other, and co-operating means effective on the aft powered and aft non-powered trolleys to move the hook on

the aft powered trolley into position to pick up the hanger on the aft non-powered trolley when the aft hook and aft hanger came into proximity to each other, said two co-operating means being relatively positioned so that a fore hook can not pick up an aft hanger and an aft hook can not pick up a fore hanger.

4. In a conveyor system a powered trolley, a hinge carried by said trolley, a hook suspended from said hinge with its open section normally extending in the line of travel of the trolley, and a spring operative to deflect the hook to one side of the line of travel of said trolley so as to avoid contact between the hook and any object positioned on the line of travel of said trolley.

5. In a conveyor system a powered trolley, a swivel carried by said trolley, a hinge carried by said swivel, a hook suspended from said hinge with its open section normally extending in the line of travel of the trolley, and a spring operative to deflect the hook to one side of the line of travel of said trolley so as to avoid contact between the hook and any object positioned on the line of travel of said trolley..

6. In a conveyor system a powered trolley, a hinge carried by said trolley, a hook suspended from said hinge with its open section extending forwardly in the line of travel of said trolley, a spring operative to deflect the hook to one side of the line of travel of said trolley so as to avoid contact between the hook and any object positioned on the line of travel of said trolley, and means for deflecting said hook back into the line of travel of said trolley at selected times.

7. In a conveyor system a powered trolley, a track for said powered trolley, a hinger carried by said trolley, a hook suspended from said hinge with its open section normally extending forwardly in the direction of movement of said trolley, means biasing said hook to one side of said direction line of movement of said trolley, a track section extending substantially parallel to said powered trolley track, a non-powered trolley supported by said track section, a hanger carried by said non-powered trolley, the direction of movement of said hook when deflected being such that the hook will miss the hanger, and means for deflecting the hook prior to reaching the hanger so that it will engage the hanger and pick up the non-powered trolley as the powered trolley moves past it.

8. In a conveyor system a powered trolley, a track for said powered trolley, a hinge carried by said trolley, a hook suspended from said hinge with its open section normally extending forwardly in the direction line of movement of said trolley, means biasing said hook to one side of said direction line of movement of said trolley, a track section extending substantially parallel to said powered trolley track, a non-powered trolley supported by said track section, a hanger carried by said non-powered trolley, the direction of movement of said hook when deflected being such that the hook will miss the hanger, and a cam for deflecting the hook prior to reaching the hanger so that it will engage the hanger and pick up the non-powered trolley.

9. A conveyor system as claimed in claim 8 further characterized in that the cam is carried by the non-powered trolley.

10. A conveyor comprising two non-powered fore and aft trolleys for supporting the load, a hanger on each of said trolleys, a track for supporting said trolleys, two powered fore and aft trolleys, a track substantially parallel to the aforementioned track for supporting the powered trolleys, a movably mounted hook carried by each powered trolley, biasing means for deflecting said hooks to one side of their vertical positions so that as deflected they would never contact either of said hangers, a co-operating means effective on the fore powered and fore non-powered trolleys to move the hook on the fore powered trolley into position to pick up the hanger on the fore non-powered trolley when the fore hook and fore hanger move into proximity to each other, and co-operating means effective on the aft powered and aft non-powered trolleys to move the hook on the aft powered trolley into position to pick up the hanger on the aft non-powered trolley when the aft hook and aft hanger come into proximity to each other.

11. A conveyor as claimed in claim 10 further characterized in that the biasing means is a spring on each hook.

12. A conveyor as claimed in claim 10 further characterized in that the movable mount for each hook comprises a hinge.

13. A conveyor as claimed in claim 10 further characterized in that a swivel joint is interposed between each hook mounting and each powered trolley and a swivel joint is interposed between each hanger and each non-powered trolley.

14. A conveyor as claimed in claim 10 further characterized in that each co-operating means comprises a follower arm on the hook and a cam on the respective non-powered trolley.

15. A conveyor as claimed in claim 14 further characterized in that the follower arm and cam associated with the fore trolleys are placed on one side of the adjacent hanger and the follower arm and cam associated with the aft trolleys are placed on the opposite side of their adjacent cam which prevents a fore hook from ever picking up an aft hanger and an aft hook from ever picking up a fore hanger.

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