Oct. 20, 1959 B. F. WHEELER 2,909,046

ASSEMBLY OF DRIVING AND DRIVEN SHAFTS

Filed Sept. 9, 1957 2 Sheets-Sheet 1

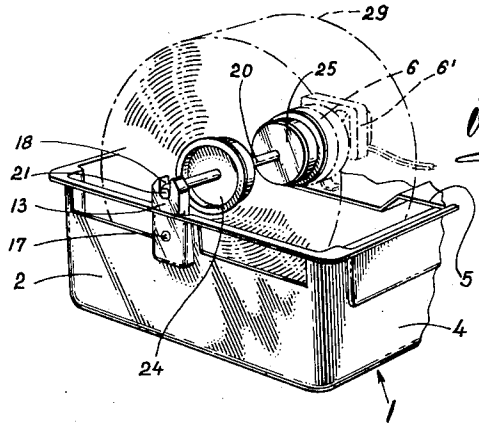


Fig. 1

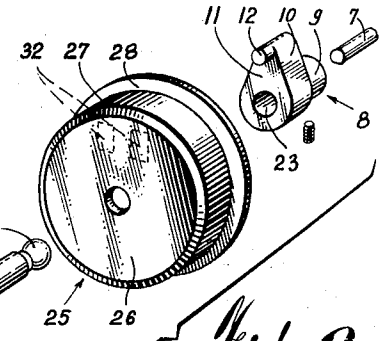


Fig. 2

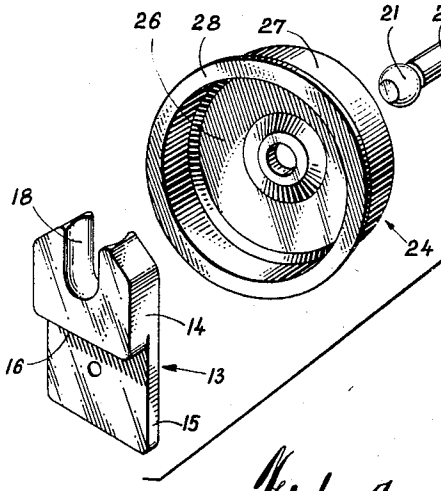


Fig. 4

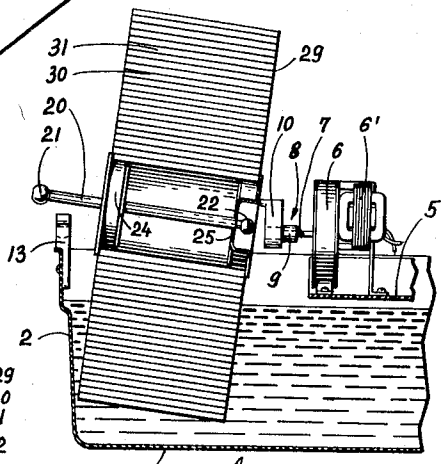
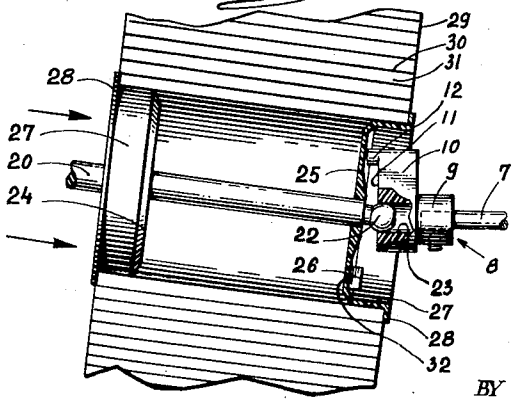


Fig. 3



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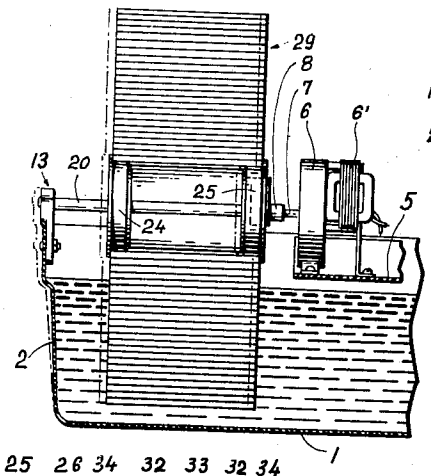
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ASSEMBLY OF DRIVING AND DRIVEN SHAFTS

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Fig. 5



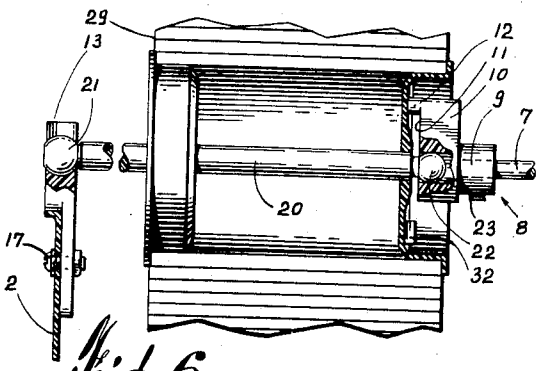


Fig. 6

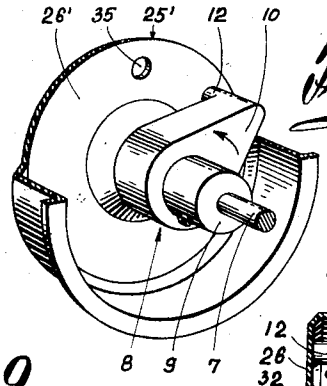


Fig. 7

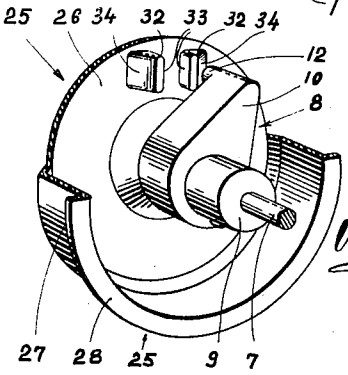


Fig. 9

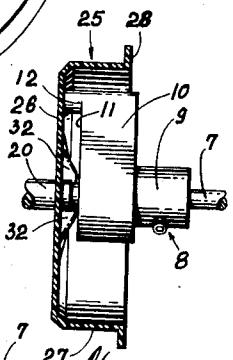


Fig. 8

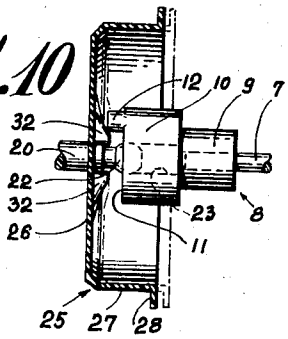


Fig. 10

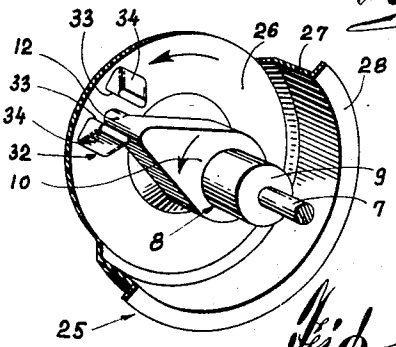


Fig. 11

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ASSEMBLY OF DRIVING AND DRIVEN SHAFTS

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Application September 9, 1957, Serial No. 682,665

5 Claims. (Cl. 64—10)

The present invention relates to an assembly of a driving and of a driven shaft of the type in which the driven shaft is easily removed from and reassembled in clutching engagement with the driving shaft.

There are numerous cases, as in machines, appliances and the like, in which a driven member comprising a driven shaft has to be frequently removed from assembled and clutching engagement with a driving shaft for replacement, maintenance or the like, and in which means have to be provided for the quick and easy reassembling of said driven member and its shaft in clutching engagement with the driving shaft, the latter being mounted for rotation in fixed bearings.

The general object of the present invention is the provision of an assembly of driving and driven shafts which is so designed as to considerably facilitate the assembling and disassembling of the driven shaft.

Another important object of the present invention is the provision of an assembly of the character described in which the driven shaft, when assembled in operative position, will automatically fall into clutching engagement with the driving shaft at the start of rotation of said driving shaft.

Another important object of the present invention is the provision of an assembly of the character described in which a universal joint is provided between the driving and driven shafts whereby any stresses due to possible misalignment of said shafts will be eliminated.

Yet another important object of the present invention is the provision of coacting bearing surfaces between the driven shaft and a support member at the end of said driven shaft opposite to the driving shaft, arranged to resiliently maintain said driven shaft in a predetermined axial position.

The assembly, according to the present invention, is applicable, as a non-limitative example, to humidifiers of the type in which air is caused to circulate through the spaced convolutions of a spirally wound sheet member forming a drum which is partially immersed in a water containing receptacle and slowly rotates to bring the wetted surfaces of the convolutions of the spiral sheet in contact with the air stream to thereby cause evaporation of the water on said surfaces.

Humidifiers of this type are described in U.S. Patents Nos. 2,584,618 and 2,631,831 by R. A. Robic.

The present invention is more particularly concerned with improvements to the drive of the evaporative drum and to the manner of mounting the evaporative drum in operative position.

Humidifiers of this type are household appliances and their upkeep, particularly the cleaning of the evaporative drum and water receptacle, is generally maintained by persons not mechanically inclined. Therefore, dismantling and reassembling of the evaporative drum has to be a simple operation, and the drive of the drum has to be so designed and made of a material as to be particularly breakage-proof.

When the assembly, in accordance with the present invention, is used in humidifiers of the above described type, the evaporative drum will be simple and easy to assemble and disassemble.

Another important object of the present invention is the provision of an assembly of the character described which, when applied and used in humidifiers, will be entirely made of a rust-proof material, preferably plastic, so that the elements constituting said assembly will not deteriorate from the constant exposure to the extremely moist atmosphere existing in humidifiers.

The foregoing and other important objects of the present invention will become more apparent during the following disclosure and by referring to the drawings in which the assembly of the present invention is used in a humidifier by way of non-limitative example; in said drawings:

Figure 1 is a perspective view of part of the water receptacle of a humidifier on which is mounted the assembly according to the present invention;

Figure 2 is an exploded perspective view of the assembly when used as an evaporative drum drive;

Figure 3 is a longitudinal section of the water receptacle, evaporative drum and driving motor showing how the evaporative drum is inserted into operative position;

Figure 4 is an enlarged, longitudinal section of the evaporative drum in the position shown in Figure 3;

Figure 5 is a similar, longitudinal section showing the drum in operative position and also showing, in dot and dash line, the position assumed by the drum just prior to clutching engagement of its support shaft with the driving shaft;

Figure 6 is an enlarged, partial, longitudinal section of the drum in operative position prior to clutching engagement of the driving member connected to the electric motor with a cup member of the drum;

Figure 7 is a perspective view, partially cut away, of a modified arrangement of the cup member adapted to be clutched to the driving member of the electric motor;

Figure 8 is a longitudinal section of the first embodiment of the cup member and driving member prior to clutching engagement;

Figure 9 is a perspective view, partially cut away, of the first embodiment showing how the driving member rides on the inclined face of a clutching block;

Figure 10 is a longitudinal section of the same elements and in the same position as shown in Figure 9; and

Figure 11 is a perspective view similar to that of Figure 9, but showing the driving element in clutching engagement with the cup member of the evaporative drum.

Referring now more particularly to the drawings in which like reference characters indicate like elements throughout, reference numeral 1 indicates a water receptacle of substantially rectangular shape and preferably made of a rigid, but somewhat resilient, rust-proof material, such as a suitable thermoplastic. The front wall 2 of the receptacle 1 is slightly flexible so that it may be pulled outwardly at its middle portion, as shown in dot and dash line in Figure 5. The side walls 4 of the receptacle 1 support a transverse shelf 5 at a location rearwardly spaced a substantial distance from the front wall 2. The shelf 5 supports an electric motor 6' and speed reducing unit 6 having an output shaft 7, which is disposed in a vertical plane passing through the centre of the receptacle 1 and which projects forwardly towards the front wall 2 of said receptacle. A male clutching member 8 is secured to the output shaft 7. The male clutching member 8 is preferably made entirely of plastic and comprises a sleeve part 9 and an integral, radially directed arm 10 forming a crank member having a flat, front face 11 and having at its outer end a for-

wardly projecting, short finger **12**. The finger **12** projects forwardly of the front, flat face **11** of the arm **10** a distance substantially equal to the distance which the bearing member **13**, mounted on the middle of the front wall **2** of the receptacle **1**, can be pulled out when exerting a slight, outward force on said front wall **2**. The bearing member **13** is preferably made entirely of plastic and comprises a block portion **14** provided with a downwardly extending flange **15**, of reduced thickness, defining a shoulder **16** with the block portion **14**; the bearing member **13** is secured within a recess formed in the upper portion of the front wall by means of a nut and screw **17**, with the flange **15** abutting the inside face of said recess and the shoulder **16** abutting the upper edge of the front wall. The block portion **14** is provided with a deep notch **18** of U-shaped section with parallel, side faces and a curved, bottom face when viewed from one, flat face of the block portion **14**. The side and bottom faces of the notch **18** are convex in cross-section, as clearly shown in Figure 2.

A drum supporting shaft **20**, consisting of a rod of plastic material, is terminated at both ends by spherical, bearing portions **21** and **22**. The front, spherical portion **21** is adapted to engage the notch **18** of the bearing member **13**, while the back, spherical portion **22** is adapted to freely engage an axial bore **23** made in the arm **10** and opening at the front, flat face **11** thereof. Thus the shaft **20** is supported by the bearing member **13** at one end, and by the arm **10** at the other end, said arm **10** being directly secured to the output shaft of the speed reducing unit **6**.

Two cup-shaped members **24** and **25** are mounted on the shaft **20** in opposed relationship. Each cup-shaped member **24** and **25** consists of a central circular web **26** and of a cylindrical, rim portion **27** terminated at its outer end by a radially directed, annular flange **28**.

The evaporative drum **29** consists of one or more elongated, flexible sheets **30** wound in spirals on the cylindrical rim portions **27** of the two, spaced cup-shaped members **24** and **25**, and arranged to leave free spaces **31** between the circumvolutions of the sheets **30**. The annular flanges **28** abut against the outer edge of the inner circumvolutions of the sheets **30**.

The back, cup-shaped member **25** is provided with means for clutching engagement with the finger **12** of the driving arm **10**. According to a first embodiment of the said means, there is formed, on the web **26** of the back, cup-shaped member **25**, two spaced projections or lugs **32** disposed at a radial distance from the shaft **20** substantially equal to the radial distance of the finger **12** from said shaft. The lugs **32** have opposed faces **33** substantially perpendicular to the face of the web **26** and outer inclined faces **34**. The finger **12** is adapted, upon rotation of the arm **10** relative to the cup-shaped member **24**, to slide along the web **26** and then up along the inclined face **34** of one of the lugs **32**, thereby pushing said cup-shaped member **25** and the associated shaft **20** forwardly to resiliently bend the front wall **2** of the receptacle **1**. Then the finger **12** reaches the space between the two lugs **32**, whereupon, due to the resilient force exerted by the front wall **2**, the shaft **20** snaps back rearwardly to its normal position in which the finger **12** again contacts the opposed face of the web **26**, as shown in Figure 11. Thus, when it is desired to position the drum **29**, it is only necessary to insert the same within the receptacle **1** in a slightly inclined position, as shown in Figure 3, and to insert the back, spherical portion **22** of the shaft **20** into the bore **23** of the arm **10** irrespective of the angular position of the drum relative to the finger **12** of the arm **10**. Then the front, spherical portion **21** of the shaft **20** is simply dropped within the notch **18** of the bearing member **13**. Thereafter, upon starting of the electric motor **6'**, the arm **10** will start to rotate and its finger **12** will automatically assume clutching engagement between the two lugs **32**. To remove the drum, the front portion of the shaft **20** is first lifted off the bearing member **13** and the drum is then moved forwardly to disengage the back, spherical portion **22** from the bore **23**. The released drum can then be bodily lifted off the receptacle **1**.

In accordance with the second embodiment of the clutching means, as shown in Figure 7, instead of lugs **32**, the web **26'** of the back cup-shaped member **25'** is provided with a hole **35** adapted to receive the finger **12**. According to this second embodiment, the cup-shaped member **25'** is disposed at such a distance from the front, spherical portion **21** of the shaft **20** that contact of the finger **12** with the web **26'** causes forward bending of the front wall **2** of the receptacle **1** to the position shown in dot and dash line in Figure 5. Upon rotation of the arm **10** relative to the cup-shaped member **25'**, the finger **12** slides on the web **26'** and as soon as it registers with the hole **35**, the shaft **20** and cup-shaped member **25'** snap back rearwardly under the resilient force exerted by the bent, front wall **2**, thereby causing clutching engagement of the finger **12** with the cup-shaped member **25'**. With this second embodiment, once the rear, sperical portion **22** has been inserted in the bore **23** of the arm **10**, the front wall **2** has to be pulled forwardly in order to insert the front, spherical portion **21** within the bearing member **13**. A similar pulling action has to be exerted when removing the drum from the receptacle in order to disengage the finger **12** from the hole **35**.

From the foregoing, it will be apparent that the drum assembly **29** can be easily removed from and replaced back into position in driving engagement with the output shaft **7** of the speed reducing unit **6**.

Due to their all plastic construction, the drum assembly and the receptacle **1** will not be affected by the humidity of the surrounding atmosphere.

It will be noted that the sperical shaft portions **21** and **22** engaging the bearing member **13** and bore **23** within the arm **10** provide universal joint mountings for the shaft **20**, whereby any misalignment of said shaft will not result in detrimental stresses being exerted on the journals of the shaft and also will result in frictionless, free rotation of the drum **29**, whereby only a relatively low-powered electric motor **6'** will be required.

Also from the foregoing description it will be noted that the main characteristic feature, in accordance with the present invention, resides in the fact that anyone can easily disassemble and replace the drum in operative position, because clutching engagement between the motor and the drum is automatically effected upon starting of the electric motor.

It is obvious that, while the assembly of the driving and driven shafts in accordance with the present invention has been illustrated in use in a humidifier, such an assembly can be put to a variety of different uses wherein there is need for the quick and easy disassembling and assembling of a driven shaft with a driving shaft. Therefore, the essential elements, in accordance with the present invention, consist of the driving shaft **7**, the crank arm **8**, the driven shaft **20** with its spherical and bearing portions **21** and **22**, the member **25** or **25'** providing clutching engagement with the crank arm **8**, and finally the bearing member **13**, which supports one end of the driven shaft **20** and prevents axial displacement of the same so as to maintain clutching engagement between the finger **12** of the crank arm **8** and the lugs **32** on member **25** or the hole **35** in member **25'**. Any type of driven member could be mounted on the driven shaft **20**. Also the members **25** or **25'** need not be cup-shaped so long as they provide a plane surface extending at right-angles to the driven shaft **20**.

It is an essential feature, in accordance with the present invention, that the bearing member **13** be provided with means to resiliently exert an axial force on said member to maintain the shaft **20** in a predetermined axial position so as to provide positive clutching engagement between the finger **12** and the lugs **32** or the hole **35**. In

the embodiment illustrated, said resilient force is exerted by the resiliency of the front wall 2 of the receptacle 1. Obviously other resilient means could be provided, such as a spring member disposed between the movably mounted bearing member 13 and a fixed abutment surface.

While preferred embodiments according to the present invention have been illustrated and described, it is understood that various modifications may be resorted to without departing from the spirit and scope of the appended claims.

I claim:

1. An assembly of a driving shaft and of a driven shaft comprising means to mount said driving shaft in a predetermined axial position, a crank arm secured to the outer end of said driving shaft, said crank arm having a bore made in the outer face thereof coaxial with said driving shaft, said driven shaft having one end adapted to removably engage said bore, a bearing member for supporting the other end of said driven shaft, means to prevent axial displacement of said driven shaft relative to said bearing member, means mounting said bearing member to permit slight axial displacement of said bearing member together with said driven shaft in a direction away from said crank arm, means to resiliently maintain said bearing member together with said driven shaft in a predetermined axial position, a finger projecting from the outer face of said crank arm, a clutching member secured to said driven shaft in a position adjacent said crank arm and providing a sliding surface in resilient engagement with said finger, and a re-entrant portion circumferentially adjacent said surface, automatically engageable with said finger upon relative rotation between said crank arm and said clutching member and upon axial displacement of said clutching member and driven shaft.

2. An assembly as claimed in claim 1, comprising two closely spaced lugs projecting outwardly from said clutching member and defining said reentrant portion, at least one of said lugs having an inclined outer face defining said sliding surface, relative rotation between said crank arm and said clutching member causing said finger to ride on said inclined face thereby causing slight displacement of said clutching member and driven shaft axially away from said driving shaft against the resilient force exerted by said resilient means, said resilient means maintaining said finger in engagement between said two lugs when said finger is in register with the space between said two lugs.

3. An assembly as claimed in claim 1, comprising a hole made in said clutching member and defining said reentrant portion, the radial face of said clutching member defining said sliding surface.

4. An assembly as claimed in claim 1, wherein said bearing member is formed with a U-shaped notch, the faces of which have a concave cross-section, the corresponding end of said driven shaft forming a substantially spherical portion, which is adapted to engage said U-shaped notch.

5. An assembly as claimed in claim 1, wherein said resilient means and said mounting means comprise a slightly resilient upright support fastened at a point remote from said bearing member.

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