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(54) Title
FLOWSPLITTING CONVEYOR

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(56) Prior Art Documents
US 4044897

(57) Claim

1. An article conveyor system comprising a source line, two receiving lines, and directing means between the source line and the receiving lines for the adjustable distribution of articles supplied by the source line between the two receiving lines, characterised in that the directing means comprises a frame between the source line and the receiving lines and movable generally perpendicularly to the general direction of travel of articles from the source line to the receiving lines, the frame carrying two sets of rollers which sets are arranged side by side and the axes of the rollers of which are inclined to one another with the apex of intersection of the axes pointing in a downstream direction.

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655452

ORIGINAL
COMPLETE SPECIFICATION
STANDARD PATENT

Invention Title:

FLOWSPLITTING CONVEYOR.

The following statement is a full description of this invention, including the best method of performing it known to me:-

1 FLOWSPLITTING CONVEYORBRIEF SUMMARY OF THE INVENTION

2 A means for controlling the load imposed on a
conveyor and its associated equipment utilizes a load
5 allocating means which is capable of dividing the incoming
load between two receiving conveyors for the purpose of
balancing the loads of the receiving conveyors or it can be
used to allocate the entire load to either one of the
receiving conveyors when the load volume warrants such a
10 procedure.

BACKGROUND OF THE INVENTION

Under the conditions created by the
conveyorization necessary in present-day warehousing,
manufacturing and article transport, it frequently becomes
15 necessary at times to relieve the load on one article
transport line by diverting a portion of the load to another
conveyor line. In the past, this has been done largely by
labor or, in other cases, by installing two separate lines
with the load factor on each being totally independent of
20 the other. This often causes under usage of both systems,
resulting in unnecessary costs for both labor and capital
equipment. It is not a satisfactory solution to simply
close one of the lines during low demand periods. This does
not solve the problem when one line is overloaded and the
25 other under used. The invention also makes it possible to
concentrate the load entirely on one of the two conveyors
when demand is small enough to justify it. It is the
purpose of this invention to provide a single solution to
each of these problems.

BRIEF DESCRIPTION OF THE INVENTION

The invention provides means whereby the load on a particular line can, when desirable, be automatically divided between two lines and quickly returned to single
5 line operation when the load demand no longer warrants dividing the load. Further, the invention provides means for proportioning the allocation of articles between lines in response to the quantity of articles approaching the diversion point provided by the invention. The invention
10 focuses on the demand for conveyor space to move the articles at a rate consonant with accurate, careful and effective handling.

According to the present invention there is provided an article conveyor system comprising a source
15 LINE (30), two receiving lines (A,B), and directing means between the source line and the receiving lines for the adjustable distribution of articles supplied by the source line between the two receiving lines, characterised in that the directing means comprises a frame (11) between the
20 source line and the receiving lines and laterally movable generally perpendicularly to the general direction of travel of articles from the source line to the receiving lines, the frame carrying two sets of rollers (22, 22a) which sets are arranged side by side and the axes of the
25 rollers (24) of which are inclined to one another with the apex of intersection of the axes pointing in a downstream direction.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plan view of the invention in neutral
30 position, that is, directing conveyor load to both output conveyors without allocation to either conveyor;

Fig. 2 is a view similar to Fig. 1 illustrating the invention positioned to direct the entire load to one of the output conveyors;



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Fig. 3 is a plan view of the lane allocating switch illustrating the drive for the article conveying rollers shown with the rollers removed;

Fig. 4 is an enlarged fragmentary sectional view
5 taken along the plane IV-IV of Fig. 1, illustrating the_____



1 roller support means ends of the rollers supported on the
sides of the article allocator;

Fig. 5 is a view similar to Fig. 4 taken along the
plane V-V of Fig. 1 illustrating the roller supports along
5 the article receiving and discharging sides of the article
director;

Fig. 6 is a fragmentary plan view of the roller
support illustrated in Fig. 5;

Fig. 7 is an oblique fragmentary sectional view of
10 a guide rail equipped with interroller article stops;

Fig. 8 is a fragmentary elevation view of the
relationship of the interroller article stops and the
rollers;

Fig. 9 is an enlarged, partially sectioned view of
15 one of the article stops;

Fig. 10 is a fragmentary oblique view of the
mounting block for the interroller article stops;

Fig. 11 is a side elevation view of one of the
roller drive assemblies;

Fig. 12 is an end elevation view of the article
20 path controlling platform;

Fig. 13 is a side elevation view of the article
path controlling platform; and

Fig. 14 is an enlarged fragmentary side elevation
25 view of the position changing drive for the platform.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figs. 1 and 2, the numeral 10 refers
to a transversely movable load path controlling platform.
The platform has a rectangular frame 11 of greater length
30 than its width in the direction of movement. The frame has
a peripheral frame including front and back members 12

1 joined by shorter end members 13 and a central frame member
14 (Fig. 3). The movable platform has stiffeners (not
shown) to give rigidity to the platform. These stiffeners
are not illustrated since they are conventional and not part
5 of the invention. Such stiffening members have long been
used in the conveyor industry. The platform 10 is supported
by wheels 20 which roll along a pair of laterally extending
tracks 21. The tracks are substantially longer than the
width of the platform whereby the platform can be moved
10 transversely in either direction from its central position
relative to the path of articles being transported on the
conveyor with which the invention is used.

The platform has a pair of side-by-side roller
assemblies 22 and 22a, each occupying one half of the
15 surface of the platform (Fig. 1). One end of each of a
majority of the individual rollers 24 of each roller
assembly is journaled to one of the side or end frame
members of that roller assembly and the other end to the
central frame member 14. The rollers of the assemblies 22
20 and 22a are arranged with their axes inclined to the path of
the articles entering the platform. The rollers of the
assembly 22 are inclined oppositely to those of assembly
22a. Thus, these rollers form a herringbone pattern, the
apex of which is centered where the assemblies adjoin each
25 other and points downstream of the movement of articles over
the platform.

The ends of the rollers mounted on either the end
members 13 or the central frame member 14 are supported
between the top flange of one of the end members 13 or of
30 the central frame member 14 and a bracket 40 (Fig. 4). The
axle 41 of each roller is sandwiched between plastic

1 isolator pads 43 and the top flange and the bracket 40 and
clamped by a bolt 42. This arrangement allows for vibration
and sound damping from the axle to the end or frame member.

5 The attachment of the rollers to the front and
back frame members 12 is illustrated in Figs. 5 and 6. In
this case, the end of the roller axle 41 is secured by a
bolt 48 which clamps it between the bracket 45 and a top
member 46 (Fig. 5). The bracket and top member have a pair
of spacers 47 between them through each of which the bolt 48
10 extends to pull the bracket and the top member together
(Figs. 5 and 6). The frame member is reinforced by a
stiffener 49 between the bracket 45 and the frame member 12.
Again, the arrangement allows vibration and sound damping
between the roller and the frame 12.

15 An infeed conveyor 30 aligns with the central
portion of the platform 10 when the platform is in its
neutral position, that is, centered between ends of the
platform support (Fig. 1). The platform has a pair of guide
rails 31 and 31a which are supported on stationary supports
20 32 and 32a, one at each end and which, in turn, are secured
to the platform's supporting structure (Figs. 1, 12 and 13).
The guide rails are arranged to form a V-shaped track, the
narrow end of which is aligned with and just wide enough to
receive the articles from the infeed conveyor 30. The
25 discharge end of the path defined by the guide rails is
substantially wider and aligns with a pair of receiving
conveyors 34 and 35.

30 The movable platform 10 is supported by rollers 20
on the tracks 21 of a stationary frame 25 for movement
either to the left or to the right with respect to both the
infeed conveyor 30 and the receiving conveyors 34 and 35.

1 As it moves, it shifts the herringbone conveyor
configuration onto which the articles are discharged by the
infeed conveyor 30 (Fig. 2). Thus, when the platform is
shifted to the left of an observer looking downstream of
5 article movement, as illustrated in Fig. 2, the inclination
of the rollers over which the articles will be moved will
bias the articles to the right. On the other hand, if the
movable platform is shifted as far as it can go to the
right, the articles will be biased to move to the left. If
10 the platform is shifted, only a portion of its possible
travel from center in either direction a greater proportion,
but not all, of the articles will be caused to exit the
platform onto the conveyor opposite that toward which it has
been shifted. Thus, by shifting the platform either to the
15 right or to the left, the discharge of the articles can be
proportioned between the conveyors as needed or directed
entirely to one of the conveyors. This is a simple and easy
to operate system for adjusting the conveyor to accommodate
widely varying volume demands.

20 To accomplish this purpose, the platform is
supported on wheels 20 which travel on tracks 21 (Figs. 12
and 14). Movement of the platform along the rails is
effected by a dog 60 which engages driver 61 mounted on the
threaded member 62. The axis of the threaded member
25 parallels the tracks 21 and is driven by the prime mover 63
to rotate in either direction, depending upon which
direction it is desired to move the platform. The dog 60 is
slidably mounted for vertical movement in a support member
64 secured to one of the platform's cross members. The dog
30 is normally seated in the slot 65 in the driver member 61 so
that movement of the driver member will cause the platform

1 to travel with the driver member. If it is desired to
 release the platform from control by the driver, the handle
 66 at the end of the platform is maneuvered to cause the dog
 to be lifted and disengage from the driver 61. This is
 5 necessary because it is essential in large warehouse
 operations that this type of equipment continue to be
 operative even though the functionality of such control
 means as the prime mover 63 fails. By releasing the
 platform 10 from the driver 61, it is free to be manually
 10 pushed to a position which will accommodate the load of
 articles being received over the input conveyor and properly
 proportion their delivery between the two receiving
 conveyors 34 and 35.

15 What has been described is satisfactory for
 situations involving only packaged articles or articles
 having significant three dimensional characteristics. The
 handling of flat, thin articles, such as letters and the
 like, involves the problem of interception of the articles
 by the guide rails 31 and 31a without the possibility that
 20 the article might be carried down under the rails by the
 rollers rather than transported on the rollers' upper
 surfaces. The problem is further complicated by the fact
 that as the frame is moved laterally, whatever means are
 employed to prevent entrapment of these flat articles by the
 25 rollers must be capable of both deflection to pass over the
 rollers and of automatically returning to active extended
 position between the next pair of rollers. At the same
 time, they must positively prevent the articles from being
 discharged downwardly between adjacent rollers.

30 The invention provides a simple means of
 accomplishing this by creating a barrier formed of a

1 plurality of fingers 50 each of which has a rounded lower
end designed to extend into the space between a pair of
adjacent rollers and there provide a positive restraint
5 movement between the transport rollers and by so mounting
each finger that it can be retracted by the roller as the
platform moves laterally beneath the guide rails (Figs.
7-10). To do this, each of the fingers 50 preferably is a
bolt or pin having a rounded end 52. The tubular housing 53
10 for the pin and spring is press-fitted into openings in a
support block 54. The support block can be molded of a
plastic such as ultra high molecular weight polyethylene
sold by E.I. DuPont De Nemours and have openings 55 of a
size such that the pin housing 53 can be press-fitted into
15 it and frictionally held in place. The depth of insertion
can be controlled by a flange 57 at the end of the housing
(Fig. 9). In extended position, each finger extends
partially into the convergent slot between a pair of
adjacent rollers to a depth such that it extends below the
20 plane of the tops of the rollers (Fig. 8). Since the
fingers extend below this plane they will not allow even a
flat object such as an envelop to become trapped between a
pair of adjacent rollers and, thus, either be removed from
the conveying surface or progressively destroyed by the
25 continuing abrasion of the rollers. To pass over each of
the rollers as the platform 10 is moved lengthwise of the
tracks 21 and transversely of the rails 31 and 31a, the
fingers 50 are mounted for sliding vertical movement in the
tubular housing 53 and urged into extended position by a
30 spring 58 (Fig. 9).

The spring 58 need exert only a light pressure
against the finger since its purpose is only that of

1 assuring finger extension when roller obstruction is
 removed. Under normal operating conditions, the weight of
 the finger alone can effect this action. The spring also
 increases the resistance to a flat object lifting the
 5 fingers just as the fingers pass over the tops of the
 rollers during lateral travel of the guide rail. As many of
 the fingers 50 are provided as there are gaps between
 rollers over which each of the guide rails are seated. So
 that the entire space above the surface of the movable
 10 platform and between the guide rails 31 and 31a remains
 unobstructed for the movement of articles, the fingers 50
 and their support block 54 are mounted on the outer face of
 the guide rails by suitable means such as screws 56 (Fig.
 7).

15 The rollers of the frame controlling the delivery
 of the articles received from the conveyor 30 are driven by
 a belt and prime mover assemblies 70 (Figs. 3 and 11).
 These assemblies 70 are mounted to the platform 10 beneath
 the rollers 24 and each has a belt 71 supported on rollers
 20 72 which hold it in driving engagement with the bottom
 surfaces of the article transporting rollers above (not
 illustrated in Figs. 3 and 11). Each belt 71 is driven by a
 prime mover 73. As will be observed from Fig. 3, in order
 to drive all of the rollers, four of the assemblies 70 are
 25 provided and travel with the platform as it is shifted from
 side-to-side.

30 When the articles are discharged from the path
 controlling platform 10, they pass onto the receiving and
 aligning conveyor sections 34 and 35. Preferably, these
 sections also have rollers with axes inclined to the sides
 of the conveyors to arrange the articles in single file

1 along one side. To facilitate this, the outer side of each
of the receiving conveyor sections is equipped with guard
rail sections 90 to cause the articles to become properly
aligned. The use of this equipment is not part of this
5 invention and can be understood from U.S. patent 4,044,897
entitled CONVEYOR SORTING AND ORIENTING SYSTEM issued August
30, 1977 and U.S. Patent 4,284,186 entitled UNSCRAMBLING
CONVEYOR issued August 18, 1981. However, this equipment is
useful in effecting neat and orderly arranged articles as
10 they enter the next phase of their transport in the
warehouse or other type of facility.

It will be recognized that the quantity of
articles entering the flowsplitter can be monitored manually
or automatically. Irrespective of the manner in which it is
15 monitored, it is the purpose of the invention to provide
easily and quickly manipulable equipment for positively,
easily and expeditiously transporting articles under
conditions in which the volume the equipment must handle may
vary widely.

20 Having described a preferred embodiment of the
invention, it will be understood that various modifications
of the invention can be made without departing from its
principles. Such modifications are to be considered as
included in the hereinafter appended claims, unless the
25 claims, by their language expressly state otherwise.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. An article conveyor system comprising a source line, two receiving lines, and directing means between the source line and the receiving lines for the adjustable
5 distribution of articles supplied by the source line between the two receiving lines, characterised in that the directing means comprises a frame between the source line and the receiving lines and laterally movable generally perpendicularly to the general direction of travel of
10 articles from the source line to the receiving lines, the frame carrying two sets of rollers which sets are arranged side by side and the axes of the rollers of which are inclined to one another with the apex of intersection of the axes pointing in a downstream direction.

15 2. A conveyor system according to claim 1 in which the axes of the rollers of both sets are inclined to the said general direction of travel.

3. A conveyor system according to claim 1 or claim 2 which includes a pair of divergent stationary
20 article guides located above the frame and extending from a discharge end of the source line towards the receiving lines.

4. A conveyor system according to claim 3 in which each of the guides has downwardly extending fingers
25 which extend between the rollers to resist articles passing beneath the guides.

5. A conveyor system according to claim 4 in which each of the fingers is supported by a resilient means which enables the finger to move and pass over a roller
30 passing beneath it on movement of the frame.

6. A conveyor system according to claim 5 in



which a tubular housing is provided for each finger, each finger being telescopically supported in its housing, each housing being secured to one of the guides and provided with means urging its finger downwardly to a position where
5 a lower end of the finger is approximately level with the axes of the rollers.

7. A conveyor system according to claim 6, wherein the lower end of each finger is of rounded shape.

8. A conveyor system according to any one of
10 claims 1 to 7, which includes a track to support the frame, friction-reducing means, preferably wheels, between the frame and the track, and means for reciprocating the frame on the track.

9. A conveyor system according to any one of
15 claims 1 to 8 which includes drive means for rotating the rollers.

10. A conveyor according to any one of claims 1 to 9 in which the combined widths of the sets of rollers is greater than the combined widths of the receiving lines, the frame being movable between the first position in which
20 all articles arriving on the source line are directed to one of the receiving lines and a second position in which all such articles are directed to the other of the receiving lines.

25 11. A conveyor system substantially as herein described with reference to and as illustrated in any one of the accompanying drawings.

Dated this 23rd day of August, 1994.

RAPISTAN DEMAG CORPORATION

30 By its Patent Attorneys:

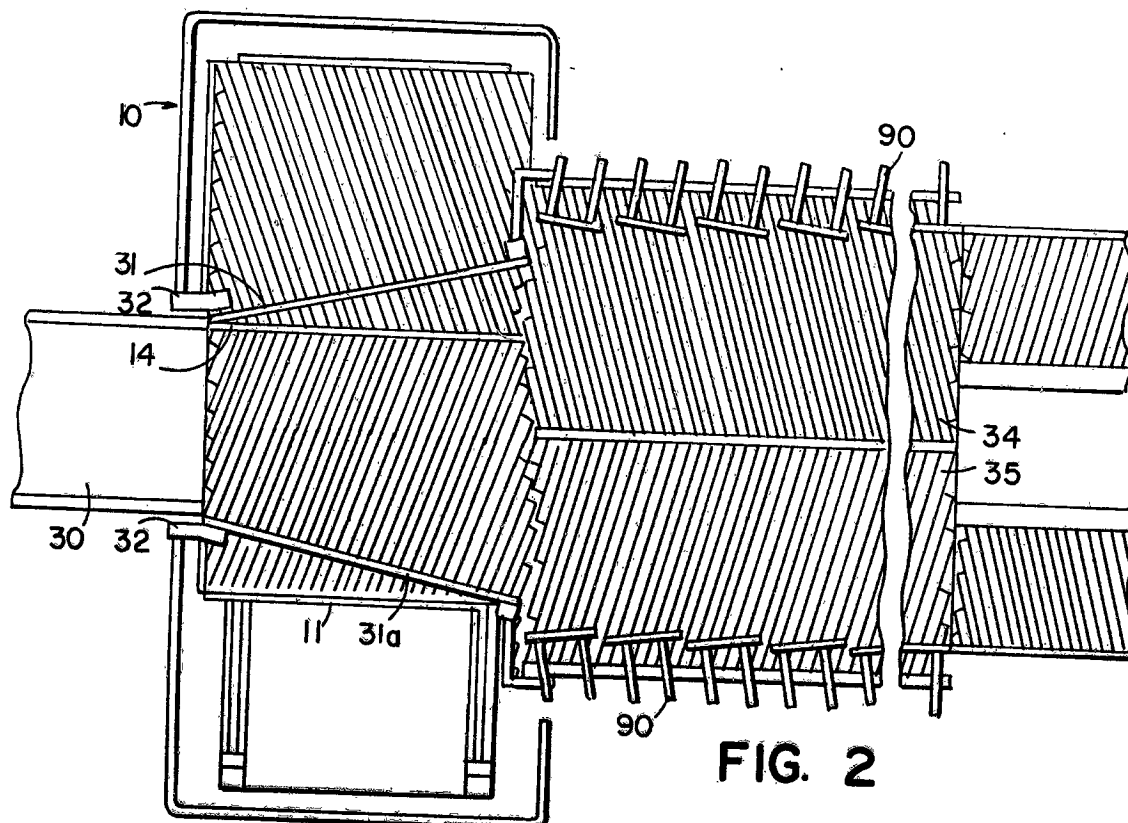
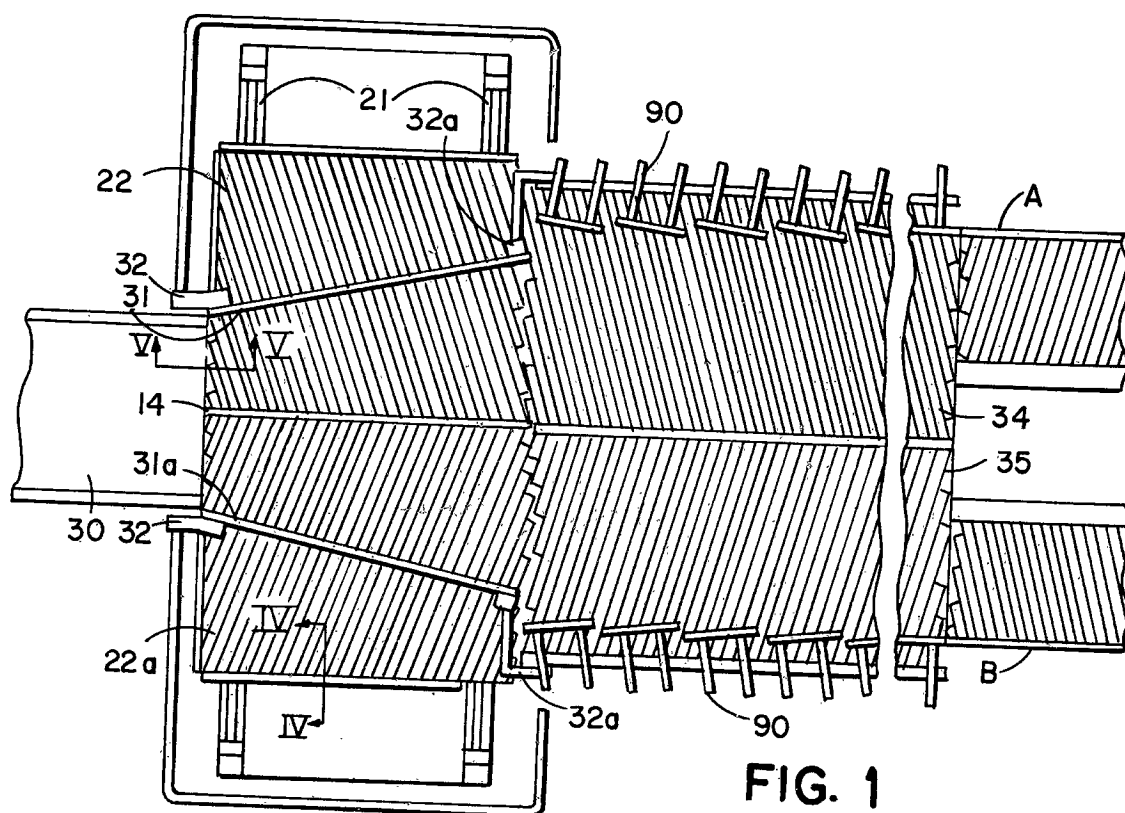
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Fellows Institute of Patent Attorneys of Australia.



ABSTRACT OF THE DISCLOSURE

1 A flowsplitting conveyor device for controlling a
load imposed on a conveyor utilizes a load allocating device
which is capable of dividing a incoming load between two
receiving conveyors for the purpose of balancing the load
5 between the two receiving conveyors or it can be used to
allocate the entire load to either one of the receiving
conveyors.



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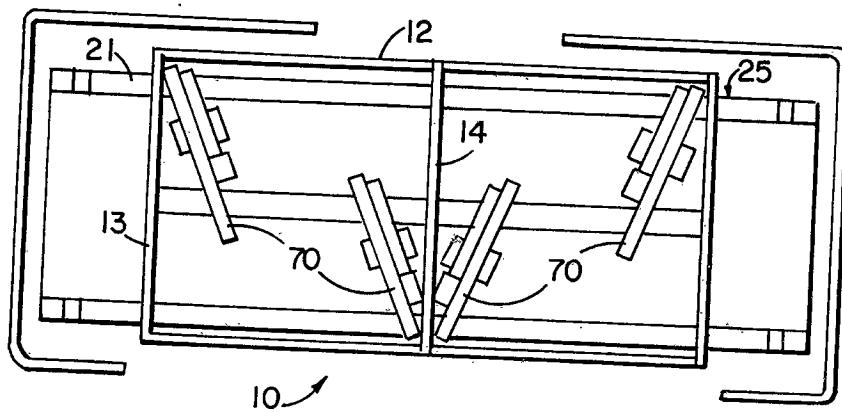


FIG. 3

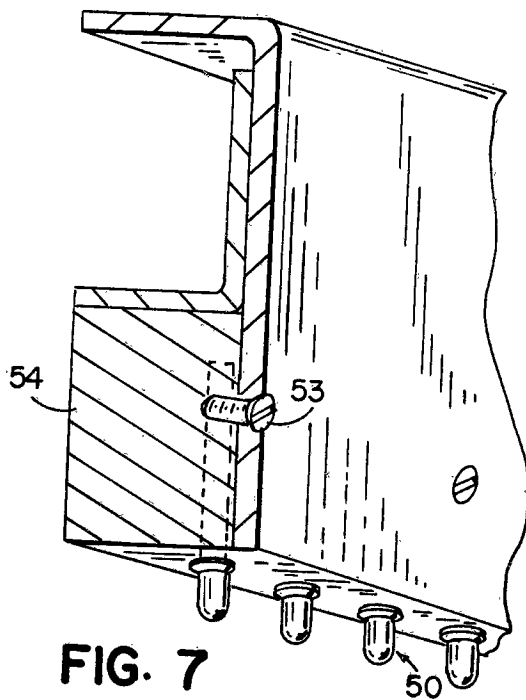


FIG. 7

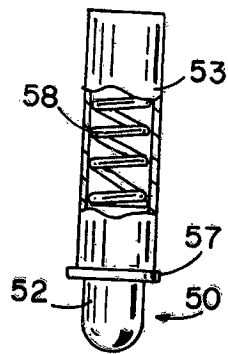


FIG. 9

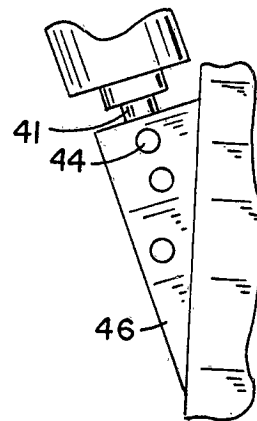


FIG. 6

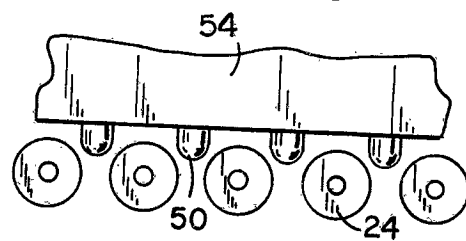


FIG. 8

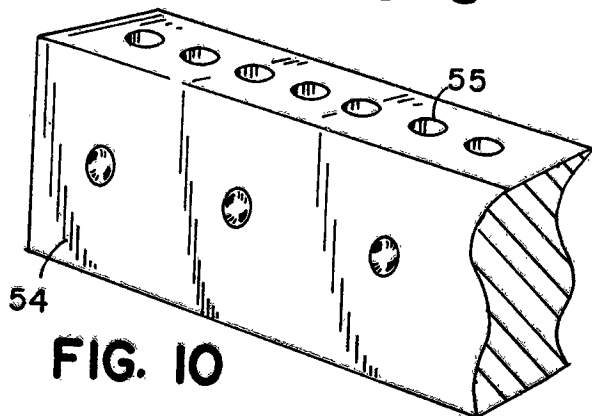


FIG. 10

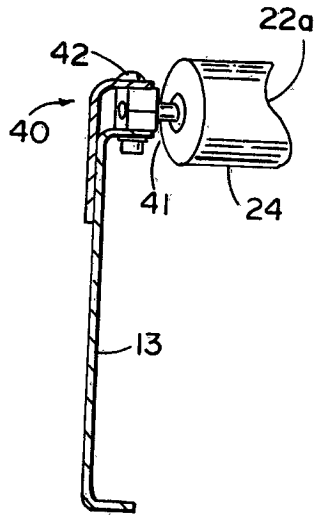


FIG. 4

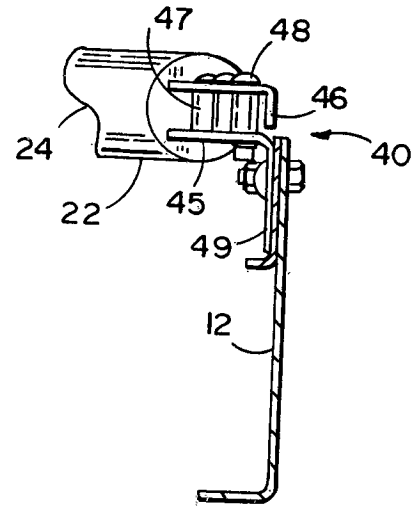


FIG. 5

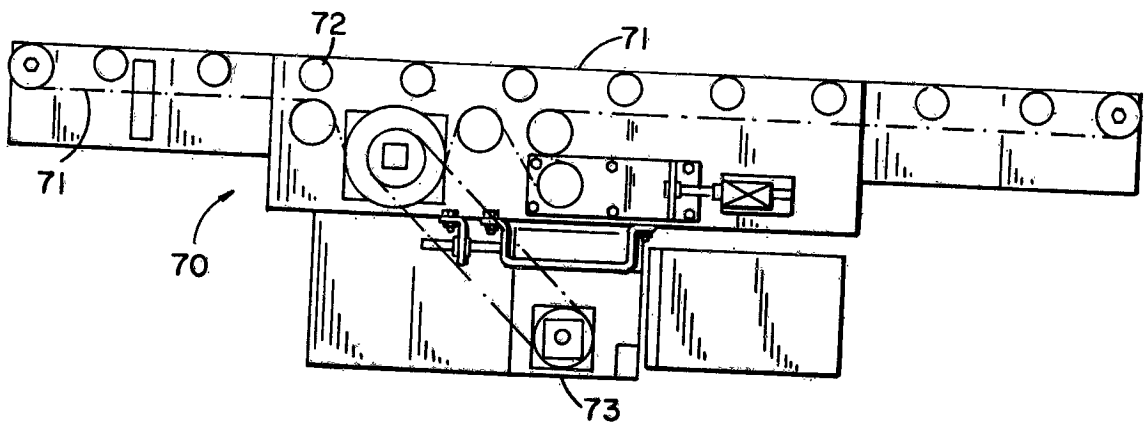


FIG. 11

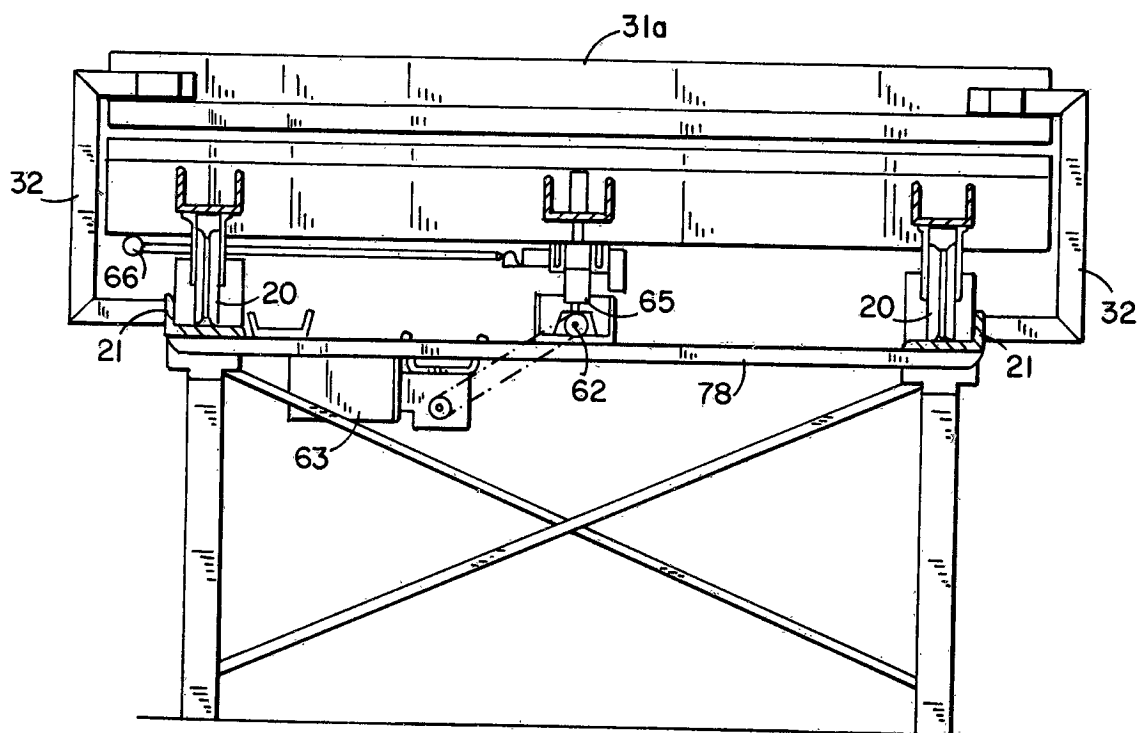


FIG. 12

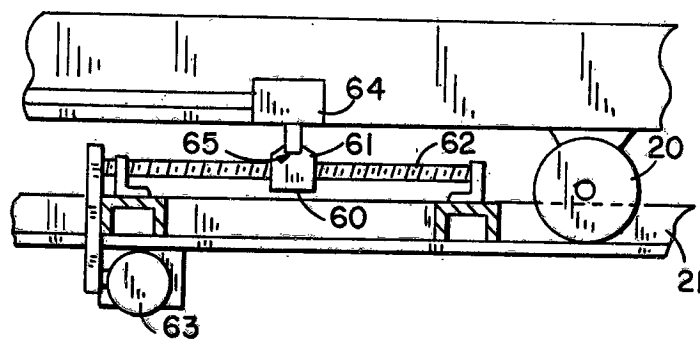


FIG. 14

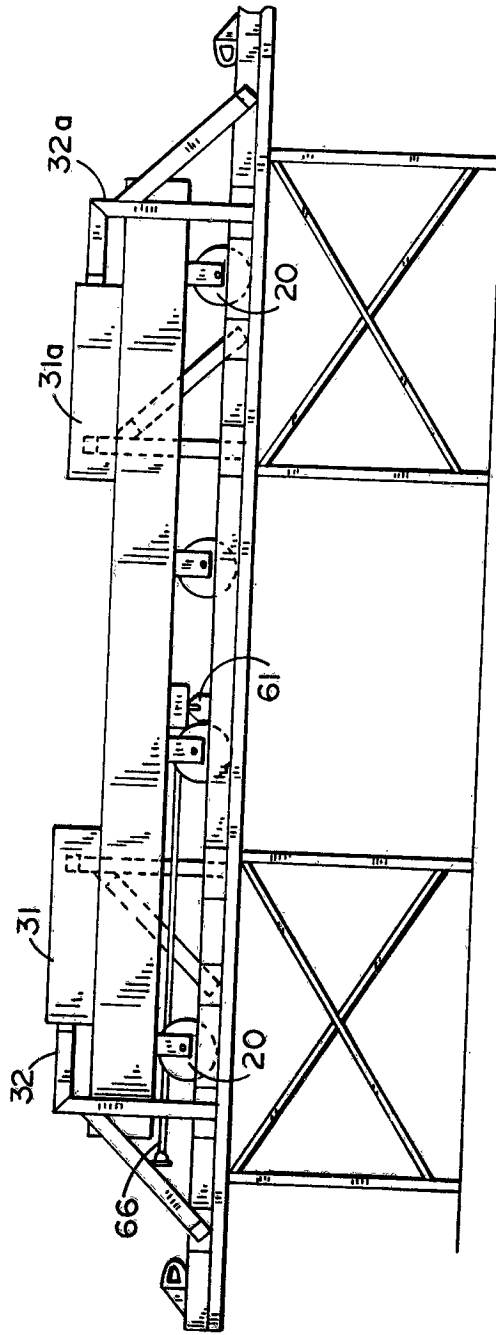


FIG. 13