

May 2, 1967

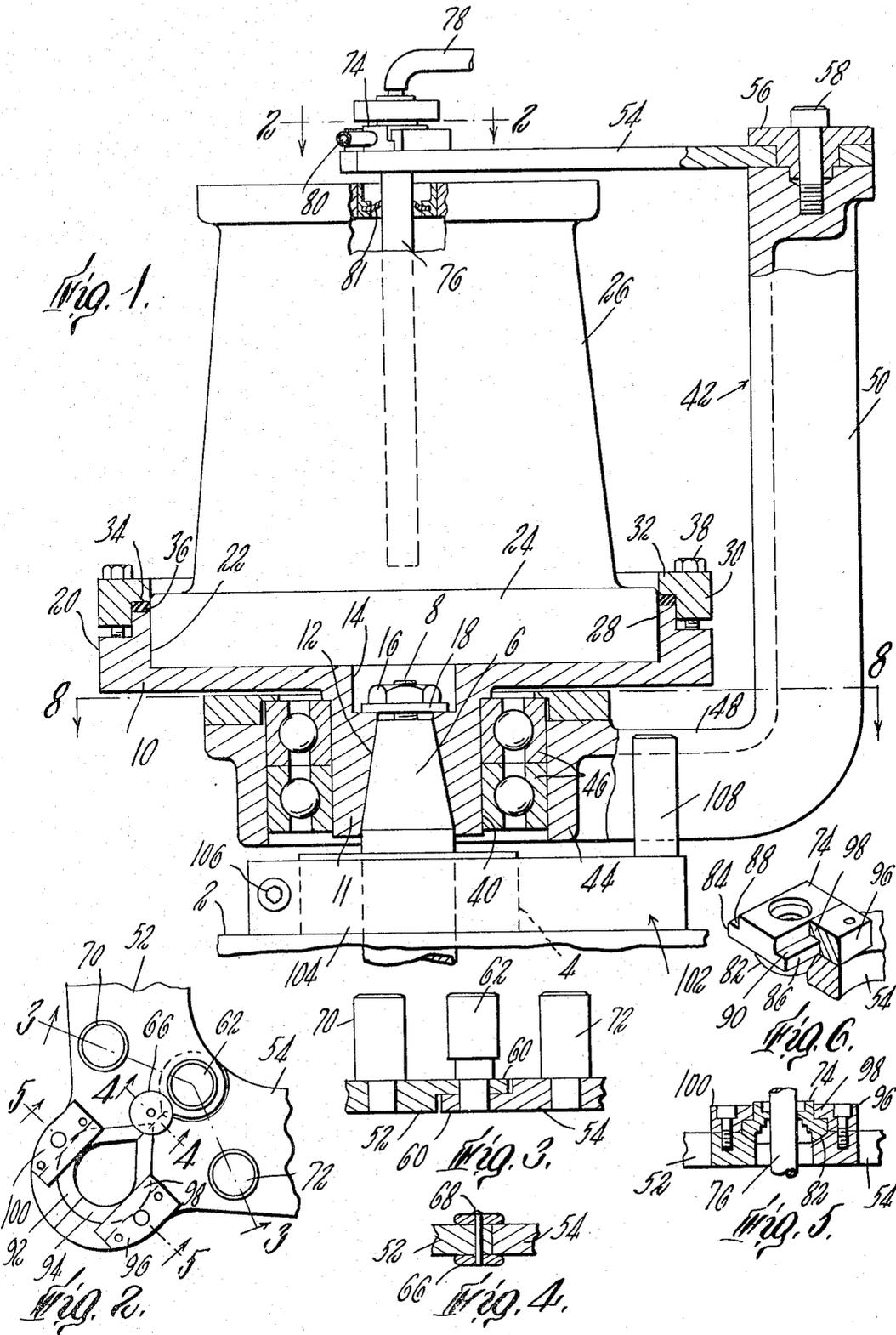
R. F. COLE

3,317,127

CENTRIFUGE

Filed March 25, 1965

2 Sheets-Sheet 1



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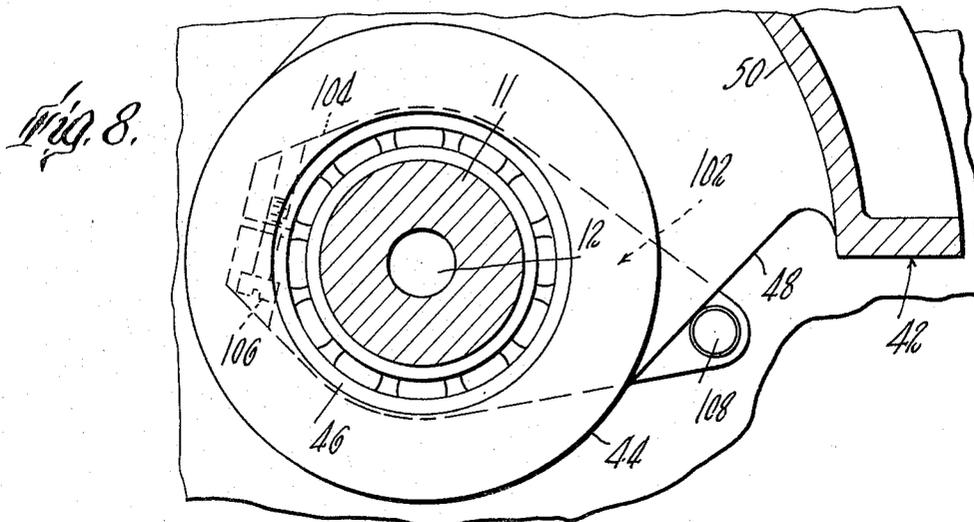
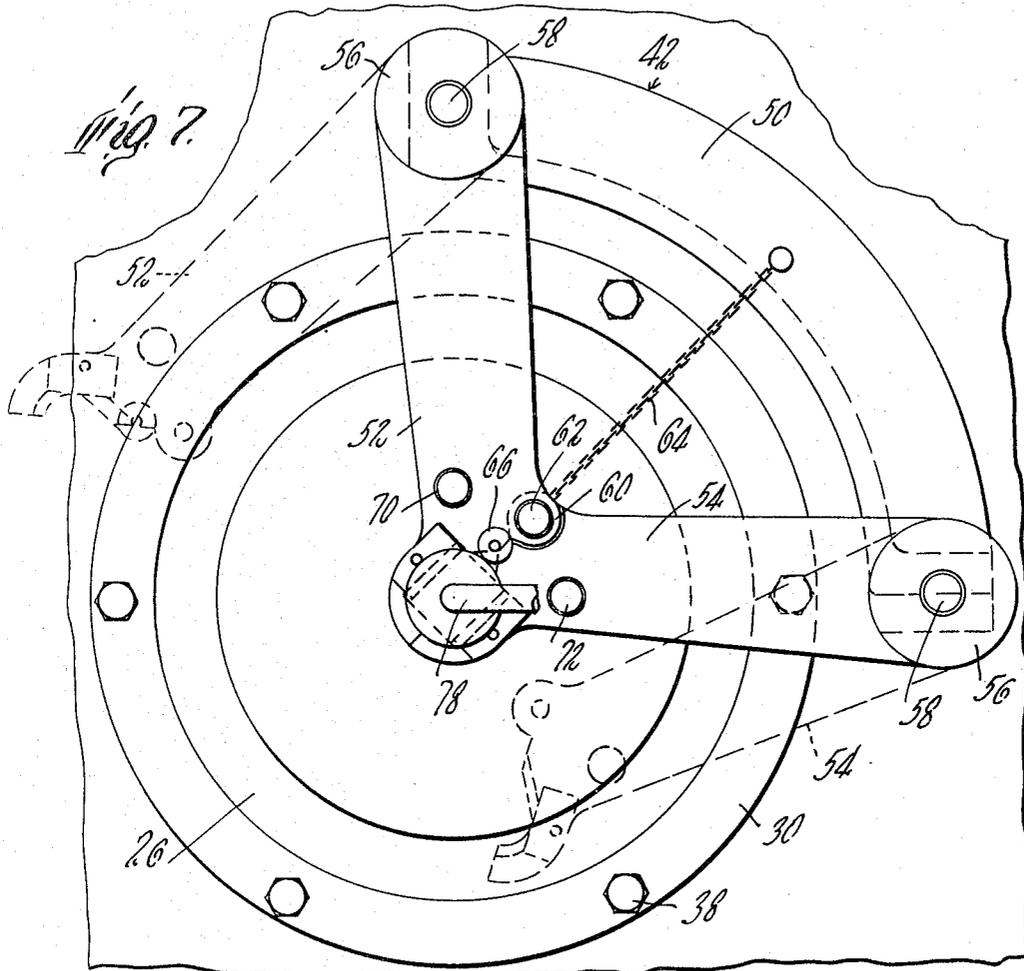
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CENTRIFUGE

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Filed Mar. 25, 1965, Ser. No. 442,765
7 Claims. (Cl. 233-26)

The present invention relates to centrifuges and more particularly to a centrifuge accessory for use with centrifuges which provide a drive spindle having an exposed free end, and with a centrifuge bowl having an attached feed header which remains stationary as the bowl is rotated.

In centrifuges of this type, for instance centrifuges shown in Latham Patent 3,145,713, liquids, for example human blood, can advantageously be processed in various procedures involving centrifugal separation of lighter and heavier fractions, for example the red cells from other components. Centrifugal treatment is carried out in a bowl which is supported in a chuck on the centrifuge drive spindle for rotation during the processing. The infeed and outfeed lines through which liquid is supplied to and removed from the bowl remain stationary during processing and accordingly the bowl is provided at one end with a feed header connected with the bowl body by means permitting the bowl body to rotate as the header remains stationary. If the header is supported on the bowl body during the centrifuging operation, as has been done heretofore, the connection between the header and the bowl body must include structure to support the header both radially and axially and maintain it in proper coaxial relationship with the drive spindle, while permitting rotation between header and body. In some applications, for example, in the processing of human blood for some purposes, the operation must be carried out under sterile conditions and, accordingly, the connection between the feed header and the bowl body must further include a seal which will maintain sterility within the bowl and yet permit rotation between bowl and header. The foregoing requirements have presented problems and incorporation into the bowl of structure performing both sealing and bearing functions has not been wholly satisfactory, and, especially if the bowl and header is a disposable unit, has unduly added to the cost of the unit. The present invention aims to overcome the foregoing difficulties.

An object of the invention is to provide simple and effective means for supporting in predetermined fixed position the feed header of a centrifuge bowl of the type referred to.

Another object of the invention is to provide such means in which the header is supported independently of the bowl body.

A further object of the invention is to provide means for positioning the bowl header which is part of the centrifuge installation, whereby a single such unit serves the desired purpose for all the individual bowl units which are processed on that installation.

A still further object of the invention is to provide apparatus whereby the header unit in such centrifuge bowls may be supported from the chuck which supports the centrifuge bowl, but independently of the bowl.

Other and further objects, features and advantages of the invention will become apparent from the following description of an illustrative embodiment wherein reference is made to the accompanying drawings, in which

FIG. 1 is a elevation partly broken away and in section;

FIG. 2 is a horizontal sectional view taken on line 2-2 of FIG. 1;

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FIG. 3 is a detail vertical sectional view taken on line 3-3 of FIG. 2;

FIG. 4 is a detail vertical sectional view taken on line 4-4 of FIG. 2;

FIG. 5 is a detail vertical sectional view taken on line 5-5 of FIG. 2;

FIG. 6 is a detail perspective view, partly broken away and in section, showing the relationship of the feed header to the means which support it.

FIG. 7 is a plan view; and

FIG. 8 is a horizontal sectional view taken on the line 8-8 of FIG. 1.

In accordance with the invention the foregoing objects are accomplished by providing a centrifuge accessory including a bowl chuck, constructed and arranged to be mounted on the free end of a centrifuge spindle to support the centrifuge bowl for rotation with the chuck and spindle, and a support member mounted on the chuck for relative rotary movement therebetween about the spindle axis, the support member extending radially outward from the spindle and axially of the spindle away from its free end, and including a pair of arms pivoted at spaced points on the support member for movement of their free ends toward and from each other, the free ends meeting at the projected spindle axis. The arms are adapted to engage and support the bowl header in the desired predetermined fixed position spaced, along the spindle axis, from the free end of the spindle a distance which is appropriate to the size of the centrifuge bowl, with the header accurately positioned with respect to the spindle axis. The arms are each provided with portions which interfit with mating portions on the other arm to accurately locate the free ends of the arms with respect to each other and means is provided for releasably locking the arms together when in position to engage the header to clamp the header between them. The ends of the arms also are provided with portions shaped to interfit with the header to hold it in position and accurately locate it with respect to the arms when it is clamped between them. Means is provided for holding the supporting member against rotation as the spindle and chuck rotate within it.

Referring now to the illustrative embodiment of the invention shown in the drawing, this is shown installed on a centrifuge having a frame 2 including an upstanding boss 4 through which the free end of the spindle 6 projects upwardly. The spindle 6 is suitably journaled in the centrifuge and provided with appropriate means for rotating it at high speed. The upper free end of the spindle 6 is tapered upwardly as shown and provided with a threaded stud 8 extending from its free end coaxially with the spindle. The centrifuge so far described is of known construction.

The bowl holding chuck comprises a chuck body 10 having a hub 11 with a conical central bore 12 adapted to receive the tapered end of spindle 6 for mounting the chuck on the spindle. A central counterbore 14 in the upper surface of the chuck body provides a recess for the reception of the spindle nut 16 which, when threaded on the stud 8 and tightened down against the washer 18, fastens the chuck body securely to the spindle. Rising from the upper surface of the chuck body is a peripheral flange 20 having a cylindrical inner surface 22 adapted to snugly receive the cylindrical bottom 24 of the centrifuge bowl 26. The interior construction of the centrifuge bowl has not been shown in detail as such does not form part of the present invention. The flange 20 includes an upwardly extending flange 28 of smaller diameter, as shown. A chuck clamp ring 30 has a cylindrical interior surface which fits on the outer cylindrical surface of the flange 28 and an inwardly extending portion 32 provided with a downwardly facing annular sur-

face 34 overlying the annular top surface of the flange 28. An O-ring 36 is disposed between the flange 28 and the surface 34. Chuck bolts 38 secure the clamp ring 30 to the flange 20 of the chuck body and may be tightened down to compress the O-ring 36 into engagement with the bowl bottom 24 to retain the bowl in the chuck. Rotation of spindle 6 thus rotates the bowl 26 with the chuck.

Supported on the outer cylindrical surface 40 of the chuck hub 11 is a support member 42. The support member 42 is provided with a hub 44 having a central vertical cylindrical opening surrounding the hub 11. Ball bearing units are disposed inside the hub 44 and on the outer surface 40 of the hub 11, whereby the supporting member 42 is carried on the chuck so that the support member may remain stationary as the chuck rotates within it.

The support member 42 further includes an arm 48 extending radially outwardly from the hub 44 and an arcuate portion 50 integral with arm 48 and extending axially in the direction away from the free end of spindle 6. The arm 48 is of such a length that the arcuate portion 50 is disposed entirely outside the chuck body 10 and bowl 26.

Mounted at spaced points on the top of the arcuate portion 50 is an arm 52 and an arm 54. Each arm is mounted on the arcuate portion 50 by means of a pivot pin 56 secured to the arcuate portion 50 by a bolt 58, these pivot pins 56 being adapted to maintain the arms accurately positioned on the arcuate portion 50 while permitting swinging movement of the free ends of the arms toward and from each other. Each arm is provided with an ear 60 adapted to lie in flat engagement (FIG. 3) with the ear on the other arm, when the ends of the arms are moved together. The ears 60 are provided with mating vertical bores which are aligned with each other for the reception of a removable locking pin 62 which holds the arms together to clamp the bowl header between them. For convenience, the locking pin 62 is connected to arcuate portion 50 by a flexible chain 64.

The arm 52 is provided with a pair of arm register disks 66 secured thereto by a rivet 68 adjacent an edge of the arm so as to extend beyond the edge to overlap the other arm, 54, as the arms are closed to maintain the ends of the arms in accurate vertical registry. The arm 52 is provided with a handle 70 and the arm 54 with a similar handle 72 for convenience in operating the arms.

The free ends of arms 52 and 54 are provided with means for engaging and accurately locating the feed header of the bowl to support it on the arms when they are moved together and locked by insertion of the locking pin 62. In the embodiment shown, the feed header is in the form of a block 74 adapted to support a tubular infeed member 76 extending downwardly through it to the desired point within the bowl body and connected at its top to the supply line 78. The header also may carry a discharge structure, including a discharge connection 80, details of construction of the inlet and outlet structures not being shown in detail. The bowl body carries a seal 81 engaging member 76. The header 74 is shaped to provide a lower conical surface 82 (FIGS. 5 and 6) and ribs 84, 86, one on each side, having flat horizontal upper surfaces 88, 90 respectively. The arm 52 is provided with a conical surface 92 and the arm 54 with a similar conical surface 94, adapted when the arms are in closed position as in FIGS. 2 and 5 to lie in a single conical surface complementary to the conical surface 82 on the header 74 to receive and locate the header. The arm 54 is provided with a clamp block 96 suitably bolted to it and having an overhanging portion 98 with a flat horizontal lower surface to engage the surface 90 of rib 86. The arm 52 is provided with a similar clamp block 100 for engagement with the surface 88 of the rib 84 (FIG. 6). Thus by means of the mating

conical surfaces and the clamp blocks 96, 100 the header 74 is accurately located both axially and radially and held by the arms 52, 54 when they are in their closed position locked by the locking pin 62.

To hold the support member 42 against rotation as the chuck body 10 is rotated within it by spindle 6, there is provided a torque arm 102 having a split sleeve 104 adapted to embrace the stationary boss 4 on the centrifuge frame 2 and to be clamped thereon by tightening of the bolt 106. Fixed on the torque arm 102 is a pin 108 rising from the upper surface of the torque arm 102 into position to engage the arm 48 of the support member and hold it against rotation.

The arms 52, 54 when locking pin 62 is removed may be swung aside, as shown in dotted lines in FIG. 7, to permit a centrifuge bowl 26 to be conveniently placed in the chuck, the chuck clamp ring bolts 38 being tightened as needed to secure the centrifuge bowl in the chuck. When the arms 52, 54 are then swung together their outer ends engage the header 74, the mating conical surfaces 82, 92 and 94 on header and arms accurately locating the header and the clamp blocks 96, 100 engaging the surfaces 88, 90 of the header to hold it with its conical surface 82 seated on the conical surfaces of the arms. Insertion of locking pin 62 then locks up the assembly in condition for operation of the centrifuge.

It will be seen from the foregoing that the invention has provided for support of a centrifuge bowl header independently of the bowl and accurately located with respect to the axis of rotation, and also axially of the bowl body. Mounting of the header support on the chuck assures constant and accurate location of the header supports with respect to the centrifuge spindle end. This arrangement thus frees the designer of the header from any need to incorporate elaborate structure within the header for supporting it on the bowl body and the design of the connection between header and body can then be directed to other functions, e.g., the sealing function, thus simplifying the design and cost of the bowl-header unit and contributing to efficient and effective operation.

I claim:

1. A centrifuge accessory for use with a centrifuge having a drive spindle with an exposed free end and a centrifuge bowl having a feed header adapted to remain stationary as the bowl is rotated, comprising a bowl chuck having means for mounting it on the spindle end for rotation therewith and having means for supporting such a bowl for rotation with said chuck and spindle, means on said chuck for supporting said header independently of the bowl in predetermined fixed position spaced along the spindle axis from the free end of the spindle, and means, having means for mounting it on said centrifuge, for holding said supporting means against rotation.

2. A centrifuge accessory for use with a centrifuge having a drive spindle with an exposed free end and a centrifuge bowl with a feed header adapted to remain stationary as the bowl is rotated, comprising a bowl chuck having means for mounting it on the spindle end for rotation therewith and having means for supporting the centrifuge bowl thereon for rotation with said chuck and spindle, a support member mounted on said chuck for rotation of the chuck with respect thereto, means on the support member for supporting the feed header of the bowl and holding it stationary in predetermined fixed position spaced along the spindle axis from the free end of the spindle, and means, having means for mounting it on said centrifuge, for holding the support member against rotation.

3. A centrifuge accessory for use with a centrifuge having a drive spindle with an exposed free end and a centrifuge bowl with a feed header adapted to remain stationary as the bowl is rotated, comprising a bowl chuck having means for mounting it on the spindle end for rotation therewith and having means for supporting

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the centrifuge bowl thereon for rotation with said chuck and spindle, a support member on said chuck on a bearing permitting said member to remain stationary as said chuck rotates but restraining said member against other movement, means on the support member for supporting the feed header of the bowl and holding it stationary in predetermined fixed position spaced along the spindle axis from the free end of the spindle, and means, having means for mounting it on said centrifuge, for holding the support member against rotation.

4. A centrifuge accessory for use with a centrifuge having a drive spindle with an exposed free end and a centrifuge bowl with a feed header adapted to remain stationary as the bowl is rotated, comprising a bowl chuck having means for mounting it on the spindle end for rotation therewith and having means for supporting the centrifuge bowl thereon for rotation with said chuck and spindle, a support member mounted on said chuck for rotation of the chuck with respect thereto, a pair of arms pivoted on said support member for swinging movement of their free ends toward and from each other, means on the ends of said arms adapted when said ends are moved together to interfit with said feed header of the bowl and hold it stationary in predetermined fixed position spaced along the spindle axis from the free end of the spindle, means on said accessory for releasably locking said free ends together when in said interfitting positions, and means, having means for mounting it on said centrifuge, for holding the support member against rotation.

5. A centrifuge comprising a drive spindle having a free end, a bowl chuck mounted on said spindle end for rotation therewith, a centrifuge bowl having one end supported in said chuck for rotation with said chuck and spindle, said bowl having at its opposite end a feed header adapted to remain stationary when the bowl is rotated, means on said chuck for supporting said header independently of the bowl in predetermined fixed position spaced along the spindle axis from the free end of the spindle, and means mounted on the centrifuge for preventing rotation of said supporting means,

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6. A centrifuge comprising a drive spindle with a free end, a bowl chuck mounted on said spindle end for rotation therewith, a centrifuge bowl having one end supported in said chuck for rotation with said chuck and spindle, said bowl having at its opposite end a feed header adapted to remain stationary when the bowl is rotated, a support member mounted on said chuck for rotation of the chuck with respect thereto, means on the support member for supporting the feed header of the bowl and holding it stationary in predetermined fixed position spaced along the spindle axis from the free end of the spindle, and means mounted on said centrifuge for holding the support member against rotation.

7. A centrifuge comprising a drive spindle with a free end, a bowl chuck mounted on said spindle end for rotation therewith, a centrifuge bowl having one end supported in said chuck for rotation with said chuck and spindle, said bowl having at its opposite end a feed header adapted to remain stationary when the bowl is rotated, a support member mounted on said chuck for rotation of the chuck with respect thereto, a pair of arms pivoted on said support member for swinging movement of their free ends toward and from each other, means on the end of each arm adapted when said ends are moved together to interfit with said feed header of the bowl and hold it stationary in predetermined fixed position spaced along the spindle axis from the free end of the spindle, means for releasably locking said free ends together when in said interfitting positions, and means mounted on said centrifuge for holding the support member against rotation.

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