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E. H. RELYEA ETAL

3,376,848

COATING APPARATUS FOR APPLICATION OF LIQUIDS

Filed Feb. 4, 1966

2 Sheets-Sheet 1

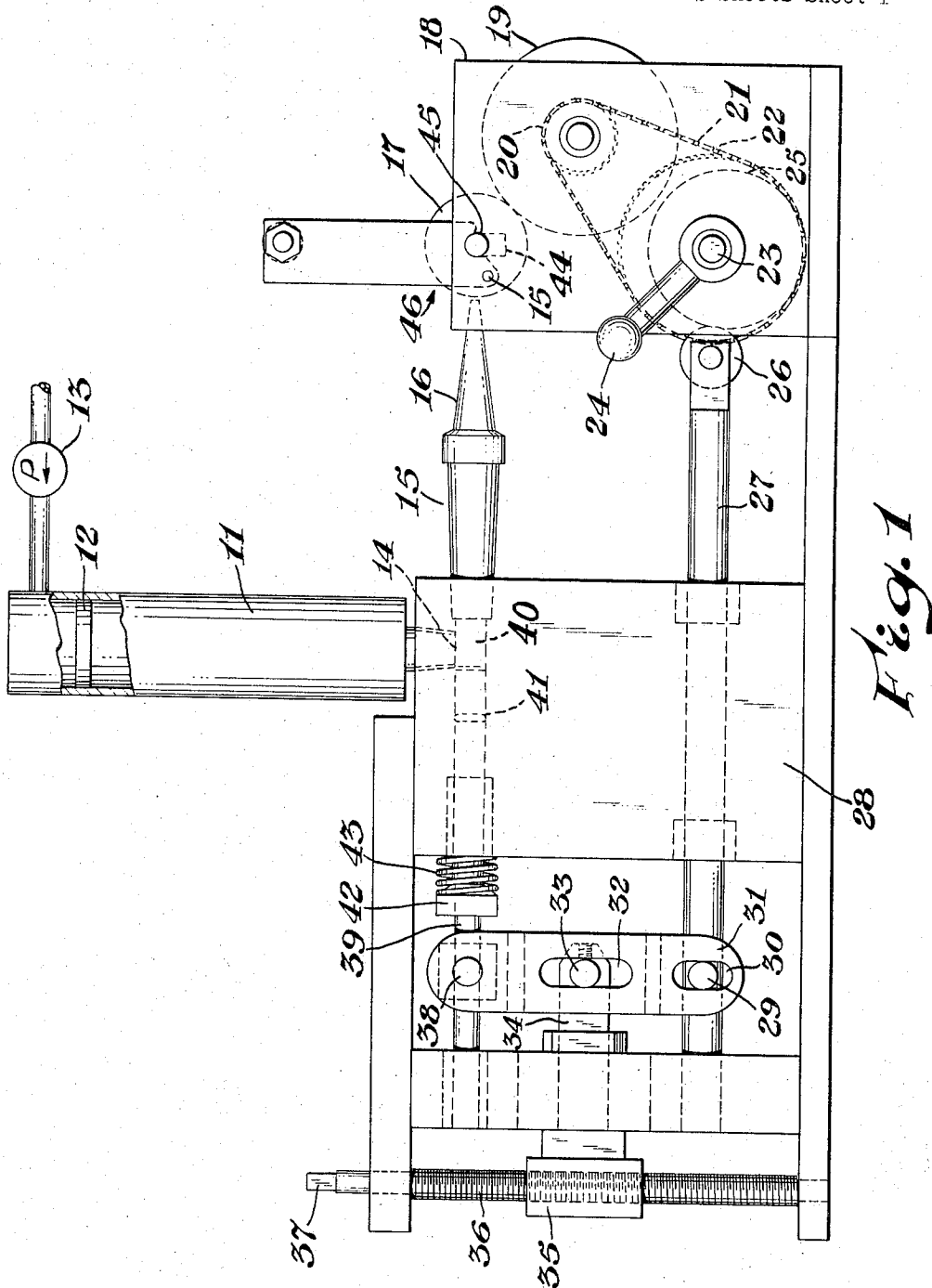


Fig. 1

INVENTORS.
Elton H. Relyea
Laurence H. Sias
Howard W. Hermann
ATTORNEY

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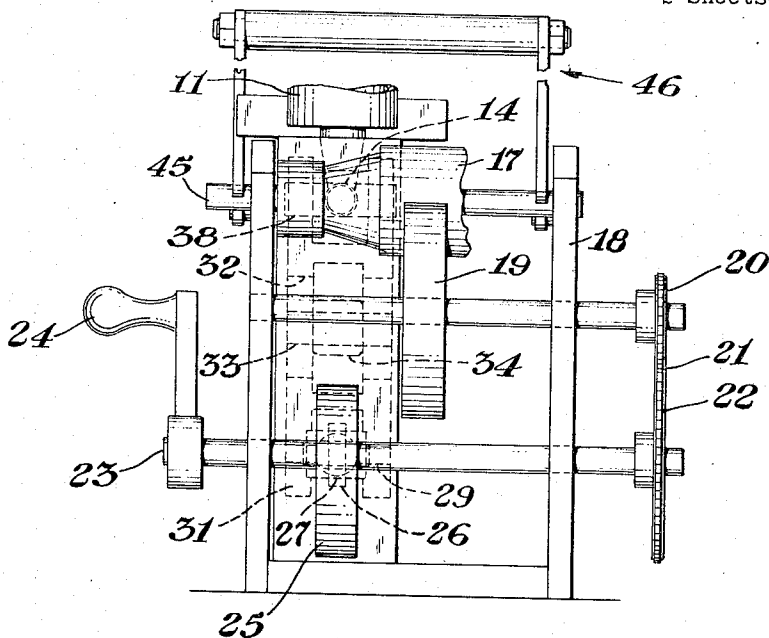


Fig. 2

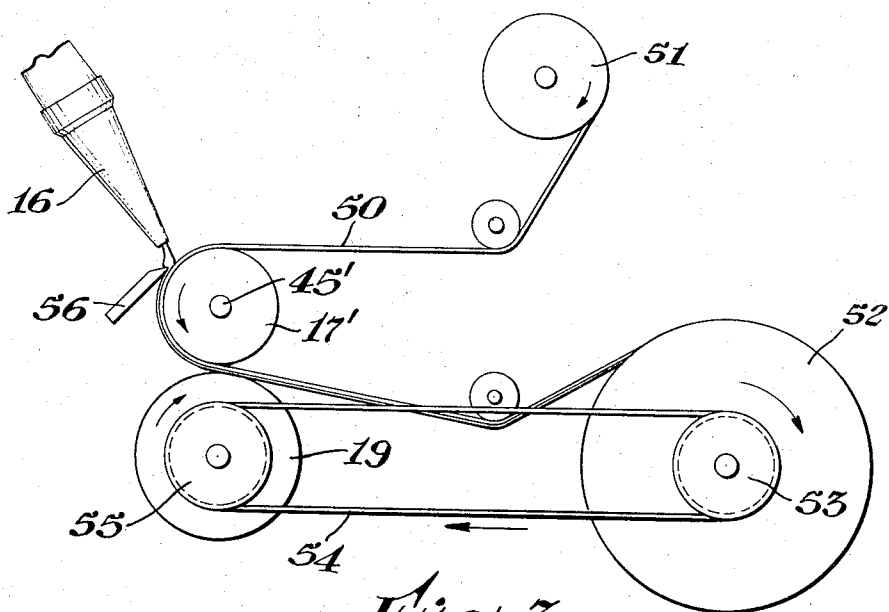


Fig. 3

INVENTORS.
Elton H. Relyea
Laurence H. Sias
Howard W. Hermann
ATTORNEY

1

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COATING APPARATUS FOR APPLICATION OF LIQUIDS

Elton H. Relyea, Sanford, and Laurence H. Sias, Midland, Mich., assignors to Dow Corning Corporation, Midland, Mich., a corporation of Michigan

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ABSTRACT OF THE DISCLOSURE

Device which may be either manually operated or power driven to apply bands of liquid coating materials uniformly and economically to cylindrical surfaces of cylindrical objects or web-shaped substrates which may be wrapped around a cylindrical mandrel.

This invention relates to apparatus for coating objects with liquid materials and, more particularly, relates to apparatus particularly designed for applying bands of curable liquid material to cylindrical or flexible web-shaped objects.

In the manufacture of electrical machines such as motors and generators, for example, it is often desirable to provide insulation and/or protective coatings on the machine rotors adjacent the pole pieces of the rotor. One particularly desirable type of material for this application is applied in a band, in liquid form, and allowed to cure into a resinous or rubbery insulation and protective coating. Similarly in other applications, bands of curable liquid materials are often needed. While various devices and methods have been proposed and used for this purpose, most practical devices of this type are cumbersome and expensive. Others are wasteful of materials or fail to produce consistently acceptable coatings.

It is an object of the present invention to provide an improved device for applying band shaped coatings.

A further object is the provision of an improved device for applying band shaped coatings which is simple in construction, economical to produce and to operate, and which produces consistently acceptable results.

In accordance with these and other objects, there is provided by the present invention a device which may be either manually operated or power driven to apply bands of liquid coating materials uniformly and economically to cylindrical surfaces of cylindrical objects or web-shaped substrates which may be wrapped around a cylindrical mandrel.

Other objects and attendant advantages of the present invention will become obvious to those skilled in the art from a consideration of the following detailed description when read in connection with the accompanying drawings wherein:

FIG. 1 is a side view in elevation of an embodiment of a device made in accordance with the present invention.

FIG. 2 is an end view in elevation of the embodiment shown in FIG. 1, and

FIG. 3 is a partially diagrammatic view of a modification of the embodiment of FIGS. 1 and 2, suitable for applying a coating to a moving web.

Referring now to the drawings wherein like or corresponding reference characters designate like or corresponding parts, there is shown in FIGS. 1 and 2 a liquid material cylinder 11 having a piston 12 mounted for travel therein upon, for example, application of air pressure by means of a pump or the like 13. Downward motion of the piston 12 causes flow of the liquid material from the cylinder 11 into a metering orifice 14. From the metering orifice 14, the liquid material passes through conduit means comprising a conduit 15 and a dispensing

2

nozzle 16 onto a workpiece 17. The workpiece 17 may be, for example, a rotor of an electric motor or generator upon which it is desired to place a band, or bands, of liquid insulating material which will then cure into solid form.

In order to accurately control the amount of liquid material being applied to the workpiece, there is provided a metering system which is controlled by the rotational speed of the workpiece. The workpiece is held in place for rotation on a housing 18 by means of a hold-down member 46 which is pivotally mounted on the housing. The workpiece 17 has a cylindrical surface which is frictionally driven by means of a friction roller 19 which is, in turn, driven by means such as a sprocket or pulley 20. The sprocket or pulley 20 in the embodiment shown is driven through a chain or belt 21 by a drive sprocket or pulley 22 mounted on a driven shaft 23. The shaft 23 is driven by power application means such as a hand crank 24 mounted thereon, or which may include an electric motor or the like.

Also mounted on the driven shaft 23 is a cam 25 which has a cam follower roller 26 in engagement therewith. The cam follower roller 26 is mounted on a cam follower rod 27 supported by a second housing 28. A pivot pin 29 projecting from the cam follower rod 27 engages a slot 30 in a pivot link 31 which is actuated thereby. The pivot link 31 has a second slot 32 therein through which projects a second pivot pin 33 which is fixed on an adjustable stud 34. The stud 34 is made adjustable in position by means of a block 35 which has an internally threaded hole through which a threaded height adjusting rod 36 passes. The adjusting rod 36 may be turned, for example, by means of a wrench applied to a squared end portion 37.

Mounted at the opposite end of the pivot link 31 from the cam follower rod pivot pin 29 is a third pivot pin 38 affixed to a piston actuator rod 39. The piston actuator rod 39 is also supported for reciprocation in the housing 28 and has affixed to its distal end a metering piston 40 which is designed to be reciprocated in a bore hole which includes a portion of the conduit 15 at the point of its intersection with the metering orifice 14. The piston is preferably sealed against the walls of the bore by means such as an O-ring 41. In order to bias the pivot linkage system to keep the cam-follower roller 26 in contact with the cam 25, a collar 42 is affixed on the piston actuator rod 39 and a spring 43 is provided between the collar 42 and a portion of the housing 28.

In operation, as the crank 24 is turned, the workpiece drive system comprising the shaft 23, the pulleys or sprockets 22, 20, and the friction drive roller 19 causes the workpiece 17 to be rotated in proximity to the nozzle 16. At the same time, the cam 25 is rotated with the shaft 23 and the cam follower rod 27 is caused to reciprocate due to the action of the cam and the urging of the spring 43 through the pivot linkage system to maintain contact between the cam and the cam follower roller 26. The reciprocal movement of the pivot pin 29 affixed to the cam follower rod causes the pivot link 31 to pivot about the adjustably fixed pivot pin 33 thereby causing reciprocation of the piston actuator rod 39 by means of the pivot pin 38. As the piston actuator rod 39 reciprocates, the metering piston 40 alternately closes and opens the metering orifice 14 acting as a valve to control the flow of liquid material through the conduit 15 and out of the nozzle 16 onto the workpiece 17.

The system described above is suitable for providing bands of liquid material around any cylindrical workpiece. If desired, the conduit 15 may be made of flexible material or be provided with a joint and/or telescoping sections to allow adjustment of the nozzle relative to the

workpiece. By providing an elongated slot 44 for insertion of the axle 45 of the workpiece 17, the device may be used to accommodate workpieces of various sizes.

As shown in FIG. 3, the same device is adaptable for use in coating web-shaped members by passing the web 50 over the surface of a cylindrical mandrel 17' which serves as a workpiece holder. The web may, for example, be passed between a pair of reels 51, 52 one of which is driven, for example, by means of a pulley 53 driven by a slippable belt 54 which is, in turn, driven by a pulley 55 on the shaft of the friction drive roller 19. If desired, a doctor blade 56, or the like, may be provided for spreading the band of liquid material applied to the web.

The device shown provides an efficient application of band shaped coatings to cylindrical or web-shaped substrate members. Since the flow of coating material is metered, waste is minimized and uniform bands of coating may be easily applied.

Obviously, other modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood, that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

That which is claimed is:

1. A device for applying bands of material in liquid form to a cylindrical surface, comprising:
 - a source of said material,
 - means for causing said material to flow from said source into a metering orifice,
 - conduit means for transferring said material from said metering orifice to said cylindrical surface,
 - drive means for moving said cylindrical surface relative to said conduit means, said drive means including a power input means and a friction roller driven by said power input means and mounted in driving relationship with said cylindrical surface; and
 - metering means responsive to said drive means for controlling the flow of said material from said metering orifice through said conduit means, said metering means including a valve comprising a piston which opens and closes said metering orifice in response to the speed with which said cylindrical surface is moved relative to said conduit means, a cam actuated by said drive means, a pivot linkage system operated by said cam, a valve operating means connecting said valve to said pivot linkage system, said pivot linkage system including a cam follower roller mounted on a cam follower rod, a pivot link having first, second, and third pivot pins in operative engagement therewith; said first pivot pin being spatially fixed relative to said cam follower rod, said second pivot pin being normally fixed in space, and said

third pivot pin being spatially fixed relative to said valve operating means, whereby said pivot link rotates around said second pivot pin as said cam follower rod reciprocates.

2. A device as defined in claim 1 wherein said cylindrical surface is a surface of a web-shaped object wrapped around a portion of the circumference of a cylindrical mandrel.

3. A device for applying bands of material in liquid form to a cylindrical surface, comprising:
 - a source of said material,
 - means for causing said material to flow from said source into a metering orifice,
 - conduit means for transferring said material from said metering orifice to said cylindrical surface,
 - drive means for moving said cylindrical surface relative to said conduit means, and
 - metering means responsive to said drive means for controlling the flow of said material from said metering orifice through said conduit means, said metering means including a valve comprising a piston which opens and closes said metering orifice in response to the speed with which said cylindrical surface is moved relative to said conduit means, a cam actuated by said drive means, a pivot linkage system operated by said cam, a valve operating means connecting said valve to said pivot linkage system, said pivot linkage system including a cam follower roller mounted on a cam follower rod, a pivot link having first, second, and third pivot pins in operative engagement therewith; said first pivot pin being spatially fixed relative to said cam follower rod, said second pivot pin being normally fixed in space, and said third pivot pin being spatially fixed relative to said valve operating means, whereby said pivot link rotates around said second pivot pin as said cam follower rod reciprocates.
4. A device as defined in claim 3 wherein said cylindrical surface is a surface of a web-shaped object wrapped around a portion of the circumference of a cylindrical mandrel.

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CHARLES A. WILLMUTH, *Primary Examiner.*

J. P. MCINTOSH, *Assistant Examiner.*