Feb. 17, 1953 P. R. FECHHEIMER ET AL 2,628,703

MEANS FOR FEEDING TAPERED ARTICLES

Filed June 30, 1948 3 Sheets-Sheet 1

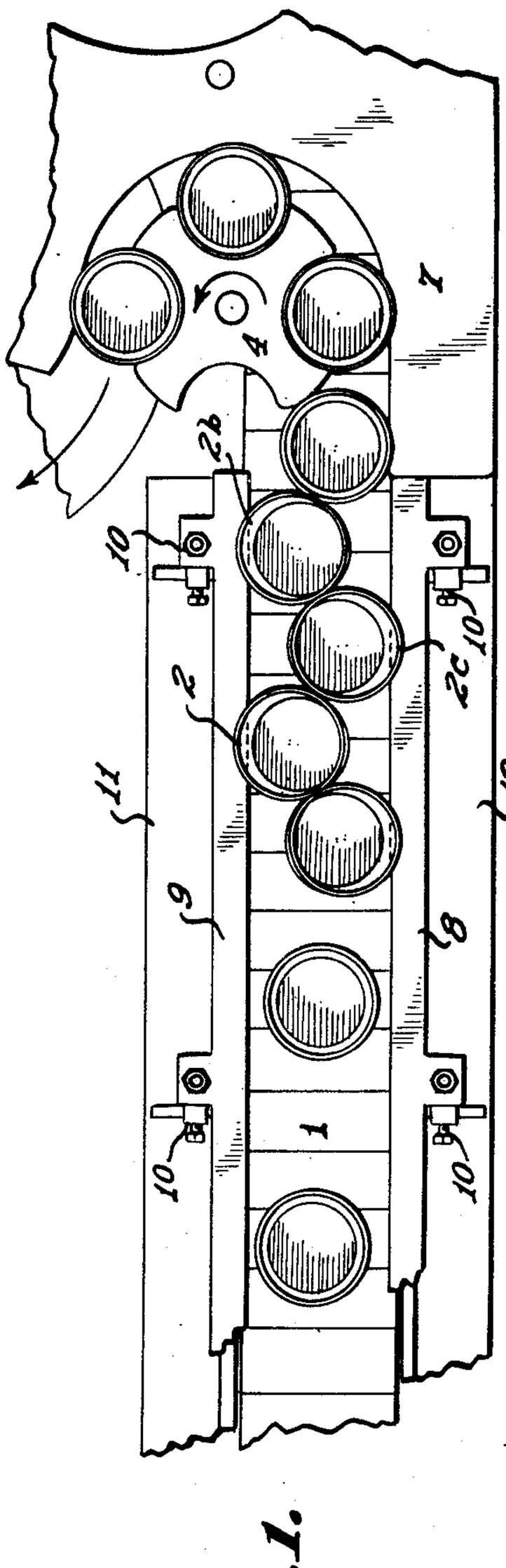

FIG. 1.

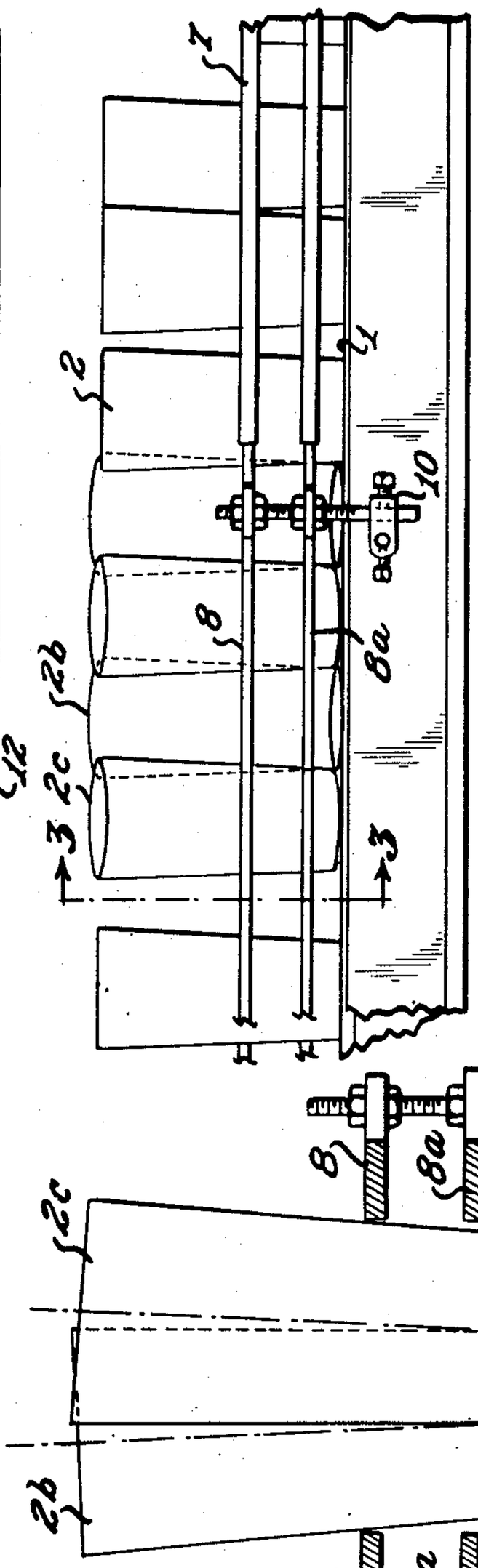

FIG. 2.

FIG. 3.

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MEANS FOR FEEDING TAPERED ARTICLES

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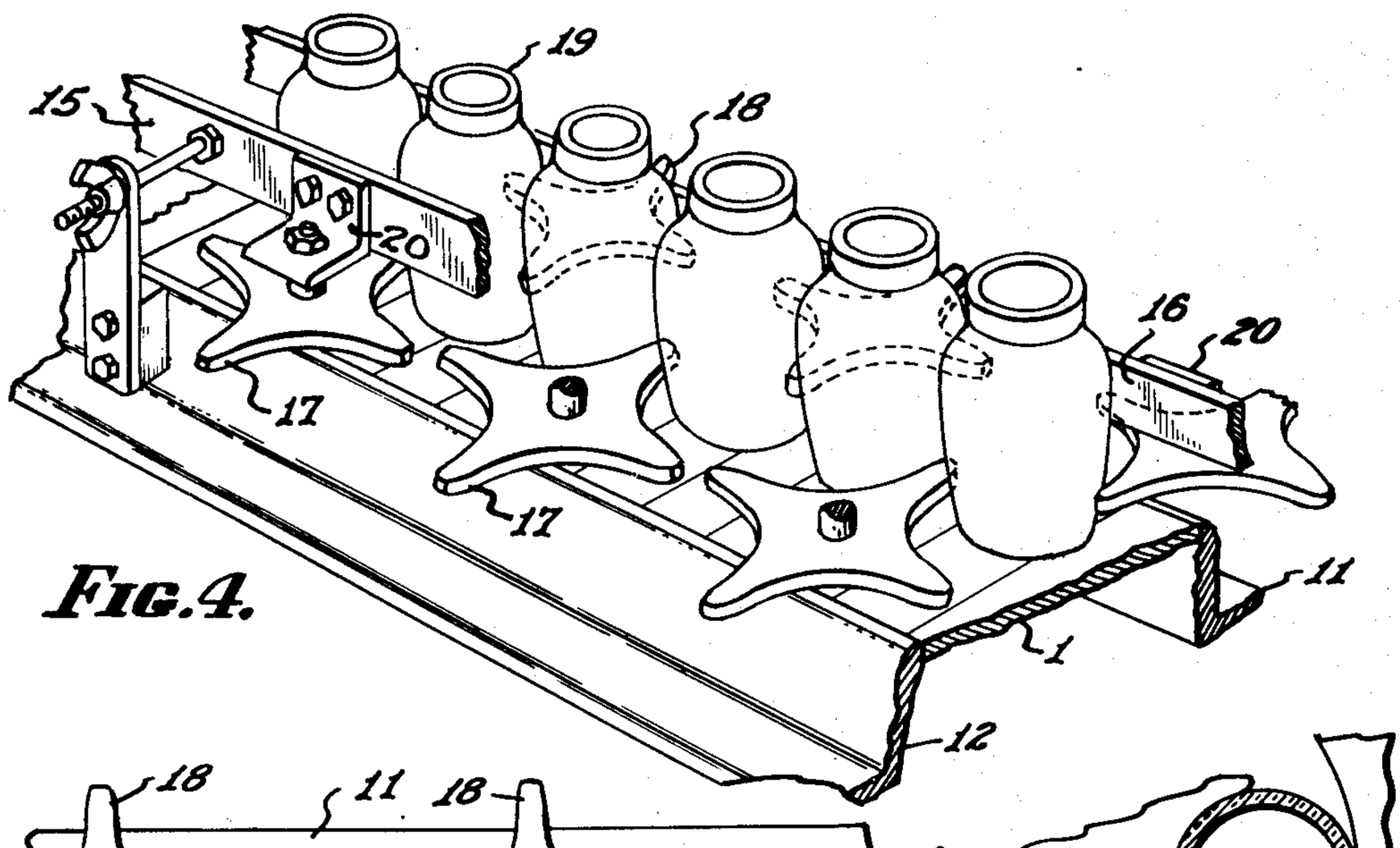

FIG. 4.

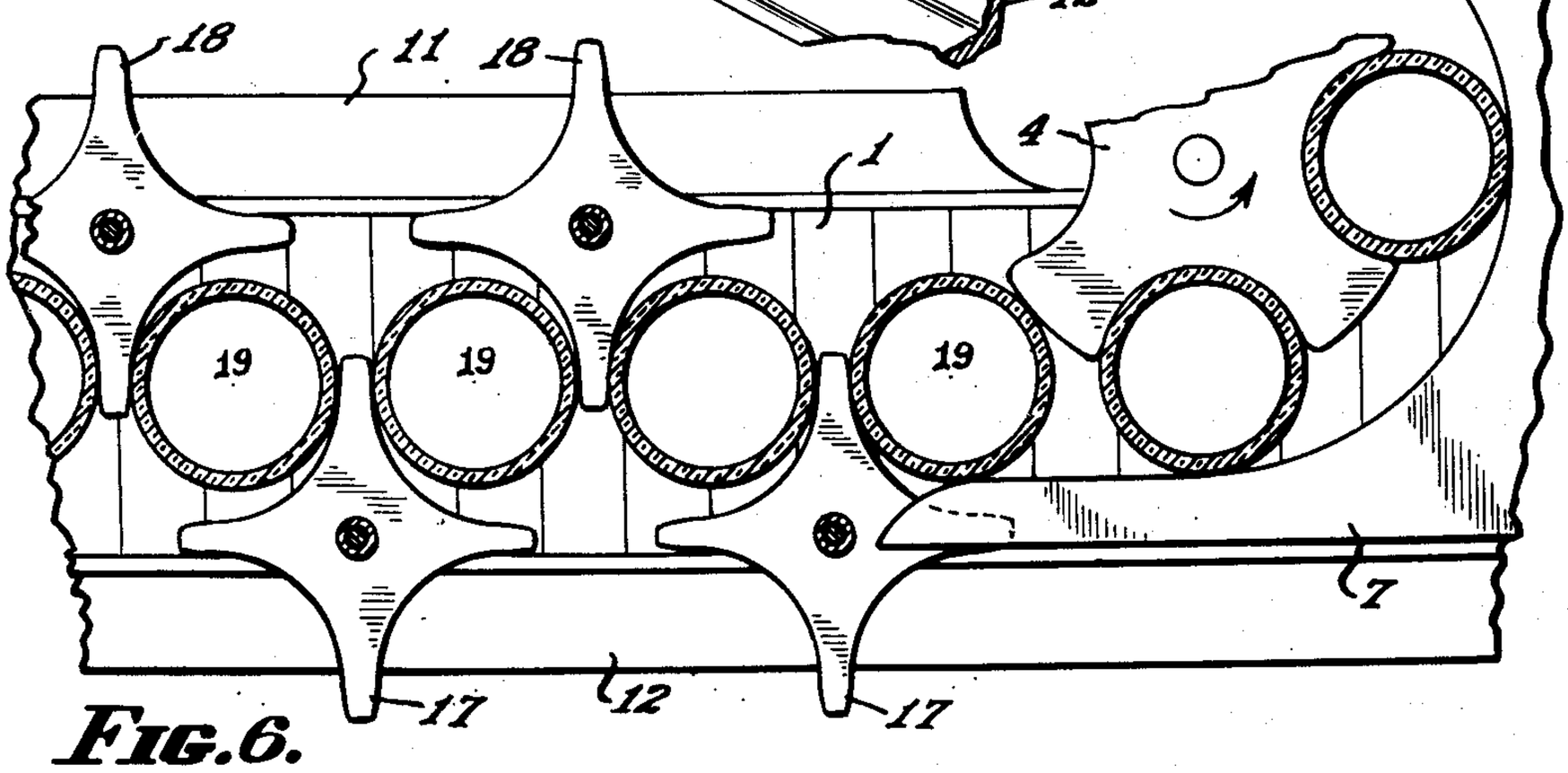

FIG. 6.

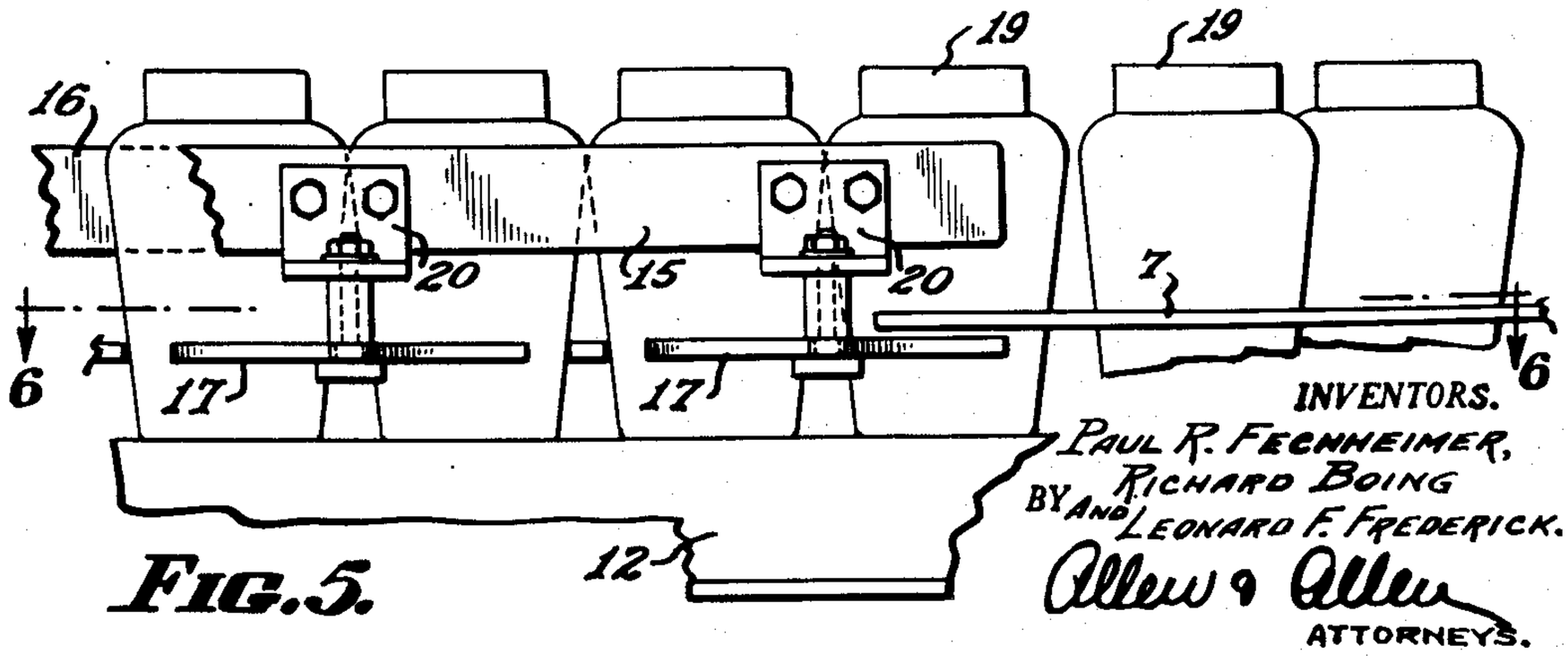

FIG. 5.

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MEANS FOR FEEDING TAPERED ARTICLES

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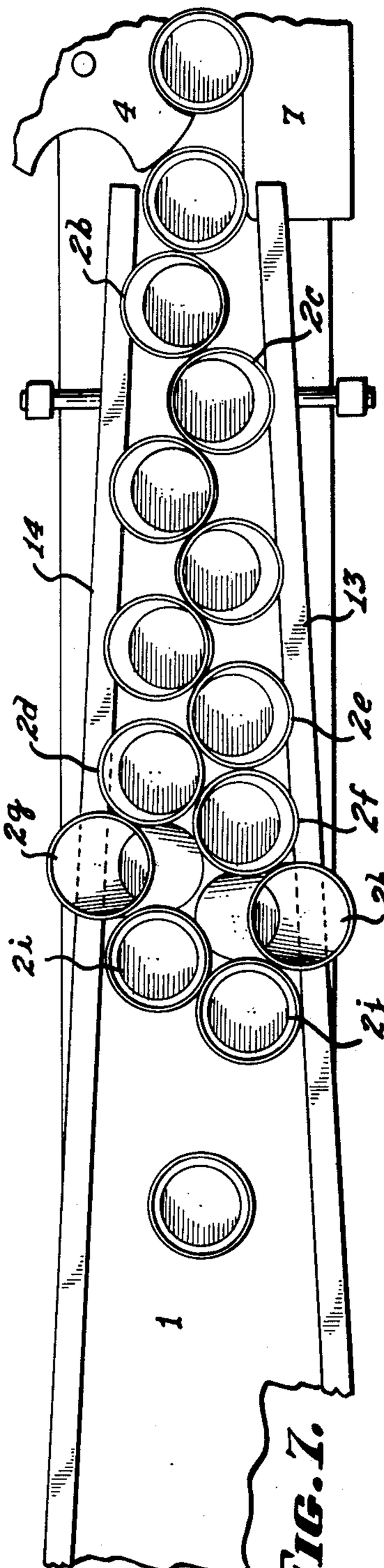

FIG. 7.

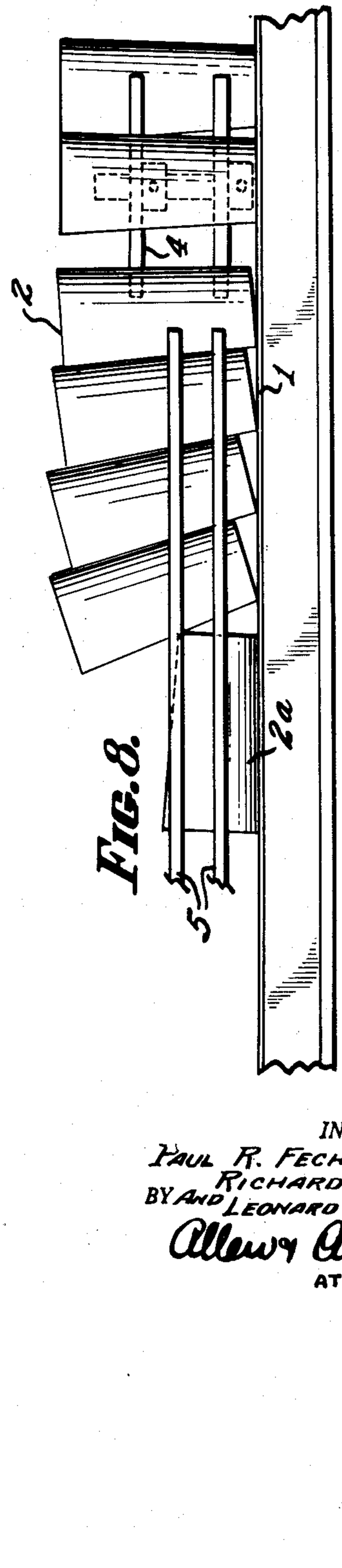

FIG. 8.

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2,628,703

MEANS FOR FEEDING TAPERED ARTICLES

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Application June 30, 1948, Serial No. 36,006

7 Claims. (Cl. 198—29)

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Our invention has for its primary object the provision of mechanical means which will feed articles and deliver them slingly to operating mechanism or a work station, in spite of a downwardly tapered configuration of the articles themselves. While our means are capable of use wherever the fundamental problem is encountered, we shall describe our invention in certain exemplary embodiments having to do with the feeding of containers, such as tapered tumblers, glasses, jars, bottles and the like, to operating mechanism which may involve cleaning means, filling means, capping means, labeling means and the like. For reasons hereinafter set forth the feeding of tapered articles has involved great difficulties, which difficulties have never hitherto been satisfactorily overcome, so far as we are aware.

The fundamental object of our invention, and others which will be set forth hereinafter or will be apparent to one skilled in the art upon reading these specifications, we accomplish in those procedures and by those constructions and arrangements of parts of which we shall now describe the aforesaid exemplary embodiments. Reference is made to the accompanying drawings wherein:

Figure 1 is a partial plan view of one form of our feeding device.

Figure 2 is a corresponding partial elevation.

Figure 3 is a sectional view taken along the line **3—3** of Figure 2 and showing the manner in which the articles arrange themselves.

Figure 4 is a partial perspective view of another form of our feeding means.

Figure 5 is a corresponding partial elevational view.

Figure 6 is a horizontal sectional view taken along the lines **6—6** of Figure 5.

Figure 7 is a partial plan view of another form of our feeding means.

Figure 8 is a partial elevational view illustrative generally of the problem encountered with downwardly tapered articles, when ordinary feeding means are employed.

In the customary method for feeding containers automatically, the containers are placed on an elongated conveyor by operators or by a preceding mechanism. The conveyor ultimately brings the containers against a timing wheel or feed wheel, and produces an accumulation of contiguously disposed containers ahead of such wheel. Parallel guide rails are placed above the conveyor generally with only sufficient clearance between them to permit the passage of a single row of the containers without binding. The containers are, of course, urged toward the feed wheel by the drag of the conveyor engaging their bottoms.

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Containers which are downwardly tapered or are so shaped as to have in effect a base substantially smaller than some remote upper portion of the container, can not successfully be handled in this fashion. Reference is made to Figure 8, wherein **1** represents the top of a conveyor upon which the articles **2** are placed. A star wheel or feed wheel is indicated at **4**, and at **5** there is shown a pair of guide rails to lead the containers to the feed wheel as they move along the conveyor. It will be understood that other guide members are located upon the opposite side of the line of containers **2**.

Each container, as it moves along the conveyor, tends to tilt until its forward side is in contact with the rear side of the preceding container. This tilt is cumulative, each successive container in a direction away from the star wheel **4** tending to tilt more and more, where the containers are tapered, until finally a point is reached at which the center of gravity of a container falls outside its base by reason of an excessive tilt. When this happens, the container tips over as indicated at **2***a*.

Placing a guide rail over the top of the containers does not solve the problem. If such a guide rail is so placed as to hold the containers with their bases flat against the conveyor, the containers can no longer pass freely beneath it. If the guide rail is given clearance, then tilting occurs with a wedging of the containers against the conveyor at the bottom and the guard rail at the top. The continued forward movement of the conveyor will then either cause breakage of the container or of the top rail.

We have found that these difficulties may be overcome by apparatus and procedures now to be described. Reference is made to Figures 1 to 3 inclusive, wherein **1** again represents a conveyor of any suitable form understood to be moving from left to right in Figures 1 and 2. **4** is a star wheel or feeding wheel having a guide means **7**. Guide rails on either side of the line of advancing tumblers **2** are indicated at **8** and **9**. These guide rails may be made adjustable by adjustable bracket means **10** on the rails **11** and **12** of the conveyor frame.

In the form of the invention shown in these figures the guide rails **8** and **9** are set parallel, are at a height between approximately ⅓ and ½ of the container height above the conveyor, and the distance between the rails is approximately

1⅓ to 1½ times the container diameter at rail height. It is sometimes advantageous to provide lower rails indicated at 8*a* and 9*a* spaced from but parallel to the rails 8 and 9. Where these rails are added, this is done as a precaution against excessive side tilt if the initial adjustment of the main rails is improper or against misplacement of containers by the operators in placing them on the conveyor 1. In the ordinary operation of our structure, the rails 8*a* and 9*a* do not function to guide the tumblers.

We have found that when we separate parallel guide rails at the heights indicated, tapered containers such as the tumblers 2 may be successfully handled. The reason for this is that when the containers are moved forward by the conveyor and accumulated ahead of the star wheel, the normal rearward tilt illustrated and described in connection with Figure 8, is compensated for by a side tilt of the containers which has the effect of bringing their axes substantially into planes parallel to each other and transverse the direction of motion of the conveyor. The action which occurs will be clear from Figures 1, 2 and 3, wherein it will be noted that successive containers 2*b* and 2*c* tilt laterally in opposite directions while maintaining line contact with each other. Certain of the containers tilt slightly forwardly and others slightly rearwardly, and the arrangement of the containers is such that their centers of gravity can at no time fall outside the confines of their bases. We have found that this mechanism and mode of operation is completely successful even at high speeds, such as 200 containers per minute.

When the guide rails 8 and 9 are set approximately 1⅓ to 1½ times the container diameter at the rail height, the star wheel 4 is still capable of forcing the containers into single file, as illustrated. We have found, however, that it is satisfactory to configure the guide rails so that at the star wheel, their distance apart is only sufficient to pass a single file of containers with a slight clearance such as ⅛ of an inch. Since, as will be clear from Figure 8, the cumulative tilt of a plurality of containers is required before the last container tips over, a narrowing of the guides adjacent the star wheel is not objectionable.

A modified arrangement is indicated in Figure 7 where like parts have been given like index numerals. Here, however, guide rail elements 13 and 14 are no longer parallel, but taper from a position adjacent the star wheel 4 at which their distance apart is that of the width of the containers plus proper clearance such as ⅛ of an inch, to a position some three or four feet to the rear of the star wheel 4 at which their distance apart may be as much as 2½ times the container diameter. In this arrangement those containers nearest the star wheel, such as the containers 2*b* and 2*c* assume the positions hereinabove described and act in the same way. As the guide elements 13 and 14 diverge, however, a point will be reached at which one container 2*d* can contact three other containers 2*e*, 2*f* and 2*g*. The tendency of any of these containers to tilt rearwardly is offset by excessive sidewise tilting of a pair of containers 2*g* and 2*h*; and the approaching containers thereupon assume a more upright position as indicated at 2*i* and 2*j*. This mode of operation is also completely successful and suitable for high speed operation.

The methods and apparatus described above are effective with tapered articles and articles of such shapes as to produce the net effect of a

taper which is constant from article to article within reasonable limits. If containers are so irregular in shape that a relative constancy of taper is not encountered, some difficulties may be encountered. We have developed another method and apparatus which will handle such containers, while being also satisfactory for constant taper as well as for articles with truly cylindrical or straight-sided bodies. This method and apparatus is illustrated in Figures 4 to 6 inclusive, where 1 again indicates the conveyor with rails 11 and 12. Side guide members are indicated at 15 and 16; but these rail members are arranged parallel to each other and a distance apart equal to the diameter of the containers at rail height, plus a suitable clearance such as ⅛ of an inch. A series of freely rotating star wheel members, indicated at 17 and 18 is provided, with alternate star wheels located at opposite sides of the line of containers 19. The star wheels themselves may be rotatively mounted on suitable bearings in bracket members 20 attached respectively to the guide rails 15 and 16, or otherwise as desired. It will be noted from the figures that each container 19 is engaged between teeth of a pair of star wheels, each mounted at a different side of the path of travel of the containers. The circumferential pitch distance between the points of the star wheels 17 and 18 is substantially the same as the length of the containers taken parallel to the direction of motion of the conveyor. The thicknes of the points of the wheels engaged respectively between containers is preferably substantially equal to the effective amount of taper of the containers between their shoulders and the points at which the wheels contact the containers. While it is preferable to have the containers move along the path, as illustrated, with their shoulders touching, and with the points of the wheels filling the gaps between containers at the wheel level, considerable leeway is permissible and it is possible not only to feed containers so shaped that their shoulders do not touch, but also to feed containers so shaped that the width of the teeth of the star wheels 17 and 18 at wheel level is not fully sufficient to fill the gaps between containers, providing the width is sufficient to prevent such a cumulative tilt of the successive containers as would bring the center of gravity of any one of them outside the confines of its base. The motion of the containers as they move with the conveyor rotates the star wheels 17 and 18 so that no drive is ordinarily necesary, although one may be provided if desired.

Since as illustrated and described in connection with Figure 8, it is possible to accumulate two or three containers without encountering a situation in which any container will fall over, we have found that instead of providing enough of the star wheels 17 and 18 to have a star wheel tooth between each container and the next, we have found that the wheels may be spaced a distance apart, along the length of the conveyor 1, equal to as much as two or three containers, without sacrificing operability.

In the devices of Figures 1 to 3 and 7 adjustments in the specific transverse separations of the guide rail means may be made in accordance with specific tapers encountered, and this may be done also in the mechanism of Figures 4 to 6 where containers are being handled having so great a taper that the teeth of the star wheels do not completely fill the gaps, or where the star

wheels are so separated that two or more containers lie between them.

Modifications may be made in our invention without departing from the spirit of it. Having thus described our invention in certain specific embodiments, what we claim as new and desire to secure by Letters Patent is:

1. In apparatus for feeding tapered containers individually into a machine, a conveyor upon which said containers approach said machine at a given speed, means to receive containers from said conveyor individually at a speed less than the effective speed of said conveyor, so that containers tend to accumulate in contact with each other ahead of said receiving means while being urged forwardly by said conveyor upon which said accumulated containers slide, means in conjunction with said conveyor for causing said accumulated tapered containers to react against each other at a plurality of points for each pair of contacting containers, said points spaced from each other above said conveyor, while the axes of said containers remain substantially in vertical planes normal to the direction of motion of said conveyor, whereby the centers of gravity of individual containers are caused to remain above their bases, said last mentioned means comprising side guides located with respect to said conveyor and above it, said side guides having at least one portion spaced approximately from 1⅓ to 1½ times the diameter of the container being fed at the height of said guides.

2. In apparatus for feeding tapered containers individually into a machine, a conveyor upon which said containers approach said machine at a given speed, means to receive containers from said conveyor individually at a speed less than the effective speed of said conveyor, so that containers tend to accumulate in contact with each other ahead of said receiving means while being urged forwardly by said conveyor upon which said accumulated containers slide, means in conjunction with said conveyor for causing said accumulated tapered containers to react against each other at a plurality of points for each pair of contacting containers, said points spaced from each other above said conveyor, while the axes of said containers remain substantially in vertical planes normal to the direction of motion of said conveyor, whereby the centers of gravity of individual containers are caused to remain above their bases, said last mentioned means comprising side guides located with respect to said conveyor and above it, said side guides having at least one portion spaced approximately from 1⅓ to 1½ times the diameter of the container being fed at the height of said guides, followed by said guides being located above said conveyor approximately one-third to one-half the height of said containers.

3. The structure claimed in claim 2 in which said side guides are parallel.

4. The structure claimed in claim 2 in which said side guides slant toward each other toward the delivery end of said conveyor, at which point they are spaced the diameter of the container at the side guide height, plus clearance of approximately ⅛ inch, the opposite ends of said side guides being spaced approximately 2½ times the diameter of said containers at the side guide height, at a distance of approximately three to four feet from said delivery end.

5. A process for feeding tapered containers individually into a machine which comprises moving said containers toward a machine upon a conveyor at a given speed, removing said containers from said conveyor individually at a speed less than the effective speed of the conveyor, so that the containers are caused to accumulate on said conveyor in contact with each other prior to removal while being urged forwardly by said conveyor upon which said accumulated containers slide, and controlling the reaction of said tapered containers upon each other by causing said containers to react against each other at a plurality of points for each pair of contacting containers, said points spaced from each other above said conveyor, while maintaining the axes of said containers substantially in vertical planes normal to the direction of motion of said conveyor, whereby the centers of gravity of the individual containers are caused to remain above their bases.

6. The process claimed in claim 5 wherein the maintenance of the axes of said containers in said substantially vertical planes is accomplished by tilting said containers laterally to bring their points of reaction upon each other substantially into vertical planes.

7. The process claimed in claim 5 wherein the maintenance of the axes of said containers in said vertical planes is accomplished by means introduced between said containers and moved thereby, said means having a width to compensate in part at least for the taper of said containers.

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