A removably mounted disposable sleeve and arbor assembly for buffing, coating and painting roll applications characterized by a non-complex and inexpensive construction which facilitates quick and simple changing of the roll sleeve. Further, the sleeve is firmly and reliably held in position during use with no substantial loss of efficiency due to the tapered adapters which frictionally grip the removable sleeve.

3 Claims, 10 Drawing Figures
REMOVABLE SLEEVE AND ROLL ARBOR ASSEMBLY

BACKGROUND

The present invention relates generally to buffing coating or painting rolls and particularly to a novel improvement in the construction which utilizes a removable sleeve and arbor assembly.

Prior to the present invention, rolls of the type referred to above featured an integral unit consisting of a shaft, roll, roll shell and a covering. The covering usually consisted of neoprene or polyurethan and of a diameter depending upon the given application. Rolls having this permanent integral construction have certain drawbacks, such as, if the rolls are damaged it becomes necessary to remove the unit from the production line and then grind the surface back to specification. If this occurs often enough to cause the roll surface to be ground below the minimum required diameter, then the roll must be sent to a service company capable of removing the remaining cover on the shell and reapplying a new cover to bring the roll assembly back to the original outside diameter.

In order to maintain production, a relatively large inventory of unit constructed rolls must be kept on hand. Rolls of this character are expensive and therefore a large capital investment is required as well as the need for adequate storage space. The grinding and or repair service is also costly not to mention the extensive downtime which is lost in the production line due to an assembly construction which is cumbersome at best, and which consumes a great deal of time to remove and replace rolls.

A further disadvantage to the integral unit roll construction stems from the production delays at the end of a specific production run. A costly clean-up operation is necessary to prepare this type of roll for the next production run and considerable downtime is required.

Roll assemblies featuring removable sleeves are known and have been used to a small extent in the past. However, it is very significant to note that these prior constructions have not replaced the integrally formed rolls. This is due in large part because these prior constructions were complex and costly in design and did not solve the problem of the convenience and ease of changing sleeves to an extent necessary to replace the unit construction.

Most of these prior art removable sleeve constructions featured a shaft with a hub member equipped with expansion members that would expand and contact by means of a wedge effect radially with respect to the shaft. In its expanded position pressure would be applied engaging it with the shell and the shell would maintain a position coaxially with the shaft in the collapsed position the shell could be removed. This type of assembly does permit the user to use a variation of sizes of removable sleeves. However, one distinct disadvantage is the mounting arrangement when the above assemblies are used. If it was decided to change from one diameter roll to a roll of a different diameter some adjustment would have to be built into the design in such a manner so as to permit adjustments to a common pass line. This could be costly and time consuming for the user.

The above-noted disadvantages are not present in the construction of the present invention.

SUMMARY OF THE INVENTION

The present invention comprises a roll assembly featuring a removably mounted sleeve and a roll arbor. The roll arbor includes a pair of tapered adapters which function to permit the removable sleeve to be easily positioned and held in place during use. One of said adapters features a removable portion which facilitates changing and positioning of the sleeve.

The present invention also incorporates a very convenient mounting arrangement between the removable sleeve, the removable arbor components and the bearing cartridge upon which the end shaft portion of the arbor is fixed. The present invention is constructed in a manner which permits the sleeve to be removed and replaced quickly and accurately without removing the bearing cartridge. This substantially reduces the downtime required to change over from one production run to another or to replace a worn or damaged sleeve.

OBJECTS

Therefore it is an object of the present invention to provide an improved coating roll having a removable sleeve on an arbor assembly and constructed in such a manner that the sleeve may be easily and economically removed and replaced.

It is another object of the present invention to provide a coating roll of the type described which permits the use of a removable sleeve of inexpensive construction to permit disposal and replacement economically as compared with the initial cost of integral rolls and the cost of maintenance of such rolls.

It is another object of the present invention to provide a coating roll of the type described which is constructed in a manner that permits quick assembly and disassembly for changing sleeves to reduce downtime as compared to prior art constructions.

It is a further object of the present invention to provide a coating roll of the type described wherein the removable sleeve and arbor construction permit short production runs to be made economically compared to prior art constructions and the attendant problems of extensive downtime and maintenance costs.

IN THE DRAWINGS

FIG. 1 is a side elevational view partially in section of a coating roll and mounting assembly constructed in accordance with the present invention, the section being taken along the centerline of coating roll;

FIG. 2 is a side sectional view of a portion of the assembly shown in FIG. 1 illustrating the arbor portion, the section being taken along the centerline of the arbor;

FIG. 3 is a front elevational view of a portion of the apparatus shown in FIG. 1 illustrating the stabilizing ring;

FIG. 4 is a side elevational view of the stabilizing ring shown in FIG. 3;

FIG. 5 is a front elevational view of the removably mounted tapered adapter ring forming a part of the assembly shown in FIG. 1;

FIG. 6 is an end elevational view of the adapter ring shown in FIG. 5;

FIG. 7 is a side sectional view of the adapter ring shown in FIG. 5, the section being taken along lines 7—7 in FIG. 6;
FIG. 8 is a side elevational view of the fixed, tapered adapter portion of the assembly shown in FIG. 1; FIG. 9 is an end elevational view of the fixed tapered adapter portion shown in FIG. 8; and FIG. 10 is a side sectional view of the fixed tapered adapter portion of FIG. 8, the section taken along line 10—10 in FIG. 8.

DETAILED DESCRIPTION

A coating roll assembly and mounting means constructed in accordance with the present invention is illustrated in FIG. 1 and includes a tubular shaft 10 which supports a removable mounted sleeve 12. Sleeve 12 preferably is constructed of inexpensive hard plastic material and is covered with a conventional synthetic felt material 14 which is bonded to sleeve tube 12.

Felt covering 14 preferably is spirally wound on sleeve 12 to eliminate the possibility of a joint or groove being formed which might transfer a pattern to the finished product.

Tubular shaft 10 preferably is constructed of steel and is machined on each end to enlarge the inside diameter to accept end plugs 16 and 18 which are fixed therein by welding for example. The inner ends of plugs 16 and 18 rest against the machined shoulders 20 on shaft 10.

End plugs 16 and 18 include bored holes 22 which accept stub shafts 24 and 26 which are fixed therein in any suitable conventional manner such as fillet welds around the entire circumference for example.

Stub shaft 24 is provided with a keyway 28 and adapter 30 accepts a driving member, either a sprocket or sheave type, not shown.

A stabilizer ring 30 is fixedly mounted on tubular shaft 10 such as by an appropriate weld and functions to provide support for sleeve tube 12.

As shown in FIG. 1, the right end of the main body portion of tubular shaft 10 is provided with a tapered adapter component 32 fixed on the outer surfaces of the shaft 10. The adapter portion is machined tapered 0.010 to 2 inches of surface on the outside diameter and includes a stop shoulder 34 on the outer end.

The opposite end of shaft 10 is provided with a threaded adapter portion 36 fixed to the outer surface of shaft 10 in the same manner as adapter 32. The distance between adapter portions 32 and 36 depends upon the user's specifications and varies according to the specific application and required length of the roll working surface.

A removable adapter ring 38 is slidably mounted over fixed adapter portion 36 with a small sliding clearance between contacting surfaces of 0.002/0.003 inches for example. The outer surface of adapter ring 38 is provided with the same degree of machined taper as fixed adapter portion 32 and is provided with machined shoulder 40.

Adapter portion 36 and adapter ring 38 cooperate with one another in position to provide essentially the same outside tapered diameter within normal machine tolerances as provided by fixed adapter portion 32.

It should be pointed out that the tapered surfaces on arbor 10 and the removable adapter ring 38 are tapered inwardly and directly contact the inner surface of tubular sleeve 12 to provide a positive friction grip to hold the sleeve in position.

A conventional locknut 42 is threadably received by threaded portion 44 of fixed threaded adapter portion 36 and locked into position by lockwasher 46.

Stub shafts 24 and 26 are preferably fitted with bearing cartridges contained in a bearing assembly which includes a tip off cap feature such as conventional dode hinge caps 48 and 50.

Since speed and ease of access to the sleeve and arbor shaft assembly is essential to the feasibility and economy of employing removable and disposable roll sleeves, such a feature is very important.

For example, all removable components, sleeve 12, adapter ring 38, locknut 42 and lockwasher 46 all have a larger inside diameter than the outside diameter of bearing cartridge 52 disposed within the hinged cap 50 of the bearing assembly.

With turning of the threaded bolt 54, the upper portion of the housing of hinged cap 48 and 50 pivots open and the stub shafts 24 and 26 may be simply lifted free with the standard bearing cartridges 52 still fixed to the shafts.

The sleeve tube 12 may then be removed by removing locknut 42 and lockwasher 46 which will slip over bearing cartridge 52 as will removable adapter 38.

Next sleeve 12 can be removed without interfering with the bearing cartridges 52.

A new sleeve 12 is easily mounted by hand until it engages the fixed tapered adapter portion 32 on the drive end of shaft 10. Preferably, the sleeve and tapered adapters are designed with dimensions that permit the end of sleeve 12 to ride approximately midway along the length of tapered adapter portion 32 with only manual pressure being applied.

With the new sleeve hand positioned as described above, removable adapter ring 38 is installed manually as far as possible and locknut and lockwasher 42 and 46 respectively are appropriately positioned and tightened until the far end of the new sleeve is pushed into contact with shoulder 34 on adapter portion 32 and shoulder 40 of adapter ring 38. The locknut is locked into position and the assembly is simply remounted into the bearing housings 48 and 50. The housing caps are closed and tightened and the driving member is connected and a new run may be commenced.

As compared to the present procedure necessary with integrally formed rolls or to that necessary with prior art removable sleeve constructions, the assembly and disassembly of the present invention is far less time consuming and very simple.

Further, the construction of the present invention is far less complex and very inexpensive as compared to the prior art. Together with the relatively small expense of the removable sleeve 12 and the time saved in change-over disposable sleeves may be used on a commercially acceptable basis and actually dictate the replacement of conventional integrally formed rolls for coating applications on a purely economic basis.

It should be mentioned that with proper design, the assembly of the present invention is quite suitable for most typical buffing, coating and painting applications wherein extreme high compression forces are not encountered.

It should be pointed out that in a typical buffing operation, the roll assembly of the present invention would normally be arranged in a series of two or four depending upon the density of the coating required on the final product. This type of use would be particularly benefi-
cial in waxing applications applied to metal used in the food industry and which require a density with rigid specifications. When used in coating or painting applications the rolls would be driven as described in the embodiment herein and rotate in a bath of the coating to be applied.

Service life of the rolls depends upon the specific application. Once the rolls have reached a saturation point relative to achieving the proper density of the coating, the sleeves would be replaced.

As described herein, this may be accomplished with speed and convenience. However, after a short production run the rolls may also be replaced for another run using a different coating or color of paint with little expense or time expended. Costly lost time in disassembly and cleaning operations which are necessary with the presently used integrally formed rolls is eliminated.

Additionally the relatively inexpensive disposable sleeve does not require the large capital investment that the additional inventory of integrally formed rolls required.

What is claimed is:

1. A coating roll apparatus comprising, in combination, a sleeve portion removably mounted on an arbor assembly, said arbor assembly including a main body portion provided with circumferentially enlarged outer end portions, each having an inwardly directed tapered surface adapted to frictionally grip the inside surface of said sleeve portion, one of said end portions provided with an outwardly extending threaded adapter portion of reduced diameter relative to the diameter of the opposing tapered end portion and a removably mounted ring segment slideably engaging an inner unthreaded portion of said threaded adapter portion and provided with an inwardly tapered surface frictionally engaging said sleeve portion; locking means threadably mounted on said threaded portion in force transmitting engagement with said ring segment; a bearing cartridge assembly fixed on each of said stub shaft means and removably mounted in a bearing assembly housing, said locking means, said ring segment and said sleeve portion having a larger inside diameter than the outside diameter of said bearing cartridge assembly.

3. A coating roll apparatus for processing sheet materials comprising, in combination, a rotatably mounted shaft having a first circumferentially enlarged end portion provided with an inwardly directed tapered surface and a second circumferentially enlarged end portion provided with an outwardly directed threaded portion, the circumference of said second end portion being smaller than the smallest circumference of said first tapered end portion; a ring adapter member removably mounted in sliding engagement with said second enlarged end portion and provided with a tapered circumference which is substantially equal to the tapered circumference of the first tapered end portion; a sleeve member having a substantially cylindrical inner surface adapted to removable receive said shaft in frictional gripping relationship with said first tapered end portion and said ring adapter member; and locking means removably threaded on said threaded portion of said second end portion in force transmitting engagement with said ring adapter member.