

May 28, 1957

I. E. McWETHY

2,793,757

CENTRIFUGAL-TYPE WASHING MACHINE

Filed Feb. 24, 1954

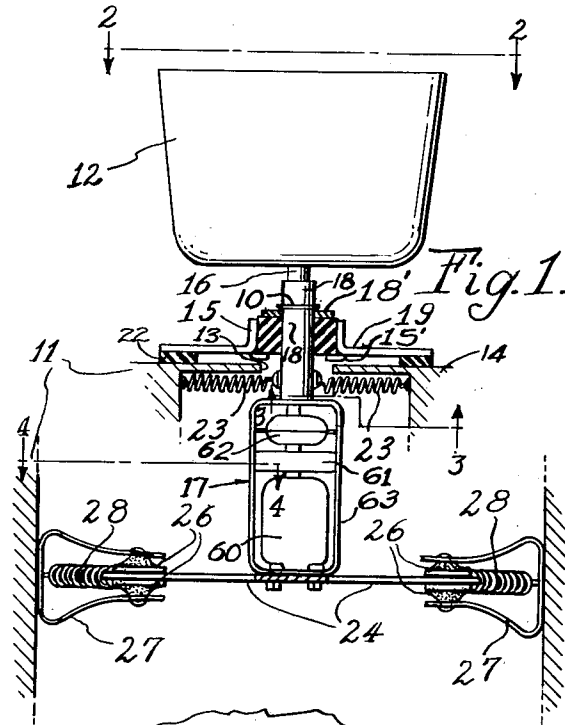


Fig. 1.

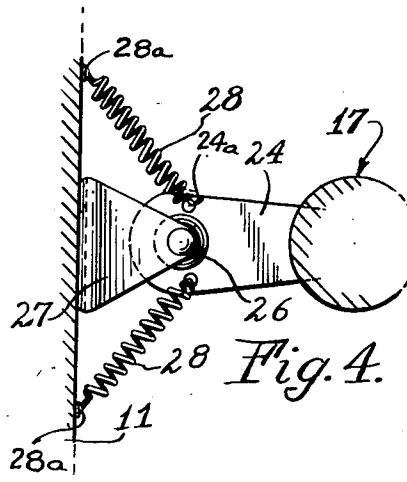


Fig. 4.

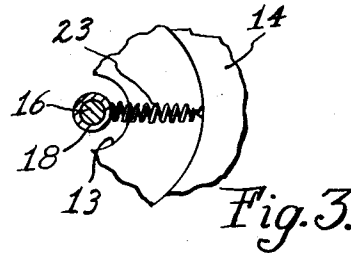


Fig. 3.

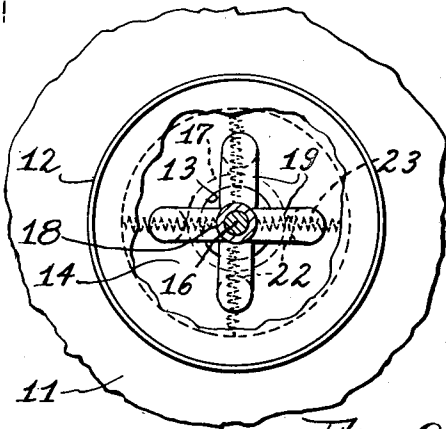


Fig. 2.

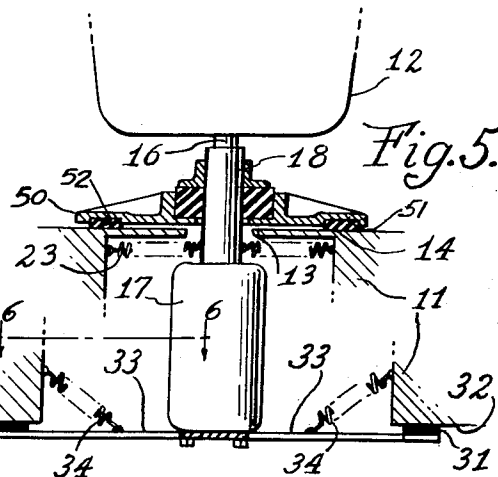


Fig. 5.

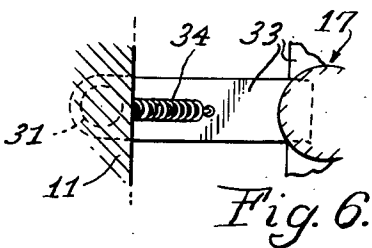


Fig. 6.

INVENTOR.
Irwin E. McWethy
BY
J. R. Douglas
Attorney

1

2,793,757

CENTRIFUGAL-TYPE WASHING MACHINE

Irvin E. McWethy, Galesburg, Ill., assignor to Admiral Corporation, Chicago, Ill., a corporation of Delaware

Application February 24, 1954, Serial No. 412,175

11 Claims. (Cl. 210—365)

This invention relates to machines for washing clothes. More specifically the invention comprehends a mounting for supporting the washing apparatus. The apparatus comprises a tub and drive mechanism therefor and the mounting includes a frame having an opening above which the tub is carried on a vertical shaft which shaft extends downward through the opening and connects to the drive mechanism.

The invention is particularly applicable to a domestic washing machine of the automatic type wherein soiled clothes are washed in the course of a cycle operation involving agitation in a soap or detergent, rinsing, and extracting. The extraction operation involves rapidly rotating a tub, in which the clothes are supported, until practically all the water is separated from the clothes by centrifugal force. The water is discharged from the tub through apertures at the top or over the top edge, before the clothes are removed from the tub. During the extraction, the load of clothes is often unevenly distributed in the tub which results in the center of gravity of the combined load and tub being spaced from the axis thereof. This causes an out of balance that results in extreme vibration when the tub is rotated which increases with increase in speed. As a result, it has been imperative that manufacturers make the supporting frames, of automatic washing machines, very heavy. In addition it is frequently necessary to clamp the machines to a heavy foundation or the floor to prevent displacement of the machines from where they were originally stationed.

By the present invention the foregoing disadvantages have been largely overcome by an improved mounting to support the tub and drive mechanism from a frame less heavy than frames previously necessary and which results in the elimination of the need for clamping the machine to a heavy, rigid support. Other advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

In the drawings:

Fig. 1 is a diagrammatic side elevational view of clothes washing apparatus, partly in section, showing a preferred embodiment of the invention incorporated therewith;

Fig. 2 is a fragmentary top plan view of the same, a central portion thereof being broken away;

Fig. 3 is a fragmentary section taken on line 3—3 of Fig. 1;

Fig. 4 is a fragmentary section taken on line 4—4 of Fig. 1;

Fig. 5 is a view corresponding to Fig. 1 showing a second embodiment of the invention; and

Fig. 6 is a fragmentary section taken on line 6—6 of Fig. 5.

Throughout the drawings, the reference character 11 is used to denote the frame of an extractor or domestic automatic washing machine which is capable of removing most of the water from clothes contained in a tub 12, by centrifugal force due to spinning of the tub about a vertical axis,

2

the water escaping through apertures, not shown, adjacent the top or over the top of the tub. The tub 12 is supported above an aperture 13 in a top wall 14 of the frame by a shaft 16 extending vertically from a drive mechanism indicated in its entirety by the character 17, the unit 17 having a sleeve or bearing portion 18 in which the shaft 16 is journaled. The tub 12 and mechanism 17 have a support at a predetermined elevation whereby they may move laterally and rock relative to the frame, their lateral and rocking motion being against resistance of their mounting.

This main support includes a plurality of arms 19 extending radially from a central socket 15 which has a cylindrical side wall spaced from the sleeve 18 and a lower flange 15'. A resilient bushing, which may be of rubber, is disposed in the socket and engages the side and bottom walls of the socket as well as the sleeve 18. The sleeve 18 is provided with a flange 18' that is in close fitting engagement with the sleeve 18 and overlies the rubber bushing in engagement with the top thereof. A lock ring 10 engaged in a groove in the sleeve holds the flange against upward movement on the sleeve. By this construction the sleeve may tilt in the mounting. Each of the arms 19 extends over the top wall 14 and bears on the lower side of its outer end, a block or pad 22 of some suitable friction augmenting material such as brake lining.

It should be pointed out that instead of arms the mounting may take the form of a ring or disc 50, Fig. 5, having the central socket for the rubber bushing. The friction means would be in the form of a ring 51 carried in an annular recess 52 on the underside. The combined weight of the tub and its contents, in addition to the weight of the unit 17, is supported by the pad or pads 22 or ring 51 which are pressed into frictional engagement with the top wall 14 for a purpose later to be indicated.

The axis of the tub 12 and mechanism 17 is normally maintained centralized relative to the aperture 13 by a plurality of springs 23 connected to the sleeve 18, at a level immediately below that of the top wall 14, and to the frame 11. The springs 23 may be under tension or compression and resist lateral displacement of the sleeve from its central position.

These springs could, as is apparent, also be connected to the plate or arms 19 and the frame and accomplish the same result.

The lower end of the drive unit is stabilized by arms 24 which may be made of resilient material capable of certain amount of flexing which arms extend diametrically opposite to each other and are engaged at their ends by friction means and also centering springs. The friction means may each include a substantially supine U shaped bracket 27, the base of which is secured to the frame 11, and which is provided with arms extending inwardly toward the axis of the machine and inclined toward each other. The arms have oppositely disposed apertures near their ends in which a pair of friction blocks 26 are rested. Each of the blocks is provided with necked parts which are engaged in apertures in the arms of the bracket and are provided with enlarged circular pads. The pads engage with the arms 24 on opposite sides thereof.

In addition to the friction means that engages the arms, they are also held centered in the friction means and their movement therein as well as their rotation about the axis of the machine resisted by pairs of springs 28 (Fig. 4) secured in apertures 24a and extending outwardly divergently from each other where they are secured to the frame at 28a.

The motor drive mechanism in its simplest form includes a motor 60 which is connected to the shaft 16 by means including a transmission 61 and a torque limiting device 62. The motor, transmission and torque limiter may all be confined within a housing or supported by a

frame 63 rigidly connected to the sleeve 18. The torque limiting device may be any one of the many well known devices now available such as those shown in Patents Nos. 2,420,071 or 2,513,845 it being contemplated that when the motor is energized torque is transmitted through the device to the tub, the slippage of the torque transferring member being such as to not overload the motor. As the tub picks up speed the slippage becomes less, providing no undue resistance is applied, until the tub is running at top speed which in this case may be between 650 to 750 R. P. M. depending on the amount of speed reduction between the motor and the tub which is effected by a speed reduction gearing in the transmission 61.

In other words when the motor is energized it comes up to full speed immediately and the torque limiting device starts the load gradually. Should the tub meet with any undue resistance it never comes up to full speed.

It will also be apparent from an inspection of Fig. 1 that the dead weight of the tub and the transmission is mostly supported by the arms 19, and that very little support is afforded by the bottom restraining members 27, and that as a result it can be said that the support for the assembly is between the mass centers defined by the tub and the transmission.

The effect of this arrangement can best be understood by taking into consideration that in most instances during the spinning operation, when the water is being extracted, the distribution of the clothes in the tub is very rarely such that the tub is balanced, and that usually an accumulation of clothes on one side of the tub causes an out-of-balance condition which causes the top axis of the tub to gyrate about a center, that is not the normal axis, with a resultant vibration that is undesirable. In the prior devices this gyration was overcome by brute force, such as bolting the whole assembly to the floor and which resulted in definitely shortening the life of the bearings and made it necessary to reduce the top spinning speed of the device to keep it from virtually battering itself to pieces.

In the present invention the lower motor drive mass is such that it provides a balance for the tub and its contents; the upper mass of the tub (and its contents) and the lower mass of the motor drive being separated from each other and supported at a point in between the masses. Because the support is between the two masses, any out of balance during rotation of one of the masses, which tends to make the assembly gyrate, causes the pivot for the gyration to be between the two masses and therefore the lower mass provides a counter balance for said gyration.

It should be particularly pointed out that the gyrational pivot point is not necessarily at a fixed position although the support point is at a substantially fixed position. This is brought about by the fact that the out of balance of the tub may be due to the weight being unevenly distributed at the bottom or near the top. Hence the actual pivot point for the gyration moves in a vertical direction depending on the amount of load and the degree of unbalance.

If the weight causing the out of balance was of the same value, the fact that this weight may shift from the bottom toward the top of the tub would cause an increase in the gyration due to the slanting nature of the tub which would cause the weight to be positioned further from the axis of the tub. The shift of the weight also changes the center of the upper mass and therefore the pivot point for the gyration would move causing the support to slide around on the frame. It will be appreciated that the point of support and the pivot point of gyration could be the same in which event there would be substantially no shifting of the support but that the variation in the distribution of the out of balance weight is what shifts the one relative to the other. It will also be apparent that this out of balance during rotation causes the

lower mass to move in a direction opposite to the upper mass.

The restraining means is therefore of a composite nature. The lower arms 24 are frictionally restrained by the friction pads 26 this action is also augmented by the springs 28 which exert a greater restraining action as the arms 24 move farther. Therefore the bottom restraining action can be said to be in proportion to the amount of movement of the bottom mass. The greater the movement the greater the restraint.

As pointed out before, substantially the entire weight of the assembly is supported on the wall 14 by the arms 19, this being a frictional support. Therefore as the dead load increases, the weight on the friction pads 22 increases and it takes more effort for the support to move on the wall. In addition to this the springs 23 besides being centering springs resist this movement in manner similar to that described in the bottom restraining means. Therefore as the out of balance load increases and shifts the gyrational pivot point, the further it shifts that point from the support point the more movement occurs at the support point since the pads 22 slide around on the support 14. Likewise with an increase in movement the springs 23 are tensioned or compressed more to assist in restraining that movement.

As the out of balance or gyrational movement becomes greater it therefore moves with greater resistance at all points. Therefore it is apparent that there is a division of the driving force which is expended in two ways, one part rotates the tub, and the other is used up in the friction means to suppress the gyration. Inasmuch as with a given weight in the tub the effort to rotate the tub remains substantially constant it will be apparent that with an increase in out of balance and resultant gyration more power is used up in the friction means and less power is left to rotate the tub. This results in a decrease in tub speed because only a fixed amount of torque is realized from the torque limiter. The greater the out of balance, the greater the reduction in speed. The speed being reduced, the amount of gyration is held within limits.

Since the out of balance is determined by a mass of wet clothes, the water is thrown off more slowly. However, as the water is thrown off, the out of balance becomes less, the frictional forces decrease, there is less power used in the friction means and the tub picks up speed. The result is the mechanisms prevent the out of balance from causing such great movement as to result in self destruction and the speed merely comes up more slowly until eventually, as the water is removed, the speed increases and the clothes are dried. This results in a slightly longer spinning cycle.

In the alternative construction shown in Figs. 5 and 6 blocks 31, corresponding to the blocks 22, are fixed to an overhanging surface 32 of the frame 11 and arranged for pressure engagement by a plurality of arms or leaf springs 33 carried by the unit 17, coiled springs 34 are anchored to each of the leaf springs and hold the arms and the blocks 31 against the surface 32. This connection resists tipping of the tub, while the blocks, by their relationship to the surface 32, resist the oscillatory motion of the unit 17.

It should be pointed out that there may be four of the arms 24 at the lower end of the mass but that I have found two such arms to be very practical. It is however desirous that there be four for the top support or that the support be substantially continuous.

Although I have described two embodiments of my invention I am aware that numerous and extensive departures may be made therefrom without departing from the spirit or scope of the invention.

I claim:

1. A centrifugal washing machine construction wherein a frame houses drive mechanism and has an aperture at the top thereof adequate to afford freedom for lateral

5

motion of a vertical neck of the drive mechanism extending through the aperture for support of a vertical shaft bearing a tub above said aperture, means to support the drive mechanism, tub and interconnected vertical shaft from the frame comprising supporting means engaging the neck and extending over the top of the frame beyond the edge of the aperture and being in longitudinal and edgewise movable relation to the frame, biasing means coupled to the neck and the frame and arranged to act on the neck to bias it to a position centrally of the aperture, first friction augmenting means between the frame and support means, said friction means being pressed against the frame by the weight of tub and drive mechanism for dampening rebound created by the biasing means when the neck is moved away from its normal position by an eccentric load in the tub, means to restrain the tub from tipping about a point below its lower extremity when moved away from its central position including a plurality of resilient members coupled to the frame and drive mechanism at a level below the biasing means and arranged to urge said mechanism toward a position wherein the axis of the tub is vertical, lateral extensions on the drive mechanism extending into the proximity of the frame, and second friction augmenting means supported from the frame and frictionally cooperating with the lateral extensions to dampen the oscillations of the tub when it tips during its operation and is urged to return to its normal position by the resilient means.

2. A centrifugal washing machine construction wherein a frame houses drive mechanism and has an aperture at the top thereof adequate to afford freedom for lateral movement of a vertical shaft therein, the shaft supporting a tub above the aperture and being an integral member of the mechanism, means to support the drive mechanism, tub and interconnected vertical shaft from the frame comprising at least one support member engaging said mechanism and extending over the frame adjacent the aperture and frictionally engaging said frame, a plurality of biasing means supported from the frame and mechanism and acting on said mechanism to center it relative to the aperture, and a plurality of resilient means anchored to the frame and mechanism and severally arranged to exert force in angularly spaced directions on the mechanism at a level differing from that of the support members thereby to resist rocking of the tub about a point on the shaft when said tub is eccentrically loaded during its operation.

3. A centrifugal washing machine construction wherein a frame houses drive mechanism and has an aperture at the top thereof adequate to afford freedom for lateral movement of a vertical shaft therein, the shaft supporting a tub above the aperture and being an integral member of the mechanism, means to support the drive mechanism, tub and interconnected vertical shaft from the frame comprising at least one support member engaging said mechanism and extending over the frame adjacent the aperture and frictionally engaging said frame, a plurality of biasing means supported from the frame and mechanism and acting on said mechanism to center it relative to the aperture, a plurality of resilient means anchored to the frame and severally arranged to exert force in angularly spaced directions on the mechanism at a level differing from that of the support members thereby to resist rocking of the tub about a point on the shaft when said tub is eccentrically loaded during its operation, and means attached to said mechanism and said resilient means, dampening means in engagement with said attached means and said frame, said attached means being movable relative to said frame by the mechanism but resisting a tendency through said dampening means of said mechanism to be oscillated about said point by the combined eccentric operation of the tub and said resilient means.

4. A centrifugal washing machine construction wherein a frame houses drive mechanism and has an aperture at

6

the top thereof adequate to afford freedom for lateral movement of a vertical shaft therein, the shaft supporting a tub above the aperture and being an integral member of the mechanism, means to support the drive mechanism, tub and interconnected vertical shaft from the frame comprising at least one support member engaging said mechanism and extending over the frame adjacent the aperture and frictionally engaging said frame, a plurality of biasing means supported from the frame and mechanism and acting on said mechanism to center it relative to the aperture, a plurality of resilient means anchored to the frame and severally arranged to exert force in angularly spaced directions on the mechanism at a level below that of the support members thereby to resist rocking of the tub about a point on the shaft when said tub is eccentrically loaded during its operation, a plurality of radial arms on the mechanism extending into the proximity of the frame and attached to said resilient means, dampening means supported from the frame and in engagement with said radial arms, said radial arms being movable relative to said frame by the mechanism and resisting a tendency through said dampening means of said mechanism to be oscillated about said point by the combined eccentric operation of the tub and said resilient means.

5. A centrifugal washing machine construction wherein a frame houses drive mechanism and has an aperture at the top thereof adequate to afford freedom for lateral movement of a vertical shaft therein, the shaft supporting a tub above and the mechanism below the aperture, means to support the drive mechanism, tub and interconnected vertical shaft from the frame comprising a plurality of radial support members in engagement with said mechanism and extending over the frame adjacent the aperture, a plurality of biasing means supported from the frame and mechanism and acting on said mechanism to center it relative to the aperture, friction augmenting means between the ends of the members and the frame, said friction means being movable by said members and resisting by friction with the frame lateral bouncing of the tub when it is eccentrically loaded during operation and by the influence of the biasing means, a plurality of resilient means anchored to the frame and severally arranged to exert force in angularly spaced directions on the mechanism at a level below that of the support members thereby to resist rocking of the tub about a point on the shaft when said tub is eccentrically loaded, a plurality of radial arms on the mechanism extending into proximity of the frame and attached to said resilient means, dampening means supported from the frame and in engagement with said radial arms, said radial arms being movable relative to said frame by the mechanism and resisting a tendency through said dampening means of said mechanism to be oscillated about said point by the combined eccentric operation of the tub and said resilient means.

6. A centrifugal washing machine construction wherein a frame houses drive mechanism and has an aperture at the top thereof adequate to afford freedom for lateral movement of a vertical shaft therein, the shaft supporting a tub above and the mechanism below the aperture, means to support the drive mechanism, tub and interconnected vertical shaft from the frame comprising a plurality of carrier members substantially incapable of lateral deflection, said members being in engagement with said mechanism and extending over the frame adjacent the aperture, a plurality of springs supported from the frame and mechanism and arranged to center said mechanism relative to the aperture, friction augmenting means between the ends of the members and the frame, said friction means being carried by the members and thereby movable and resisting lateral bouncing of the tub by friction with said frame when said tub is urged alternately in different directions by said springs and the eccentric load in said tub during its operation, a plurality of arm mem-

7

bers on the mechanism extending horizontally therefrom at a level below that of the carrier members, said arm members being radial of the mechanism and capable of lateral deflection within predetermined limits of elasticity, dampening means supported by said frame and in engagement with the outer ends of the respective arm members adjacent the frame, and at least one resilient member coupled to the frame and to the respective arm members to resist rocking of the tub about a point on the shaft intermediate said tub and said arm members and arranged to bias the arm members into engagement with the dampening means to resist a tendency of the tub and mechanism to be rockingly oscillated about said point alternately by the load and force of said resilient member.

7. A centrifugal washing machine construction wherein a frame houses drive mechanism and has an aperture at the top thereof adequate to afford freedom for lateral movement of a vertical shaft therein, the shaft supporting a tube above and the mechanism below the aperture, means to support the drive mechanism, tub and interconnected vertical shaft from the frame comprising a plurality of carrier members substantially incapable of lateral deflection, said members being in engagement with said mechanism and extending over the frame adjacent the aperture, a plurality of springs supported from the frame and mechanism and arranged to center said mechanism relative to the aperture, friction augmenting means between the ends of the members and the frame, said friction means being carried by the members and thereby movable and resisting lateral bouncing of the tub by friction with said frame when said tub is urged alternately in different directions by said springs and the eccentric load in said tub during its operation, a plurality of arm members on the mechanism extending horizontally therefrom at a level below that of the carrier members, said arm members being radial of the mechanism and capable of lateral deflection within predetermined limits of elasticity, and at least one resilient member coupled to the frame and to the respective arm members to resist rocking of the tub about a point on the shaft intermediate said tub and said arm members by biasing the mechanism toward a vertical position, fixed dampening means embracing and exerting pressure on opposed sides of the respective arm members adjacent the frame to resist a tendency of the tub and mechanism to be rockingly oscillated about said point alternately by the load and force of said resilient means.

8

8. A centrifugal extractor apparatus comprising a frame presenting an upwardly facing supporting wall having an opening therein, drive mechanism below said support wall, a rotary drive shaft coupled to said drive mechanism to be driven thereby and extending upward therefrom, said drive shaft extending up through said opening in the supporting wall and being substantially smaller in cross-section than said openings and capable of substantial lateral displacement therein, a support seated on top of said support wall for frictional movement across said supporting wall laterally of said opening therein, and a tub coupled to said drive shaft above said support and supported from said supporting wall of the frame by said support.

15 9. The apparatus of claim 8, wherein said drive mechanism includes torque limiting means which limits the torque applied to said drive shaft.

20 10. The apparatus of claim 8, wherein there is also provided resilient means acting between the frame and the assembly of the tub and shaft adjacent said opening in the supporting wall of the frame to restrain the assembly of the tub and shaft against displacement laterally of said opening.

25 11. The apparatus of claim 10, wherein said drive shaft and said drive mechanism are suspended from said support, and wherein there are also provided friction means and resilient means acting between the frame and the drive mechanism substantially below said supporting wall of the frame to restrain said drive mechanism against lateral displacement.

References Cited in the file of this patent

UNITED STATES PATENTS

35	408,791	Cairns	Aug. 13, 1889
	1,760,775	Peters	May 27, 1930
	2,106,609	Krauss	Jan. 25, 1938
	2,366,236	Clark	Jan. 2, 1945
	2,454,112	Woodson	Nov. 16, 1948
40	2,534,194	Emmert et al.	Dec. 12, 1950
	2,652,710	De Remer	Sept. 22, 1953
	2,658,372	Kirby	Nov. 10, 1953

FOREIGN PATENTS

45	475,199	Great Britain	Nov. 16, 1937
	683,094	Germany	Oct. 30, 1939