

United States Patent

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[72] Inventor **Gordon R. Cooper**
Erdington, Birmingham, England
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 [73] Assignee **The Dunlop Company Limited**
London, England
a British Company
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Primary Examiner—Gerald M. Forlenza
Assistant Examiner—Robert J. Spar
Attorney—Stevens, Davis, Miller and Mosher

[54] **STACKING DEVICES**
16 Claims, 4 Drawing Figs.

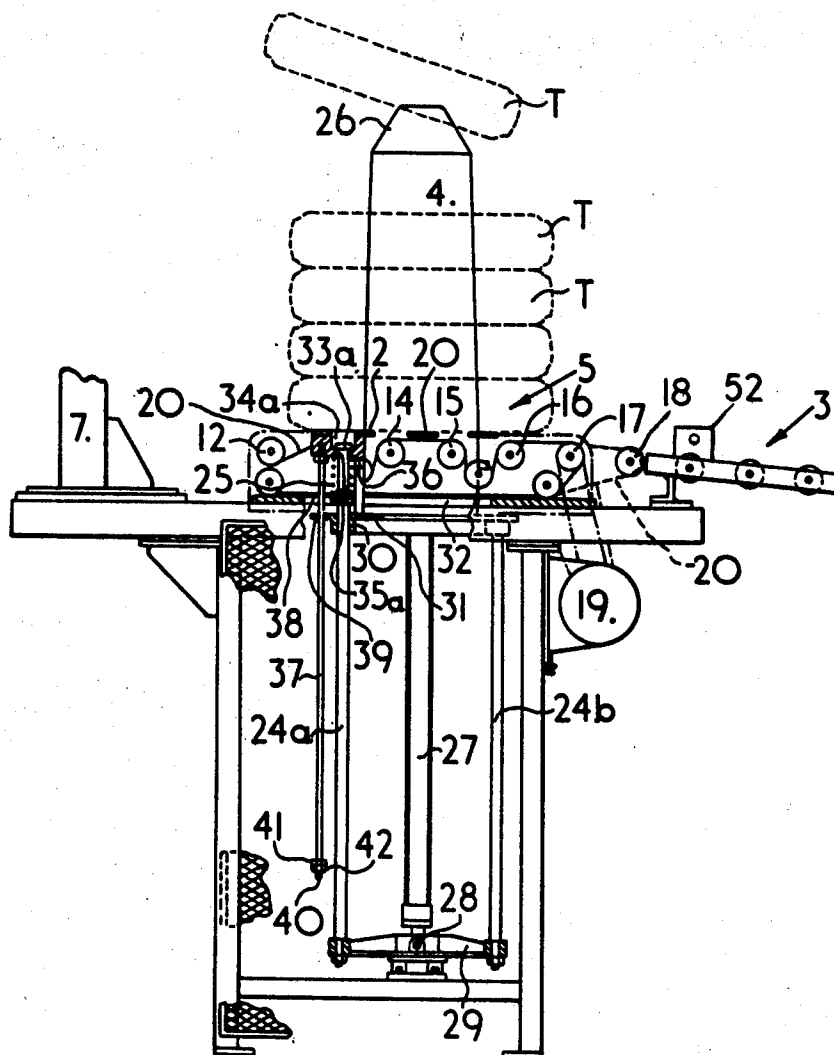
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 [50] Field of Search **214/8,**
8(R), 6(K), 6(H), 6(D), 6(P), 6(S)

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ABSTRACT: A device for stacking articles such as pneumatic tires comprising conveyors for feeding articles to and from a stacking area and a reciprocable member for engagement with the articles to stack them in piles in the stacking area. Means may be provided for detecting when a predetermined number of articles have been stacked or when a pile of given size has been formed, these means actuating the reciprocable member to disengage it from the stacked pile of articles and allow the pile to be moved away from the stacking area.



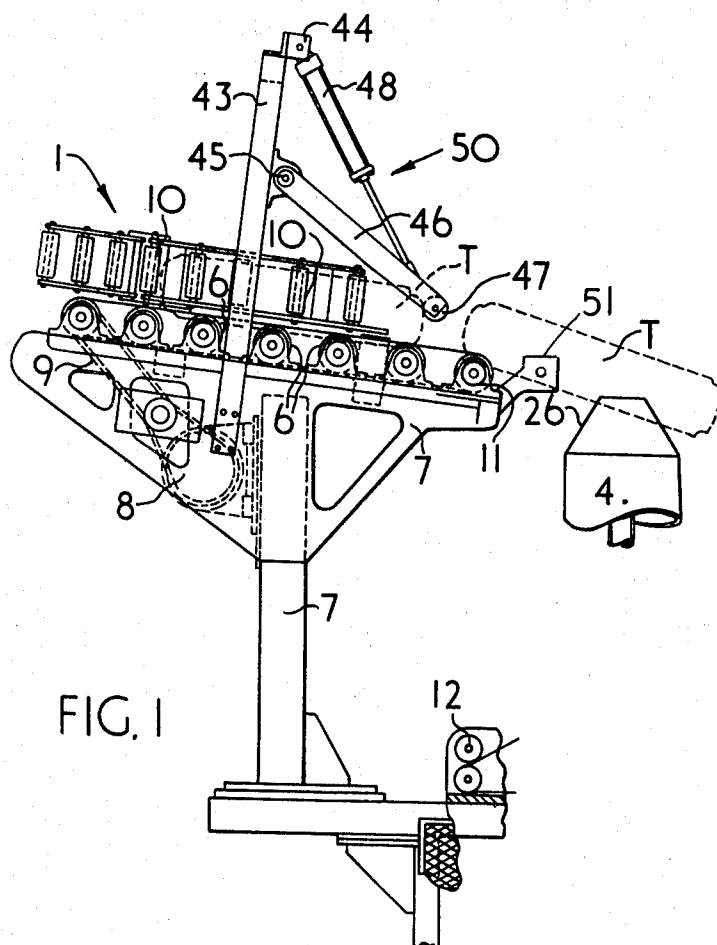


FIG. 1

INVENTOR

GORDON R. COOPER

By Stevens, Davis, Miller & Nash

ATTORNEYS

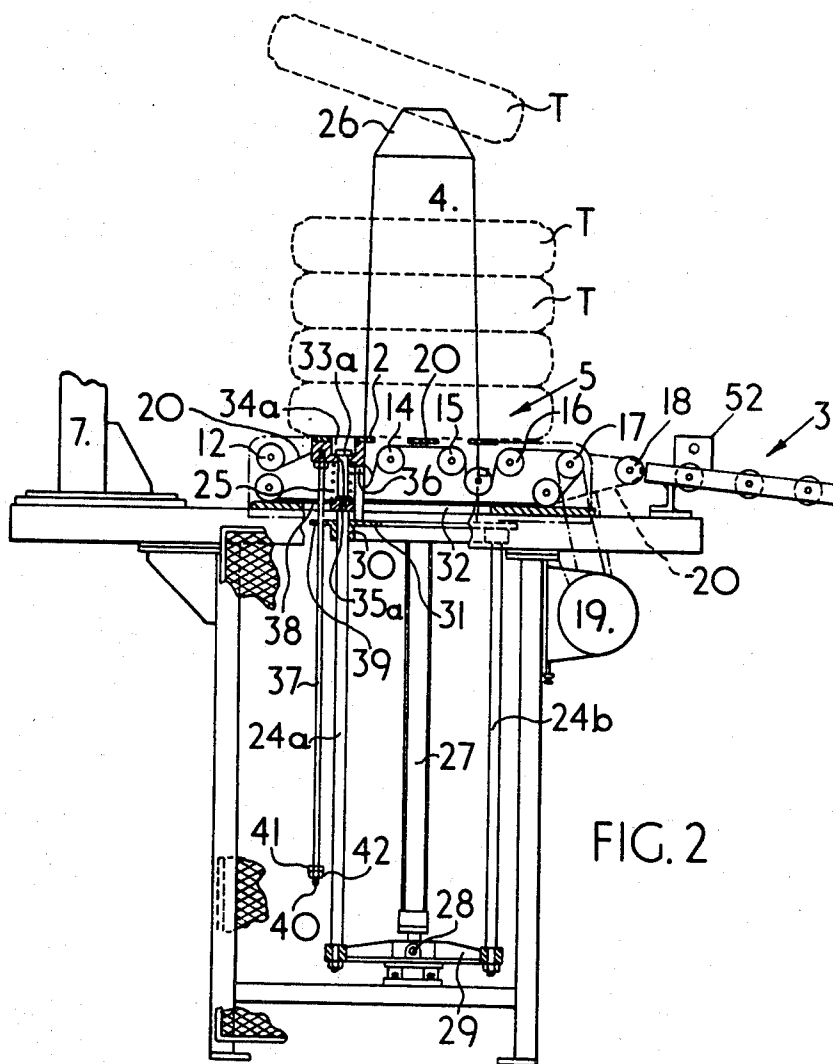
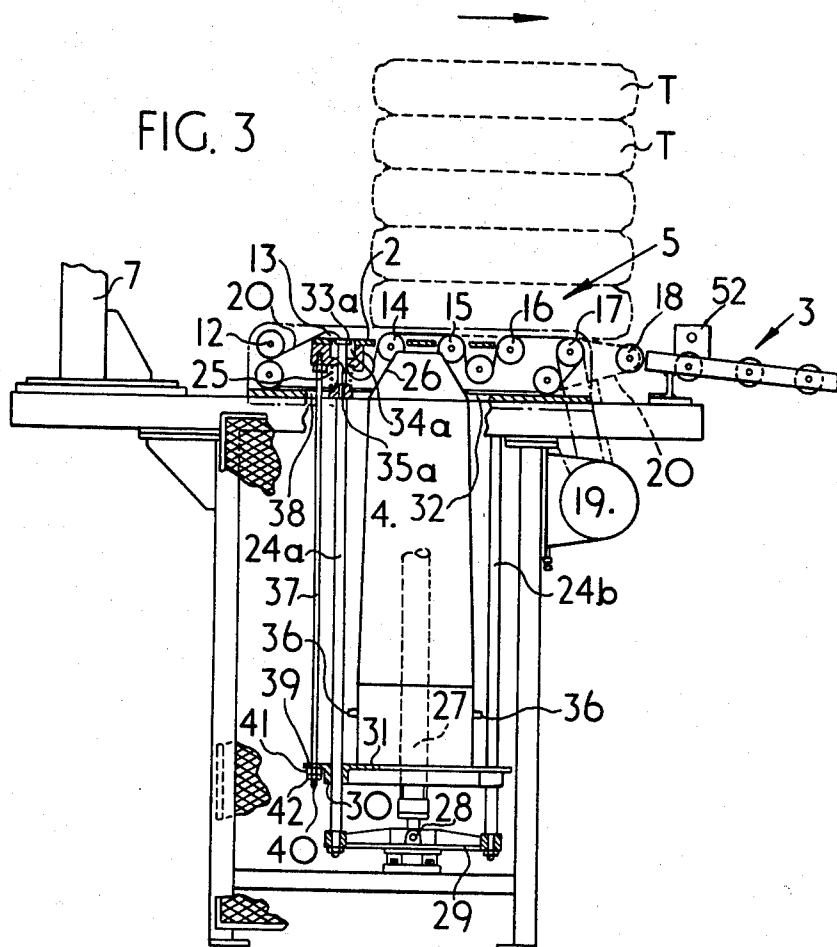


FIG. 2

INVENTOR
GORDON R. COOPER

By *Gordon R. Cooper*
ATTORNEYS



INVENTOR

GORDON R. COOPER

By *Edward J. Kelly* folio 10

ATTORNEYS

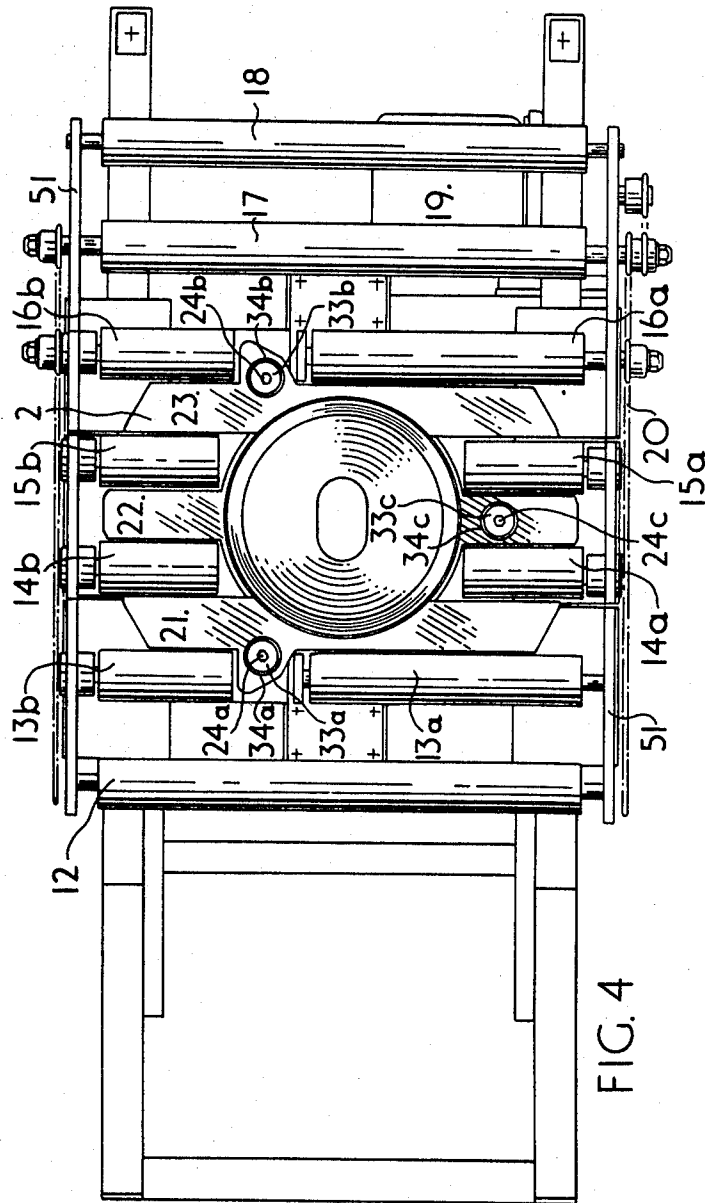


FIG. 4

INVENTOR

GORDON R. COOPER

By *Gordon R. Cooper, Attorney*

ATTORNEYS

STACKING DEVICES

This invention relates to stacking devices.

According to the invention a device for stacking articles comprises a reciprocable guide member engageable with at least part of each article to be stacked, a first conveying means for feeding the articles one at a time to a position where they form a stack with at least part of each article being in engagement with the member, means for reciprocating the member into and out of said position and a second conveying means for moving stacked articles disengaged from said member away from said position.

The articles may each be provided with at least one perforation in the same relative location, and the guide member, which may be in the form of a post, is engageable with the perforations in a plurality of said articles to form a tidy stack.

The device may comprise detecting means for detecting either when a desired number of articles have been stacked or when a predetermined size of stacked pile has been engaged by the member, and reciprocable means, actuated by the detecting means, may be provided for reciprocating the member to disengage it from the stacked articles and allow the second conveying means to move the stacked articles away from the aforementioned position. Further, the detecting means may prevent the articles from being fed to the aforementioned position while the member is reciprocating by actuating a switch for stopping the first conveying means from operating for the period of reciprocation and/or by closing, for said period, a gate in the path of an oncoming article.

One embodiment of the invention, a tire stacking device, will now be described by way of example with reference to the accompanying drawings of which:

FIG. 1 shows a side view of the upper portion of the device, the last tire of a stack moving into engagement with the guide post and the gate closed preventing a further tire from moving onto the stack,

FIG. 2 shows a side view of the lower portion of the device, the last tire of a stack moving into engagement with the guide post which is in its extended position,

FIG. 3 shows a side view of the lower portion of the device with the guide post in its retracted position and a stack of tires moving away from the stacking area,

FIG. 4 shows a plan view of the stacking area of the device.

For the sake of clarity, some parts of the device have been omitted from the drawings.

A device for stacking pneumatic tires in piles each containing the same number e.g. five, for inspection purposes, comprises generally a first conveyor 1 along which tires are fed from the production department, a spring-loaded stacking platform 2 and a second conveyor 3 for feeding stacked tires away from the stacking platform. So that the tires are arranged in substantially vertical piles a vertically-extending retractable guide post 4 is disposed beneath the edge of the first conveyor in the stacking area 5.

The first conveyor 1 (see FIG. 1) comprises a plurality of parallel rollers 6, each slightly longer than the diameter of the tires to be stacked and each supported with their axes horizontal between side frames 7 so that the general plane of the conveyor slopes at a small angle towards the stacking platform 2. Also mounted on one of the side frames is an electric motor 8 for driving the rollers 6 by means of a friction belt or chain drive system 9. To prevent tires from falling off the sides of this conveyor, a plurality of freely rotatable rollers 10 are mounted on each side of the conveyor with their axes substantially vertical.

The axis of lowest and last roller 11 of the first conveyor is positioned directly vertically above the axis of the first roller 12 (see FIGS. 2, 3 and 4) of the lower, stack-feeding, conveyor 3, which is similar to the upper in that it comprises a plurality of parallel horizontal rollers 12, 13, 14, 15, 16, 17, 18 disposed between side frames 51 and is driven by a motor 19 and friction belt or chain drive system 20.

The upper surfaces of the first six rollers 12, 13, 14, 15, 16 and 17 of the lower conveyor generally define a stacking area

5 (see FIG. 3) in which the tires are stacked by means of the guide post 4 on the stacking platform 2. This platform comprises rigidly connected parallel slats 21, 22, 23 which are disposed between the second (13) and third (14), third and fourth (15), and fourth and fifth (16) rollers of the conveyor. The vertical guide post 4 protrudes through a hole in the stacking platform and through the third (14) and fourth (15) conveyor rollers which for this reason do not extend the full width of the stacking area but each comprise two shorter rollers one located near each side of the stacking area (14a and 14b, 15a and 15b respectively). The second and fifth rollers also comprise two parts (13a and 13b, 16a and 16b respectively) to enable two (24a and 24b) of three guide rods (24a, 24b and 24c) for guiding the guide post to pass vertically downwards from the stacking area. The stacking platform 2 is mounted on springs 25 so that it is generally held approximately three-quarters inch above the level of the tops of the rollers of the lower conveyor 3, but may be lowered to a position approximately one-quarter inch below the said level by a mechanism to be described.

The guide post 4 is generally cylindrical having a diameter slightly less than that of the bead regions of the tires to be stacked but tapers in that its diameter decreases slightly from bottom to top. Its appearance is generally blunt-ended since the top few inches are frustoconical in shape, the angle of the cone 26 with respect to the horizontal plane being about 60°. The post is also hollow, and located within it is a pneumatic piston and cylinder assembly 27 which is pivotally mounted at its lower end 28 to a rigid base 29 about 4 feet below the level of the stacking area, and at its upper end (not shown) to the inside of the upper end of the post. Actuation of the piston and cylinder assembly 27 causes the post to move between a fully-extended position where its top is slightly below the level of the upper conveyor (as shown in FIGS. 1 and 2) and a fully-retracted position where it is completely below the level of the lower conveyor (as shown in FIG. 3).

The guide post is constrained to move in a vertical direction by three rigidly mounted vertical guide rods (24a, 24b and 24c) disposed at 120° intervals around the periphery of the guide post 4 and sliding through three collars 30 mounted on a support ring 31 attached to the lower end of the post. These rods are secured to and extend between the rigid base 29 and a horizontal support plate 32 for the stacking platform 2 and positioned a few inches below it. Although the rods (24a, 24b and 24c) are secured to the support plate they extend through it and end approximately one-quarter inch below the level of the tops of the rollers of the second conveyor in the stacking area. Three discs (33a, 33b, 33c) each having a diameter larger than the rods (24a, 24b, 24c) are attached one to the top of each rod and are slidably fitted in three recesses (34a, 34b, 34c) in the stacking platform, the rods are slidably fitted in holes (35a) at the bottom of each recess. Between the underside of the stacking platform and the top of the support plate are three springs 25, one around each guide rod, which normally hold the top surface of the platform approximately three-quarters inch above the level of the tops of the rollers in the stacking area. The support of these three springs is supplemented by three support pads 36, welded on to the periphery of the post and which just engage the underside of the stacking platform 2 when the post is fully extended. The stacking platform 2 is constrained from moving higher under the action of these springs and the pads by the discs (33a, 33b, 33c) at the end of the guide rods (24a, 24b, and 24c).

Located radially outwardly, with respect to the guide post, of the three guide rods (24a, 24b and 24c) is a set of three smaller diameter rods 37. This second set of rods is rigidly secured to the underside of the stacking platform and passes vertically downwards therefrom through holes 38 in the support plates and a set of three holes 39 disposed radially outwardly of the three collars 30 mounted on the ring 31 at the lower end of the guide post 4. These rods 37 are slidably fitted in each hole 39 of the set and end generally level with the lower end of the guide post 4. The lower ends of these rods

have a screw-threaded portion 40 and each has two nuts (41 and 42) mounted thereon, the lower nut 42 being a locknut for the upper nut 41. The position of these nuts on the rods 37 controls the level to which the stacking platform 2 is lowered beneath the level of the tops of the rollers 12, 13, 14, 15 and 16 of the second conveyor 3 in a manner to be described.

Attached to the support ring is a striker plate (not shown) so disposed that it will engage and operate, in a manner to be described, a limit switch (not shown) which is connected to the motor driving the first conveyor and which is mounted on one of the side frames (not shown) beneath the stacking area 5.

A gate mechanism 50 (see FIG. 1) is attached to the first conveyor 1 to prevent tires from being accidentally fed to the stacking area 5 while the post 4 is reciprocating. This comprises two side members 43 one attached to one side of the conveyor and the other to the other side, and a crossmember 44 joined to the upper end of each side member and forming a bridge over the first conveyor. Located beneath this crossmember and attached to each side member 43 by means of pivots 45 are two arms 46 which carry a freely-rotatable roller 47. This roller 47 has its axis of rotation parallel to the axes of the rollers 6 of the first conveyor and also parallel to the cross member 44, and may be lowered or raised, into or out of the path of a tire travelling along the first conveyor by means of a pneumatic piston and cylinder assembly 48 pivotally connected at one end to the crossmember 44 and at the other end to a spindle (not shown) carrying the freely-rotating roller 47.

Mounted at the side of each conveyor, and in the case of the second conveyor away from the stacking area, are two photoelectric devices 51 and 52 for sensing the passage of tires, either singly or in piles respectively. Alternatively, the first of said photoelectric devices may be arranged to sense a predetermined size of the stacked pile.

The operation of the stacking device will now be described.

Tires (shown in various positions in the drawings and referred to generally as T) from production departments, sorted into separate sizes, pass singly, at varying intervals of time and distance along the first conveyor 1 to pass over the last roller thereof and fall onto the stacking platform 2 so that they are each located around the guide post 4 which is in its upper position. As the tires pass along the conveyor they are sensed by the first photoelectric device 51 located at the side thereof so that when five tires have passed an electric relay is operated which stops the motor driving the first conveyor and actuates the piston and cylinder assembly 48 so as to lower the roller 47 of the gate mechanism 50 in the path of an oncoming tire thereby preventing any more tires from falling onto the stacking platform 2. Simultaneously the piston and cylinder assembly 27 inside the guide post 4 is also actuated by the relay so that the post is retracted downwards completely beneath the stacking area 5.

When the guide post is almost fully retracted the ring 31 mounted at its lower end engages with the upper side of the upper nuts 41 located on the second set of rods 37. This engagement causes the rods and therefore the stacking platform 2 to be lowered against the action of the springs 25 below the level tops of the rollers 12-18 of the second conveyor 3 so that the lowest tire of the stacked pile engages with the stack-feeding conveyor rollers 12-18 which are kept constantly rotating and is moved out of the stacking area.

As this stacked pile is conveyed away it is sensed by the second photoelectric device 52 located at the side of the lower conveyor. This causes a second relay to actuate the two piston and cylinder assemblies 27 and 48 so that the guide post 4 is raised to its fully-extended position, where the striker plate engages with and operates the limit switch thus restarting the motor driving the first conveyor. The roller 47 of the gate mechanism 50 is also raised to allow tires to fall off the first conveyor. As soon as the guide post 4 starts to move upwards the constraint holding the stacking platform below the level of the second conveyor is removed and it moves upwards under the action of the springs to a position approximately three-

quarters inch above the conveyor, thereby preventing subsequent tires from touching the second conveyor until the guide post is retracted once more.

In a first modification the second photoelectric device and relay may be dispensed with and the first relay replaced by a delay relay. Thus a predetermined period after retraction of the guide post this relay raises the post to its fully-extended position where the striker plate operates the limit switch thus restarting the motor driving the first conveyor 1 and raising the gate 50.

Several of these devices each with a different size post may be arranged in conjunction with a sorting device to stack tires of various sizes coming from the production departments into batches of stacked piles all of the same size of tires, ready for inspection.

I claim:

1. A device for stacking articles comprising a substantially vertically reciprocable guide member engageable with at least part of an interior edge of each article to be stacked, a first conveying means for feeding the articles one at a time to a position where they form a stack, at least part of each article in the stack then being in engagement with the member, means for substantially vertically reciprocating the member into and out of said position and a second conveying means for moving a stack of articles disengaged from said member away from said position.

2. A device according to claim 1 wherein the guide member is a post engageable with a perforation in each of a plurality of said articles to form a tidy stack.

3. A device according to claim 1 comprising reciprocable means for reciprocating the member to disengage it from the stacked articles.

4. A device according to claim 3 further comprising detecting means for detecting when a desired number of articles has been stacked, the detecting means then actuating the reciprocable means for reciprocating the member to disengage it from the stacked articles and allow the second conveying means to move said stacked articles away from said position.

5. A device according to claim 3 further comprising detecting means for detecting when a predetermined size of stacked pile has been engaged by the member, the detecting means then actuating the reciprocable means for reciprocating the member to disengage it from the stacked articles and allow the second conveying means to move said stacked articles away from said position.

6. A device according to claim 1 further comprising a switch for stopping the first conveying means from operating to prevent an article from being fed to said position while the member reciprocates.

7. A device according to claim 6 further comprising detecting means for detecting when a desired number of articles has been stacked, the detecting means then actuating the said switch.

8. A device according to claim 6 further comprising detecting means for detecting when a predetermined size of stacked pile has been engaged by the member, the detecting means then actuating the said switch.

9. A device according to claim 1 further comprising a gate closable across the first conveying means in the path of an oncoming article to prevent said article from being fed to said position while the member reciprocates.

10. A device according to claim 9 wherein the gate comprises a freely rotatable roller attached to a piston and cylinder assembly, said assembly being actuable to place the roller in the path of an oncoming article on the first conveying means.

11. A device according to claim 9 further comprising detecting means for detecting when a desired number of articles has been stacked, the detecting means then actuating the said gate.

12. A device according to claim 9 further comprising detecting means for detecting when a predetermined size of

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stacked pile has been engaged by the member, the detecting means then actuating the gate.

13. A device according to claim 1 wherein the second conveying means comprises a plurality of continuously rotating rollers arranged with their axes parallel in substantially the same plane, the device comprising a stacking platform for receiving the articles located in the position where the stack is formed, the platform comprising a plurality of slats which are located above the level of the tops of the rollers of the second conveyor whilst the articles are being fed to the stacking platform and which are moveable below the said level, with one slat between each adjacent pair of rollers, when the stack is

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complete to allow the bottom article of the stack to engage the rotating rollers.

14. A device according to claim 13 wherein resilient means are provided for holding the platform above the said level.

15. A device according to claim 13 further comprising platform lowering means attached to the guide member, movement of said member out of said position operating said means to lower the platform below the said level.

16. A device for stacking pneumatic tires according to claim 1.

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