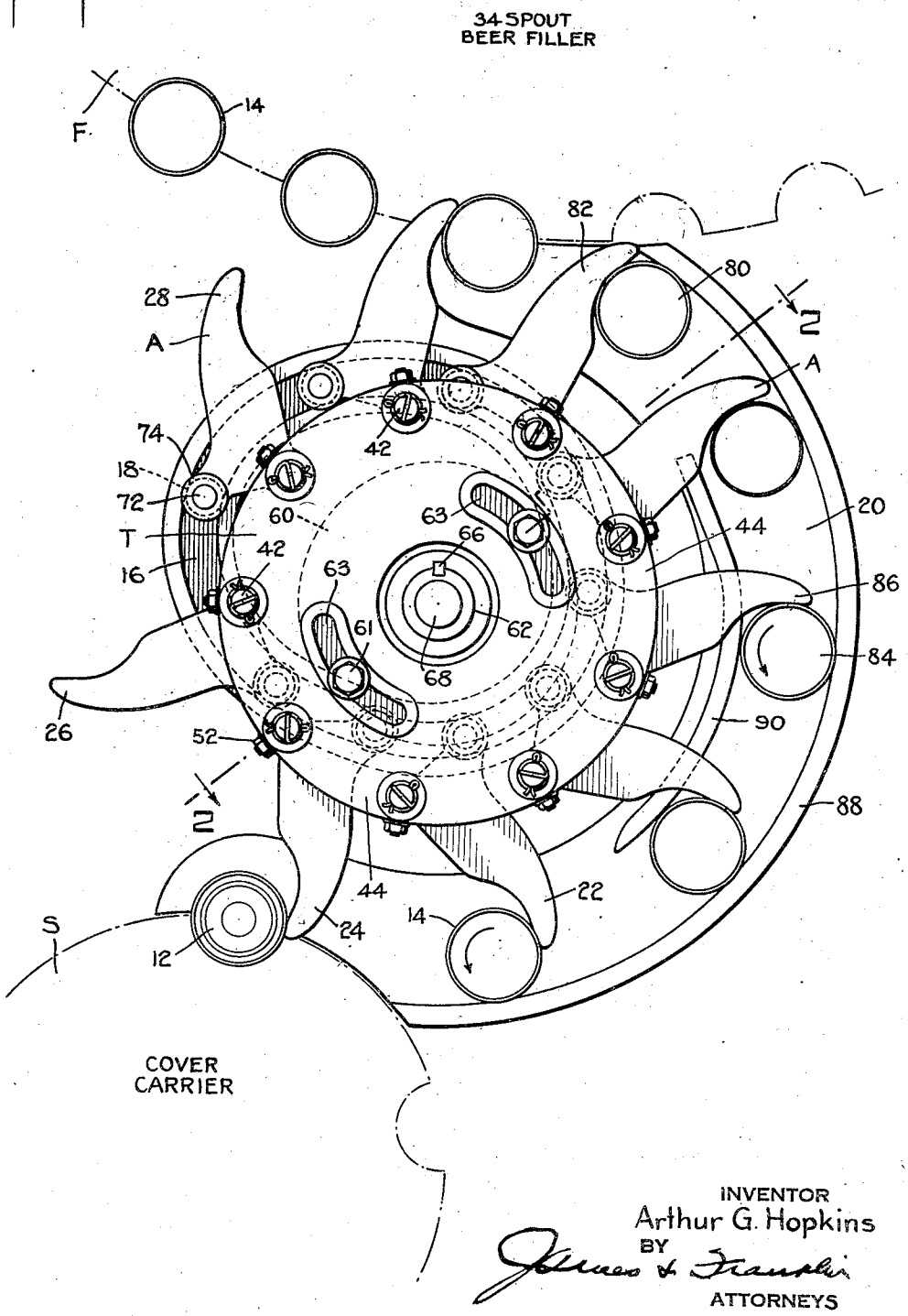
April 18, 1939. A. G. HOPKINS 2,155,088

ACCELERATING DEVICE

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Fig. 1.



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ACCELERATING DEVICE

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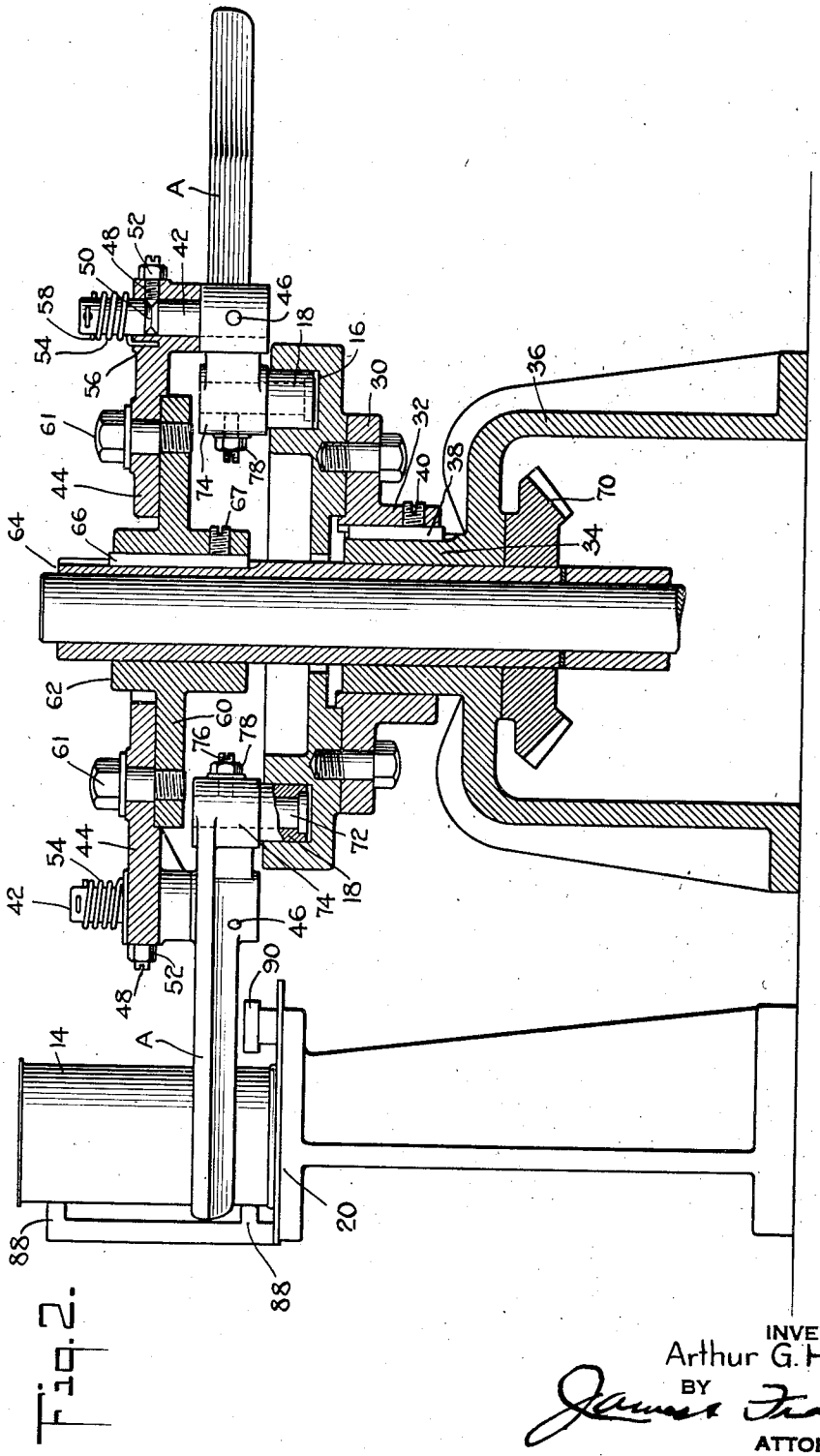


Fig. 2.

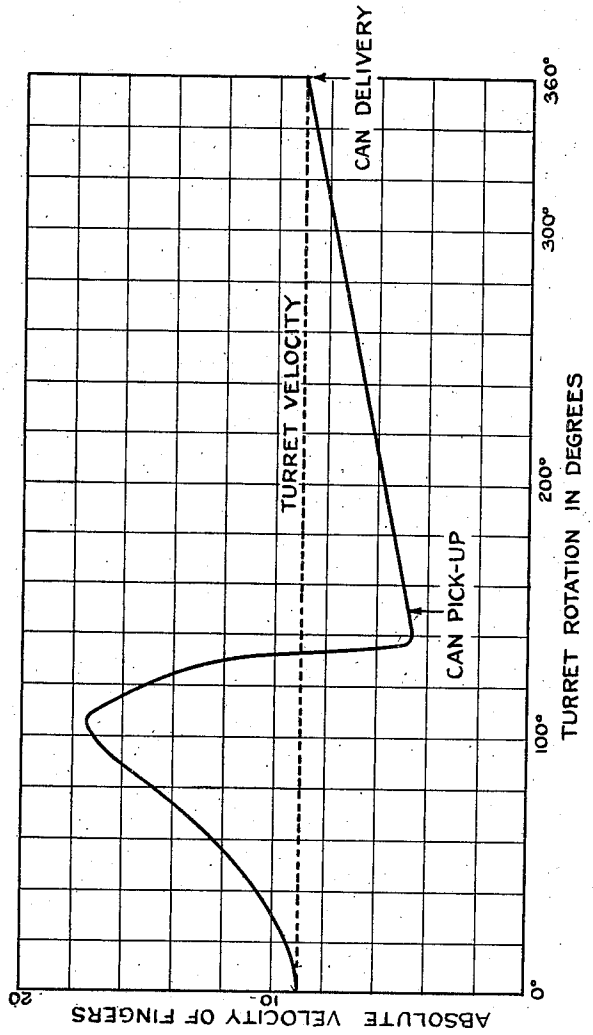
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Fig. 3.



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2,155,088

ACCELERATING DEVICE

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Application January 19, 1937, Serial No. 121,284

11 Claims. (Cl. 198—22)

This invention relates to an accelerating device and more particularly to such a device for use with apparatus for filling receptacles, particularly cans.

In canning machinery or the like, it is sometimes desirable to accelerate the cans or receptacles, as when transferring the same from a slowly moving turret to a faster moving turret. A specific example is the case of filling and closing of beer cans, for the cans must be filled slowly to prevent excessive foaming, hence it is customary to use a large slowly moving turret with a large number of can pockets therein. The can seaming machine, however, ordinarily has a smaller number of seaming heads operating at higher speed. To accelerate the cans from the relatively slow speed of the filler to the higher speed of the seaming machine, it has been suggested to employ a series of fingers distributed about a turret, the said fingers being accelerated relative to the turret while transferring the cans from the filler to the seaming machine. The object of the present invention is to generally improve can accelerating devices of this character.

I have discovered that greatly improved operation is obtainable if the fingers are moved backward relative to the turret, while transferring the cans from the filler to the seamer, the rate of retraction, however, being lessened in amount during movement of the cans in order to accelerate the cans. The fingers return empty from the seamer to the filler, and during their return are readily abruptly accelerated to a speed greater than the turret speed and abruptly decelerated to a speed lower than the turret speed, thereby preparing the same for subsequent acceleration while moving the cans. During the acceleration of the cans they approach but do not reach the normal turret velocity. I find that with this arrangement the cans are moved smoothly, and the beer is left undisturbed and does not foam, for the fingers moving the cans are being laid back, and this permits the cans to roll smoothly off the fingers without shaking or vibration. Another advantage of my improved arrangement centers about the ease with which the fingers pass between and pick up the cans on the filler, regardless of close can spacing, and the ease with which the fingers are separated from the cans on delivery to the seaming machine.

To the accomplishment of the foregoing general object and other more particularized objects which will hereinafter appear, my invention consists in the accelerator elements and their relation to the preceding and following turrets, as hereinafter are more particularly described in the specification and sought to be defined in the claims. The specification is accompanied by drawings in which:

Fig. 1 is a plan view of an accelerator embodying features of my invention;

Fig. 2 is a section taken in elevation in the plane of the line 2—2 of Fig. 1; and

Fig. 3 is a curve explanatory of the invention.

Referring to the drawings, the accelerator is here employed to transfer a series of open filled cans from a filler F to a seaming machine a portion of which is indicated at S. This portion may, for example, be a cover carrier which places a cover or end 12 over each open can 14, whereupon the covered cans are transferred to a seaming turret (not shown in the drawings) which seams the ends to the can bodies. The filler F and the seaming apparatus S are shown in broken lines because they may vary in construction. They have been omitted in Fig. 2. In general, the filler moves at a lower peripheral or linear speed than the seaming machine, and it is therefore necessary to accelerate the cans while transferring the same from the filler to the seaming machine. In the specific case here illustrated, the filler is a Meyer 34-spout beer filler having 34 can pockets, while the cover carrier has only 5 pockets. This is mentioned by way of illustration, and not limitation, for connection has been readily made with other beer fillers, by suitable modification to compensate for differences in dimension and capacity.

It will be seen that from one viewpoint the function of the accelerating turret is to engage the cans at a small center to center spacing and to spread the same apart to a large center to center spacing.

For this purpose the accelerating apparatus T comprises a plurality of fingers A movably mounted on a turret, together with additional means, specifically the stationary cam 16 and cam followers 18 for moving the fingers relative to the turret. The turret is rotated at a uniform speed, and any movement of the fingers relative to the turret results in an acceleration or deceleration of the fingers. Inasmuch as the turret moves at constant speed, it has been assumed that to accomplish the desired can acceleration the fingers on the turret should be moved faster than the turret while moving the cans, but in accordance with my invention exactly the opposite procedure is followed, the fingers being moved slower than

the turret while moving the cans, and faster than the turret while returning empty.

The cans are moved from filler F to seaming machine S on a suitable approximately semi-circular track 20. The fingers A are accelerated during their movement over the track 20, and are even more rapidly accelerated during the first part of their return movement from the seaming machine S to the filler F. The rapid acceleration of the fingers is clearly indicated by the change from the spacing between fingers 22 and 24, for example, to the very much larger spacing between fingers 26 and 28. This advances each finger into close proximity with the preceding finger, and the fingers are thus brought to the small spacing of the can pockets on the filler F. In one sense, the fingers are preliminarily advanced, relative to the turret, so that they may subsequently be retarded, relative to the turret.

The mechanical details of the turret may be briefly described as follows. The cam 16 (see Fig. 2) is stationarily mounted on a flange member 30 the hub 32 of which is secured on the upstanding collar 34 of a stationary frame member 36. Collar 34 and flange member 30 are keyed together by a suitable key 38, which may be additionally locked by a screw 40. Cam 16 is thus held stationary and forms a part of the machine frame.

The fingers A are pivotally mounted on pins 42 which in turn are carried by a turret wheel 44. The fingers are secured to the pins 42 by suitable locking means, for example small cross pins 46. The pins 42 are rotatable in turret disc 44 and are held against axial movement by a suitable pointed screw 48 the point of which is received in a circumferential groove 50 formed on pin 42. The position of screw 48 is determined by a lock nut 52. Pin 42 is additionally provided with a spring 54 the lower end 56 of which is secured in turret disc 44, and the upper end 58 of which passes through a slot at the top of pin 42. The spring tends normally to turn the pin and consequently the finger A in one direction, thus preventing any vibration or loose movement of the finger as a result of play of the cam follower 18 in the cam groove.

The turret disc 44 is mounted on a flange member 60 the hub 62 of which is secured to a tubular driving shaft 64, as by means of a key 66 and set screw 67. The disc 44 and flange 60 are secured together by bolts 61 which, as is best shown in Fig. 1, pass through arcuate slots 63 in disc 44. This affords rotational adjustment of the turret disc with respect to its driving shaft for adjustment of the position of the fingers relative to the can pockets on the filler and seaming machine.

It is not essential that the driving shaft 64 be tubular, but in the particular case here illustrated additional mechanism, not shown, was provided in association with the accelerating turret, said mechanism being connected to a center shaft 68 passing through tubular shaft 64. Otherwise the shaft 64 may, of course, be a simple solid shaft. Shaft 64 is journaled in collar 34 of frame 36. At its lower end it is provided with suitable means for driving the same, here illustrated by a bevel gear 70, it being understood that gear 70 meshes with another bevel gear, not shown, which in turn is driven by and synchronized with the main driving mechanism of the filler and seaming machine. As shaft 64 rotates, the turret disc 44 carries the accelerating fingers A around with it, and this causes the cam follower rollers 18 of the accelerating fingers to be moved around the stationary cam 16.

Each cam follower roller 18 is carried on the lower end of a pin 72 the upper end of which is received in a boss 74 cast integrally with and forming a part of the accelerating finger. The pin 72 is held in place by a suitable set screw 76 which in turn is locked by a lock nut 78.

Referring to Fig. 1, it will be seen that whenever the radius of cam 16 is increasing, the fingers are being advanced relative to the turret; that whenever the radius of the cam is decreasing, the fingers are being retarded relative to the turret; and that whenever the radius of the cam is constant, the fingers are neither advanced nor retarded, but instead remain at a fixed angular position and therefore move at a uniform velocity equal to the turret velocity. For best results, a small range of movement at uniform velocity may be provided at the point of pick-up of the cans from the filler, and at the point of transfer of the cans to the seaming machine, although this refinement is not essential. Between these points the radius of the cam decreases on the advancing side of the turret, thus causing retardation of the fingers relative to the turret. But it decreases at a decreasing rate, hence the deceleration is negative, that is, the fingers are actually being accelerated while they are moving the cans, although they are lagging more and more behind the turret. This is because the velocity of the fingers, while increasing, does not reach turret velocity before the discharge point is reached. The radius of the cam increases and then still further decreases on the return side of the turret, thus causing an advance and then an even greater retardation of the fingers. The rate of change on the return side of the turret may be made rapid and abrupt, for the fingers are without load. On the opposite side of the turret, however, where the cans are carried, the acceleration of the fingers is carefully worked out to be smooth, gradual, and uniform. Because the rate of laying-back of the fingers constantly lessens, the cans being moved thereby are, in an absolute sense, accelerated. From another viewpoint, because the rate of laying-back of the fingers decreases as the fingers move over the can track 20, the spacing between the fingers constantly increases, and the can spacing is accordingly increased by a suitable amount, say approximately two-fold, or from the spacing of the filler F to the spacing of the seaming machine S.

The movement of each can relative to its finger is significant, for while it is difficult to adequately bring out this feature on the drawings, the fact is that in practice the cans are smoothly rolled from the fingers, and are moved along the track 20 with a rotating and sliding action which prevents jarring or bumping. Specifically, note that can 80 bears against finger 82 near the inner part of the finger, while can 84 rests against finger 86 at a point nearer the end of the finger. This relative movement progressively increases until the can reaches the tip of the finger and is rolled away therefrom. During its movement on track 20, the can rotates in a counter-clockwise direction, as is indicated by the arrows on cans 14 and 84. This rotation is caused not merely by reason of contact of the can with the rail 88 at the outside of track 20, but also by reason of the retraction or laying back of the fingers themselves.

The point to be kept in mind is that if the fingers were moved faster than the turret they would

be advanced and pointed in such a direction as to tend to cause the cans to move toward the center of the turret or inwardly along the fingers. When, however, as is here the case, the fingers are moved slower than the turret, and are retracted or laid back relative to the turret, the cans tend naturally to move outwardly and to escape from the fingers, which in turn makes the movement of the cans and particularly their transfer from the accelerating turret to the seaming machine smoother and more gradual. With the present arrangement the cans tend to roll off the fingers, whereas if the fingers are accelerated at speeds above instead of below turret velocity, the cans tend to roll into the fingers. In my machine, the angle assumed by the finger at the time of transfer of the can to the seaming machine is a most advantageous angle for ready discharge of the can; and the advanced angle assumed by the fingers at the time of picking up the cans from the beer filler is also of advantage, in that the fingers point toward and readily move between the successive cans despite small can spacing on the beer filler.

In speaking of the fact that the fingers are accelerated during return from the seaming machine to the filler, I do not, of course, mean that the fingers are accelerated throughout this movement, for manifestly the deceleration of the finger begins before the time of pick-up of the can from the filler. This is necessarily so because it is only by reason of maximum backward velocity of the finger relative to the turret that the absolute velocity is made a minimum and thereby is made about equal to the relatively slow speed of the filler. From this minimum, the velocity is thereafter increased until at the time of delivery of the can to the seaming machine the relative velocity of the finger and the turret may be approximately zero, in which case the absolute velocity of the finger is a medium velocity about equal to that of the first turret of the seaming machine. Thereafter the fingers are abruptly accelerated and attain their maximum absolute velocity.

In the specific example of the invention here illustrated the filler is a Meyer 34-spout beer filler. The accelerating turret is provided with nine fingers, while the cover carrier is provided with five pockets, the arcuate spacing between which is about double that of the beer filler.

The accelerating turret accelerates the cans, or increases the can spacing from that of the filler to approximately that of the cover carrier of the seaming machine. It may be noted, however, that it is not essential for the can velocity (or spacing) produced by the accelerating turret to actually equal that of the cover carrier, for it may be slightly less, in accordance with the invention disclosed and claimed in my Patent No. 2,032,481, issued March 3, 1936, disclosing how the cover carrier may function to apply the can end to and hold the same on the can body somewhat ahead of true center to center relation of the turrets, this being made possible by reason of the divergence or slope of the outer flange on the can end. The premature capping of the can with the cover prevents spillage even though the speed of the accelerating turret is somewhat less than the speed of the cover carrier turret.

My improved accelerating turret may be used to transfer cans from an indexing star to a cover carrier turret. The latter may be provided with pockets separated by an arc length more than double the pocket spacing of the indexing star, the fingers of the accelerating turret then increasing the can spacing somewhat more than twofold. The speed of the fingers at the time of pick-up of the can may slightly exceed the speed of the indexing star which feeds the cans to the accelerating turret, and similarly the speed of the fingers at the point of transfer of the cans to the cover carrier may be slightly less than the speed of the cover carrier.

When dealing with beer it is desirable to minimize any abrupt movement or shaking of the can, and the difference in speed between the accelerating fingers and the cover carrier at the instant of transfer is reduced to a slight amount, say, a difference of 5%.

Figure 3 is a graph plotting the absolute speed in space of the can and can finger, as a function of the rotation of the turret. It will be observed that there is a slow steady acceleration of the can from the time of can pick-up to the time of can delivery, this being shown at the right-hand part of the curve. More than half the rotation of the turret may be devoted to the can acceleration, this being so because of the rapidity with which the finger may be moved during the remaining part of the cycle of rotation of the turret. Immediately after delivery of the can the finger is rapidly accelerated, as is indicated at the first part of the curve, and the finger is then rapidly decelerated to a point of minimum velocity for the can pick-up.

The normal velocity which the fingers would have were they not moved relative to the turret is indicated by the horizontal dotted line marked Turret velocity. Those parts of the curve above the dotted line represent an advance of high-speed movement of the fingers relative to the turret, while those parts of the curve below the dotted line represent a retraction or low-speed movement of the finger relative to the turret. Manifestly the can is picked up, accelerated, and delivered, all at speeds below the turret speed. The fingers are moved at a speed higher than the turret speed only when unloaded, that is, between can delivery and can pick-up.

The product of velocity and time is distance, and the area of the curve above the dotted line therefore represents the distance which the finger moves in advance of the turret. Similarly the area below the dotted line represents the distance which the finger moves backwardly on the turret. These areas, of course, equal one another, so that the finger is brought to initial position at the end of one complete revolution of the turret. The useful part of the curve is the slow-speed part below the dotted line, and the primary function of the high-speed part above the dotted line is to compensate for the loss of position suffered by the finger during the slow-speed movement. In simple parlance, the fingers are moved far ahead when empty in order to provide room for the subsequent retraction or backward movement of the fingers relative to the turret while moving the cans.

It is believed that the construction and operation as well as the many advantages of my improved apparatus for accelerating cans, will be apparent from the foregoing detailed description thereof. It will also be apparent that while I have, for convenience, referred to the handling and acceleration of cans, the invention, may, of course, equally well be applied to other receptacles. It will further be understood that while I have shown the accelerating turret disposed between a filler and a seaming machine, the accel-

erating turret may also be disposed between other devices where such devices move at relatively different speeds.

It will be apparent that while I have shown and described my invention in a preferred form, many changes and modifications may be made in the structure disclosed, without departing from the spirit of the invention, defined in the following claims.

I claim:

1. Apparatus for accelerating a can, comprising driving means moving at a uniform speed, means driven thereby to move a can, control means to move said can moving means backward relative to the driving means during substantially all of the time that the can-moving means is moving the can, but the backward movement produced by said control means being at a decreasing rate in order to accelerate the can.

2. An accelerating device for can seaming machinery, said device comprising a rotatable turret, a plurality of fingers movably mounted on and projecting from said turret, and means to move said fingers relative to said turret in order to accelerate or decelerate the same, said means being so designed as to move the fingers backward relative to the turret during substantially all of the time that the fingers are moving the cans to be accelerated, the rate of backward movement being decreased while the can is being moved, in order to accelerate the can.

3. An accelerating device for can seaming machinery, said device comprising a turret, means to rotate the same at a uniform speed, a plurality of fingers movably mounted on and projecting from said turret, and cam and cam follower means to move said fingers relative to said turret in order to accelerate or decelerate the same, said means being so designed as to move the fingers backward relative to the turret while the fingers are moving the cans to be accelerated, the rate of backward movement being decreased from the time the can is received until the time the can is delivered, in order to accelerate the can.

4. Can accelerating apparatus comprising a turret rotated at uniform speed, a can guide track surrounding a part of said turret, a plurality of accelerating fingers projecting from and oscillatably mounted on said turret, and means for oscillating said fingers on said turret, said fingers moving slower than the turret during the major movement of the turret and during the conveyance of the cans, the rate of speed of said fingers increasing as the fingers move over the track in order to accelerate the cans.

5. Can accelerating apparatus comprising a turret rotated at uniform speed, a can guide track concentrically surrounding a part of said turret, a plurality of accelerating fingers projecting from and oscillatably mounted on said turret, and cam and cam follower means for oscillating said fingers on said turret, said fingers being retarded and laid back relative to the turret during substantially all of their movement over the guide track, the fingers being laid back in order to help roll the cans off the fingers with a smooth rotating movement, the cans approaching the ends of the fingers by reason of the laying-back of the fingers relative to the turret, the rate of retardation of said fingers decreasing as the fingers move over the track in order to accelerate the cans.

6. An accelerating device for accelerating freshly filled beer cans or the like, said device comprising a rotatable turret carrying a plurality of accelerating fingers projecting therefrom, a can guide track extending around a substantial part of the periphery of said turret for cooperation with the accelerating fingers, said fingers each being movably mounted on the turret and being provided with mechanism for accelerating or decelerating the fingers relative to the turret, the fingers being retarded relative to the turret while passing over the aforesaid guide track, and being advanced relative to the turret when remote from the guide track, the rate of retardation of the fingers being lessened as the fingers pass from the entrant to the discharge end of the guide track, whereby the cans moved by said fingers are accelerated in an absolute sense.

7. An accelerating device for accelerating freshly filled beer cans or the like, said device comprising a rotatable turret carrying a plurality of accelerating fingers projecting therefrom, a can guide track extending around a substantial part of the periphery of said turret for cooperation with the accelerating fingers, said fingers each being oscillatably mounted on the turret and being provided with cam and cam follower mechanism for accelerating or decelerating the fingers relative to the turret, the fingers being moved slower than the turret while passing over the aforesaid guide track, and being moved faster than the turret when remote from the guide track, the slowness of the fingers being lessened as the fingers pass from the entrant to the discharge end of the guide track, whereby the cans moved by said fingers are accelerated in an absolute sense.

8. Can treating apparatus comprising a supply turret, a receiving turret moving at a faster linear speed than the supply turret, and an accelerating turret between said supply turret and receiving turret, said accelerating turret having a plurality of fingers projecting outwardly therefrom, cam followers on said fingers, a cam cooperating with said cam followers, said cam being so shaped as to retard the fingers relative to the turret during substantially all of the movement of the fingers from the supply turret to the receiving turret, and to advance the fingers relative to the turret during movement of the fingers from the receiving turret to the supply turret, the rate of retardation being variable and being decreased as the fingers move from the supply turret to the receiving turret, whereby the cans are accelerated from the speed of the supply turret to the speed of the receiving turret.

9. Can treating apparatus comprising a can filling turret, a receiving turret moving at a faster linear speed than the filling turret, and an accelerating turret between said filling turret and receiving turret, said accelerating turret having a plurality of fingers projecting outwardly therefrom, cam followers on said fingers, a stationary cam cooperating with said cam followers, said cam being so shaped as to move the fingers backward relative to the turret during movement of the fingers from the filling turret to the receiving turret, and to move the fingers forward relative to the turret during movement of the fingers from the receiving turret to the filling turret, the rate of backward movement being variable and being decreased as the fingers move from the filling turret to the receiving turret, whereby the cans are accelerated from the speed of the filling turret to the speed of the receiving turret.

10. Apparatus comprising a supply turret, a re-

ceiving turret moving at a faster linear speed than the supply turret, and an accelerating turret between said supply turret and said receiving turret, said accelerating turret having a plurality of fingers projecting outwardly therefrom, a can guide track extending around a part of the periphery of the turret between the supply turret and the receiving turret for cooperation with the accelerating fingers, and means to vary the speed of the fingers relative to the turret, said means being so arranged as to preliminarily abruptly accelerate the fingers to a speed faster than the turret and to then abruptly decelerate the fingers to a speed lower than the turret speed, all while the fingers are empty and are moving on the side of the turret opposite the can guide, and thereafter accelerating the fingers while moving the same more slowly than the turret during substantially all of the time that the fingers pass over the can guide, the cans being accelerated while the fingers moving the same are being laid back with respect to the turret.

11. Apparatus comprising a supply turret, a receiving turret moving at a faster linear speed than the supply turret, and an accelerating turret between said supply turret and said receiving turret, said accelerating turret having a plurality of fingers projecting outwardly therefrom, a single cam follower on each of said fingers, a single stationary cam cooperating with said cam followers, the cam being so shaped as to preliminarily abruptly accelerate the fingers to a speed faster than the turret and to then abruptly decelerate the fingers to a speed lower than the turret speed, all while the fingers are empty and are moving from the receiving turret to the supply turret, and thereafter accelerating the fingers while moving the same more slowly than the turret during substantially all of the time that the fingers move from the supply turret to the receiving turret, the cans being accelerated while the fingers moving the same are being laid back with respect to the turret.

ARTHUR G. HOPKINS.