This invention relates to a machine for beading and/or flanging can bodies. Can bodies are frequently beaded, that is they are formed with one or more peripheral grooves, to strengthen the metal. By this means it is possible to use a thinner gauge metal in forming can bodies.

A can beader should operate at high speed and should perform the beading operation uniformly and accurately. Also, it should operate so as not to damage or deform can bodies during the beading operation. It is also desirable to provide adjustment means to vary the spacing and number of beads and to adjust the machine for can bodies of different diameters and different heights.

Machines heretofore used for beading operations have been relatively complex in their design and operation. In beading a can body it is necessary to provide a male die or seaming tool and a female die or chuck. The male die bears against the outer surface of the can body and the female die bears against the inner surface of the can body. In prior can body beaders, the design and operation of these dies have been such that their movements are complex and their timing is difficult.

It is an object of the present invention to provide an improved machine which is capable of performing beading or flanging or other similar operations on can bodies or the like.

It is a further object of the invention to provide a machine of the character and for the purpose described which is capable of high speed, dependable and accurate operation.

It is a further object of the invention to provide means for adjusting a can body beader or flanger to vary the number and spacing of the beads and to adjust the machine for can bodies of different diameters and heights.

Yet another object of the invention is to provide a machine of the character and for the purpose described which is simple in design and includes fewer moving parts and fewer timing difficulties than machines previously designed.

Still another object of the invention is to provide a machine which is capable of performing both beading and flanging operations on can bodies.

These and other objects of the invention will be apparent from the ensuing description and the appended claims.

One form of the invention is illustrated by way of example in the accompanying drawings and is described in detail hereinafter.
made, the spider is clamped in adjusted position by means of a screw 32. The spider 30 is formed with arms 33 which slideably support slide members 34, one of which is best shown in Figure 4. As there shown, the spider arms 33 are formed with L-shaped, machined portions 35 to slidably receive the slide member 34 and gib 36 are provided to retain the slide in place.

The slide member 34 includes a sleeve bearing 37 within which a spindle 38 is rotatable. Bushings 39 are provided in which the spindle 38 is freely rotatable. Suitable means may be provided for positively rotating the spindle 38, e.g., a sprocket 40 which is keyed at 41 to the spindle and a chain 42 extending about the perimeter of the machine and meshing with the sprockets. The chain 42 is suitably anchored at one point (not shown) to the frame of the machine so that rotation of the sprockets 40 about the axis of shaft 26 will cause rotation of the sprockets and hence of the spindles 28 about their axes. The sprocket 40 is keyed to the spindle for sliding movement along the length of the spindle, so that as the spindles are reciprocated in the manner and for the purpose described hereafter, the sprockets 48 will nevertheless remain in the same position.

It will be apparent that, as the shaft 26 and with it the spider 30 rotate, each slide member 34 will also rotate and its spindle 38 will rotate about its own axis and about the axis of the drive shaft 26. A reciprocating motion is also imparted to each slide member 34, and with it to its spindle 38, by means of a cam 45 which abuts the outer end of the sleeve 30. A bushing 46 is provided so that the shaft 26 is freely rotatable within the cam. The cam 45 is formed with an annular groove 47, and it will be seen from an inspection of the left-hand cam 45 that the cam groove 47 has a high point at 47a corresponding to the advanced or innermost position of the spindle 38, and a low point at 47b corresponding to the retracted or outermost position of the spindle 38. A roller 48 rides in the cam groove 47a, and it is connected, as by means of a stub shaft 49 and a nut 50, to the slide 34.

Referring more particularly to Figure 3, it will be seen that, at its inner end, each spindle 38 is fixed to a chuck or female die 51. In can body headers of prior design the dies corresponding to the dies 51 are called spindles, but for convenience of description and to distinguish them from the spindles 38, they will be referred to hereinafter as "chucks." The right-hand chuck 51 is formed in three parts, i.e., a cap or flanging portion 52 which is formed with an annular flanging shoulder 53, an intermediate portion 54 which is formed with annular beading grooves 55 and an end portion 56 which is also formed with one or more beading grooves 57. The several parts are clamped together and to the spindle 38 by means of a cap screw 58 which is countersunk in a recess 59. The left-hand chuck 51 is of generally similar construction but its end portion 56c is smaller and is not formed with a beading groove.

Each spider 30 also supports a pair of spaced guide plates 65 which are formed with holes 66 to receive, and permit passage of, the chucks 51, and it also supports a pair of spaced burret plates 67 which are formed with pockets 68. The pockets 68 are best shown as there shown, rollers 69 are rotatably mounted at the outer edges of each pocket 67. As shown in both Figures 1 and 2, cap screws 70 serve to bolt the turret plates 61 to the spider 30.

The chucks or female dies 51 are intended to cooperate with a male die or beading assembly 75 which is best shown in Figure 2. Referring thereto, left- and right-hand support rings 76a and 76b are provided on opposite sides of the beading and flanging station. As shown in Figures 2 and 7, tie bars or rods 77 are provided at spaced intervals about the support rings 76a and 76b and are clamped thereto as by means of split collars 78 and cap screws 79. As shown in Figure 7, the tie rods 77 are clamped to the frame of the machine by means of screws 80.

A suitable number of cross bars 81 are provided as shown in Figure 2. As shown in Figure 3, each cross bar 81 extends between and is adjustably mounted on the support rings 76a and 76b by means of screw assemblies 82. Each of the screw assemblies 82 comprises a tubular screw 83 which is formed with an axial passage 85 through which a screw 86 extends. The inner end of the screw 85 is threaded at 85a into one end of the cross bar 81. The outer or tubular screw 83 extends through a passage 87 formed in the lip 83c of the support ring 76a and, as will be seen, the passage 87 is of sufficiently large diameter to allow a certain amount of play of the screw 83. At its inner end the screw 83 is threaded to a square nut 84c which is located so closely to the support ring that it cannot turn and will not, therefore, loosen during operation of the machine. A lock nut 85 is also provided.

It will be apparent that cross bars 81 can be adjusted with great precision. Thus, they can be moved inwardly or outwardly and they can be warped, by manipulation of the screw assemblies 82. Thus, if it is desired to move inwardly the right-hand end of the cross bar 81 shown in Figure 2, it is merely necessary to screw the right-hand screw 83 inwardly. If it is desired to move the right-hand end of the cross bar 81 outwardly, it is merely necessary to screw the right-hand screw 83 outwardly, then tighten the lock nut 85. The relatively large diameter of the holes 87 allows some play to the screws 83, hence permits warping the cross bars 81.

The cross bar 81 is formed with grooves 85 to receive beading bars 86 and flanging bars 87. The bars 86 and 87 are inserted into guides 90 which are secured on an arm extending from a receiving station A to a delivery station B (see Figure 2). They are fixed to the cross bars 81 by means of cap screws 91. Each of the beading bars 86 is formed with a beading rib 92 and each of the flanging bars 87 is formed with a beveled flanging shoulder 94. The ribs 92 are of a rounded shape calculated to form annular grooves or beads 101 in a can body, in cooperation with the beading grooves 85 of the chucks 51, and the beveled shoulders 94 are of a convex shape calculated to form flanges 102 in cooperation with the shoulders 53 of the chucks 51.

It will be apparent from an inspection of Figures 1 and 3 that, as the drive shaft 26 rotates the spindles 28 and the chucks 51 will also rotate about the axis of the drive shaft 26. As the spindles 28 and the spindles and chucks will also rotate about their own axis. It will also be apparent that the cams 45 will cause each pair of spindles 28 and chucks 51 to reciprocate between an outermost or retracted position as shown at the lower edge of Figure 3 and an advanced position as shown at the upper edge of Figure 1 and in Figure 3. This latter operation is timed so
that, as each can body is delivered at the delivery station A by the feed screw 16 and is seated in a pocket 68 of the turret plates 67, the spindle 33 and chucks 51 will move inwardly to the position shown in Figure 3 in which the annular grooves 55 are in registry with the feeding ribs 59 and the shoulders 55 are in registry with the shoulders 59 of the flanging bars. Continued rotation of the drive shaft 25 will cause the cam body to traverse the inner edge of the feeding bars 96 and flanging bars 97. Meanwhile, because of frictional engagement of the cam bodies with the feeding bars and flanging bars the cam bodies will roll along the bars 88 and 97. It will thus be apparent that beads 151 and flanges 152 will be formed on the can bodies. When each can body, after completion of the feeding and flanging operations, reaches the station B, a deflector bar 183 will deflect it to the exit chute 12.

As illustrated in the drawings, positive means such as the prongs 45 and a chain 54 are provided for positively rotating the spindles 33 and chucks 51 about their own axes. However, it is not necessary to provide any such means. In most cases, if not all cases, frictional engagement of the chucks 51 with the can bodies will cause rolling of the can bodies.

During the feeding and flanging operations, the chucks 51 and the seaming and flanging bars 88 and 97 are, of course, held in operative relation to each other. In prior bearers this is accomplished by moving the bearing rollers radially inwardly toward the can bodies and holding them in engagement with the can bodies during the feeding operation. The prongs or bearing spindles are not moved radially.

By way of contrast in the feeding machine of my invention the chucks 51 are mounted for radial movement as well as for rotative movement about the central axis of the machine and reciprocating movement transversely of the feeding and flanging bars. Also, the chucks 51 are pivotally mounted and are subjected to a constant yielding force which is exerted in an outward, radial direction. This type of mounting and its mode of operation and significance will now be described.

Referring to Figures 4 and 5, each sleeve 37 is formed at each end with an arm 116 which is pivotally mounted on pivot pin 111. The pivot pins 111 are clamped to bosses 112 formed on the slide 33. The slide 33 is formed with two projecting lugs 113 and the sleeve 37 is formed with a projecting lug 114 having a slot 115 to receive a screw 116. A gib 117 bridges the gap between the lugs 113 and is bolted thereto by means of screws 118, and it is formed with a slot 119 to receive the screw 116. A coil spring 125 is mounted on the screw 116 and is compressed between the lug 114 and a square nut 123 which is prevented from turning by an angle bracket 127.

It will be apparent that each spring 125 will constantly urge its spindle 33 and chuck 51 outwardly and will urge the lugs 113 against the gib 117. In this position each chuck 51 will bear firmly against a can body and will hold the can body firmly against the bars 88 and 97. However, each chuck will yield inwardly whenever an extra thinness of metal is encountered, as at a side seam.

Means are also provided for adjusting the machine for can bodies of different diameters and different heights. Adjustment for can bodies of a different diameter can be made by removing the turret plates 67 and replacing them with turret plates having pockets 68 of the proper radius (see Figures 1 and 2). Adjustment for can bodies of a different height is accomplished by the means shown in Figure 6.

Referring to Figure 6, one of the cams 45 is there shown and it is provided with an extension or hub 130 which is formed with a flange 131. The flange 131 is bolted to a flange 122 which has a hub 132 formed with two diametrically opposite bosses 134, only one of which is shown in Figure 6. A threaded rod 135 is provided which is fixed at one end by means of a set screw 135 to one of the bosses 134, and which extends through an end casting or leg 137 of the frame of the machine. Nuts 138 and 139 are threaded onto the rod 135 on opposite sides of the casting 137. A smooth, unthreaded guide rod (not shown) is provided on the opposite side of the drive shaft 25.

It will be apparent that, by loosening one of the nuts 138, 139 and turning the other nut clockwise, the rod 135, and with it the cam 45, will be moved one way or the other along the shaft 25, and that one set of spindles 33 and chucks 51 can be adjusted to accommodate can bodies of a given height. When adjustment has been made, the other nut is tightened to lock the cam 45 in adjusted position. Further adjustments may also be required; e.g., when the cam 45 is shifted outwardly for taller can bodies, the adjoining spider 102 must be loosened, shifted until it is again in abutting relation to the cam 45, and then clamped to the shaft 25. Also, adjustment of the right-hand chuck 51 may be necessary; e.g., it may be necessary or desirable to substitute a shorter or a longer end portion 56.

Among the advantages of the machine thus described and illustrated may be mentioned the following:

The feeding and flanging operations are performed by tools (i.e., by the bearing bars 96 and flanging bars 97), which are stationary. The only moving parts are the central drive shaft 25 and the parts carried thereby including the spindles 33 and the chucks 51 which also have a rotary motion about their own axes and a longitudinal, reciprocating motion. The necessity of moving a bearing or flanging tool into contact with a can body, then removing it, all in timed relation to a very rapidly operating machine, is completely obviated. The reciprocating and rotary motions of the chucks and spindles are relatively simple and do not present nearly as great a timing difficulty as the bearing tools of prior machines. As a consequence, the machine of my invention is simple in its construction and operation and is capable of high speed, accurate and dependable performance.

The pivotal mounting and spring bias of the bearing spindles and chucks are highly advantageous. As explained hereinafore, in prior bearers, bearing rollers are provided which are moved inwardly by positive mechanical means to accomplish the bearing operation. The complications of a positive mechanical movement are avoided in the machine of the present invention, by mounting the bearing spindles and chucks for outward radial movement, and holding them normally in operative position but allowing inward yielding in proportion to the thickness of metal encountered.

The machine of my invention can also be adjusted easily and quickly for varying conditions. Thus, the chucks 51 can be readily changed to provide a greater or lesser number of beads and to provide or omit a flanging operation, as de-
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sired. The beading bars 96 and flanging bars 97 can be rapidly and accurately adjusted by the screw mountings illustrated in Figure 3. The machine is easily adjusted for can bodies of a different height by the means illustrated in Figure 6, and it is equally easily adjusted for can bodies of a different diameter by substitution of turret plates 87.

Yet another advantage resides in the particular structure of the chucks 51. Referring to Figure 3, it will be seen that the chucks comprise identical intermediate or body portions 54, each of which has two seaming grooves 55. If it is desired to form a middle bead 55 on can bodies, then an end portion such as shown at 56 is fitted on the right-hand chuck. If a middle bead is not desired, then both chucks are fitted with end portions such as shown at 56a. In either case, the stroke of the chucks remains the same. This will be made apparent by an inspection of Figure 1. Referring thereto, it will be seen that when the chucks 51 are in their advanced, operating positions as shown at the top of Figure 1 (and in Figure 3), the two chucks will touch, or nearly so, and that the center beading groove 57 and the center beading bar 51 coincide with the center of the can body. When retracted as shown at the bottom of Figure 1, the left-hand (or short) chuck 51 clears the can body by a greater margin than the right-hand chuck 51. Nevertheless, the two chucks make the same stroke, and if a small (ungrooved) end portion 56a is fitted to the right-hand chuck instead of the large (grooved) end portion 56, the stroke will remain the same. It will, therefore, be apparent that provision is made for forming or omitting a center bead, without the necessity of varying the stroke of the beading chucks and spindles.

I claim:

1. A can body beader comprising a rotary turret adapted to receive can bodies and to rotate the same in sequence about the turret axis from a receiving station to a discharge station; an arcuate beading member concentric to said turret, said beading member being adapted to bead can bodies; a plurality of cooperable dies mounted for reciprocating motion transversely to said beading member and for rotation about the turret axis in juxtaposition to said beading member, said dies being also pivotally mounted for radial movement toward said beading member and being yieldably biased toward said beading member, each of said dies being also mounted for rotation about its own axis; means for positively rotating said dies with said turret; and means for reciprocating the same in timed relation to rotation of the turret to hold each can body received by the turret in operative relation to the beading member and to release the same at the discharge station.

2. A can body beader comprising a rotary turret adapted to receive can bodies and to rotate the same in sequence about the turret axis from a receiving station to a discharge station; an arcuate beading member concentric to said turret and spaced radially therefrom, said beading member being adapted to bead can bodies; a plurality of cooperable dies mounted for reciprocating motion transversely to said beading member and for rotation about the turret axis in juxtaposition to said beading member, said dies being also pivotally mounted for radial movement toward said beading member and being yieldably biased toward said beading member, each of said dies being also mounted for rotation about its own axis; means for positively rotating said dies with said turret; and means for reciprocating the same in timed relation to rotation of the turret to hold each can body received by the turret in operative relation to the beading member and to release the same at the discharge station.