Sept. 15, 1959 L. H. EWING 2,904,279

EXPANDING CHUCK

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Fig. 1

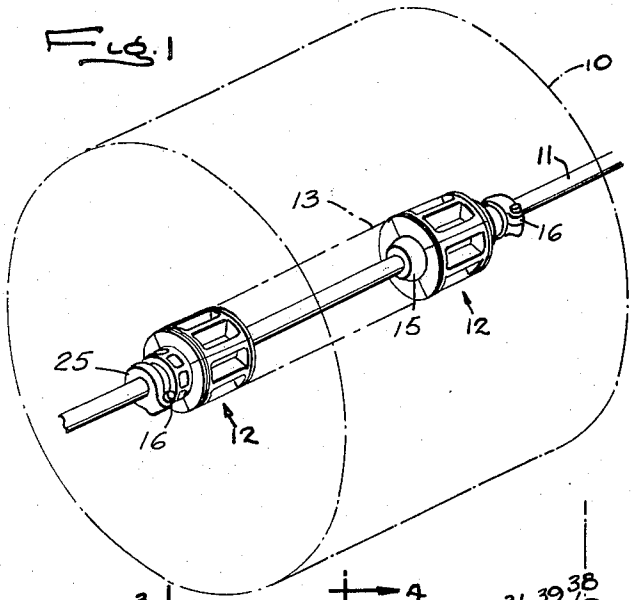
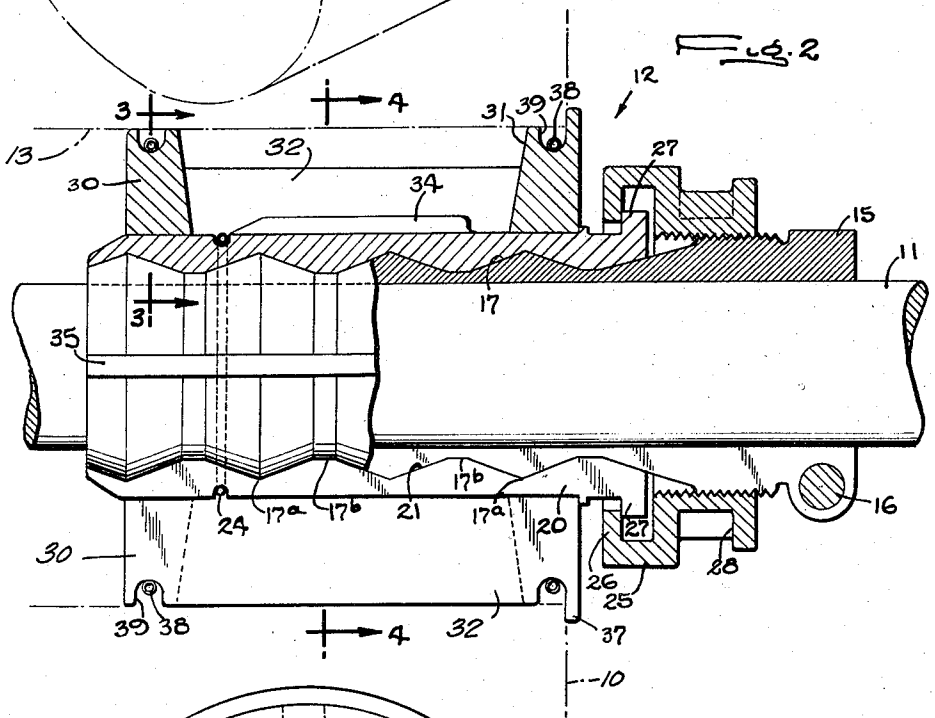


Fig. 2



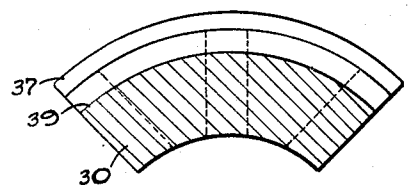


Fig. 3

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Fig. 4

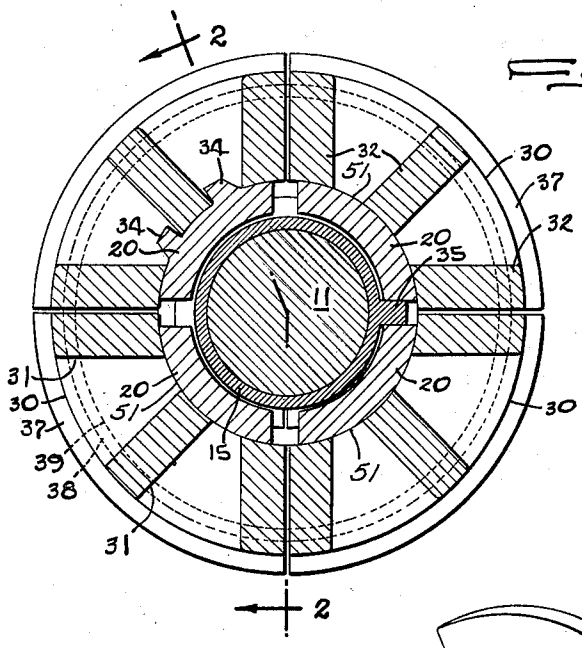


Fig. 6

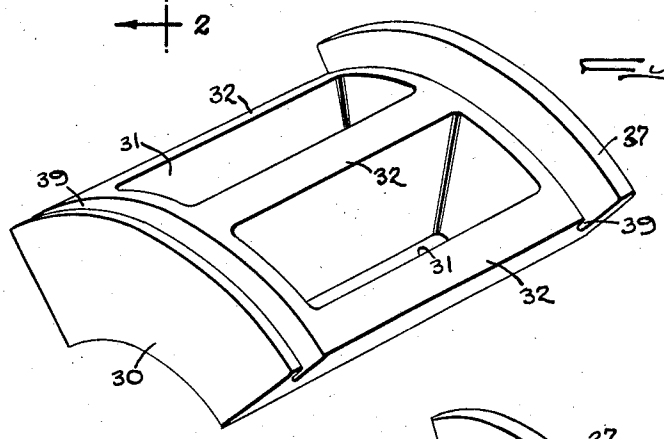
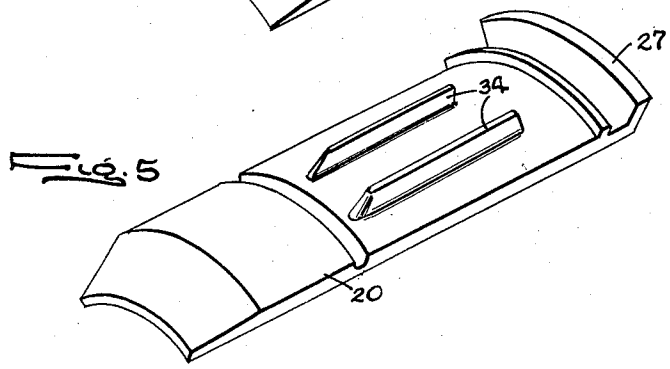


Fig. 5



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EXPANDING CHUCK

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6 Claims. (Cl. 242—72.1)

The present invention relates to expanding chucks and more particularly to expanding chucks for supporting a roll of paper or other like sheet material on a shaft.

One object of the present invention is to provide an expanding chuck which, when mounted on a shaft and inserted in the core of a paper roll, is easily expanded or collapsed and, when in the expanded position, affords a secure, positive and uniform gripping action on both the shaft and the core.

Another object of the present invention is to adapt conventional paper roll chucks for use with paper roll cores of large internal diameter while maintaining perfect centering and uniform expansion of the chuck within such a core.

A further object of the present invention is to increase the gripping action between variable size expandable paper roll chucks having the above characteristics and a hollow core in order to achieve a positive, driving connection therebetween and to prevent the slipping or coasting of the roll under conditions of high brake tension.

Other objects and advantages of the present invention will become apparent as the following description proceeds, taken in connection with the accompanying drawings wherein:

Figure 1 is a perspective view of a paper roll mounted on a shaft by a pair of chucks and adaptors illustrative by the present invention.

Fig. 2 is a longitudinal elevation view, partly in section, of the right end chuck and adaptor shown in Fig. 1, the view being taken generally on the line 2—2 of Fig. 4.

Fig. 3 is a transverse section taken substantially in the plane of line 3—3 of Fig. 2.

Fig. 4 is a transverse section taken substantially in the plane of line 4—4 of Fig. 2.

Fig. 5 is a perspective view of an expandable chuck leaf of the type used in the chuck shown in Fig. 1.

Fig. 6 is a perspective view of an adaptor chuck leaf for use with the chuck collar shown in Fig. 5 and illustrative of the present invention.

While the invention is susceptible of various modifications and alternative constructions, a certain illustrative chuck has been shown in the drawings and will be described below in detail. It should be understood that there is no intention to limit the invention to the form disclosed. On the contrary, the intention is to cover all modifications, alternative constructions and equivalents falling within the spirit and scope of the invention as expressed in the appended claims.

In order to secure a core mounted paper roll **10** on a shaft **11** as shown in Fig. 1, a pair of expansible adapter chucks **12** are mounted on the shaft and are inserted into the respective ends of the core **13** of the roll **10**. By expanding the chucks to engage the inner area of the core and by tightening them on the shaft, the paper roll and shaft are securely gripped and held in a non-rotative relation. While one of the pair of chucks will be described,

it will be understood that the other is similar in all respects.

One illustrative example of an expanding chuck **12** (Fig. 2) suitable for securely mounting a paper roll **10** on a shaft **11** comprises an inner cam member **15** in the form of an annular cylinder adapted to be placed around the shaft and secured thereto by means of a clamping bolt **16**. The inner member **15** carries on its outer surface an undulating cam face **17** formed of an axial succession of transverse ridges **17***a* and valleys **17***b*.

A plurality of axially extending quadrant-shaped segmental leaves **20** are circumferentially spaced around the inner member **15**. Each leaf **20** has on its inner surface an undulating cam face **21** of a form similar to the cam face **17** on the inner member **15** (Fig. 2) and an outer arcuate surface **51**. When the leaves **20** are placed around the inner member **15** the ridges formed by the undulating cam face on one nest within the valleys formed by the undulating cam face on the other so that the cam faces **17** and **21** are mutually engaged. One or more coil springs **24** serve to hold the leaves in place on the inner member forming generally on the outer faces **51** a circular bearing surface.

To increase the outer circumference of the circular bearing surface of the nested leaves they are moved axially along the inner member, the cam action between the undulating faces **17** and **21** on the leaves **20** and the inner member **15** forcing the leaves radially outwardly to a larger external diameter. The axial movement giving the cam action is accomplished by a nut **25** threadably mounted on the inner member **15** and having an annular shoulder **26** which engages an annular collar **27** on the ends of the leaves **20**.

When the nut is rotated, a force is exerted between the shoulder **26** and the collar **27**. This axial force is transmitted to the engaging cam surfaces **17** and **21** forcing the leaves to be expanded on the inner member. For example, when the chuck is inserted in a core **13** the leaves upon expansion engage the inner surface of the core and if sufficient force is exerted on the nut, the chuck is tightly engaged therewith.

A spanner wrench is desirably, although not exclusively employed for rotating the nut on the inner member. To this end a series of holes **28** are circumferentially disposed around the nut for engagement by the spanner wrench.

In accordance with the present invention, provision is made for increasing the outer circumference of a paper roll holding chuck in order to accommodate it for use with paper roll cores having large inner diameters. This is accomplished by the use of a plurality of annular or quadrant-shaped adapter chuck leaves **30** fastened over the chuck leaves **20** to increase the radial thickness thereof. One of the annular adapter chuck leaves **30** is nested around each of the chuck leaves **20** and in effect increases the thickness of each of them. Each adapter leaf **30** is alined with a corresponding leaf **20** and the outer circumference of the chuck is thus increased to slightly smaller than the circumference of the oversize core **13**. Upon expansion of the chuck, the outer surfaces of the supplementary chuck leaves **30** positively engage the inner surface of the paper roll core.

In order to increase the gripping action and at the same time reduce the weight of the adapter chuck leaves **30**, each is formed with two outwardly flaring radial slots **31** which form three radial walls **32**. The outer edges of these walls, when the adapter is in use on the chuck, bite into the yieldable surface of the paper roll core and firmly anchor it with respect to the chuck. In this respect, the paper roll core surface, being relatively soft compared to the walls of the adapter leaves **30**, is deformed to project slightly within the slots **31**, thereby in-

creasing the strength of engagement between the chuck adapter and the paper roll.

Means are provided for preventing the adapter leaf members **30** from rotating relative to the chuck leaf members **20**. To this end, one of the chuck leaves **20** (Fig. 5) is formed with two axially extending spaced keys **34**. These keys project into the radial slots **31** of one segmental core member and engage the radial walls thereof when it is placed on that leaf. The leaves **20** are in turn prevented from rotating relative to the inner member **15** by an axially extending key **35** on the latter which projects radially and longitudinally between two of the leaves **20**. Relative rotation between the leaf members of the chuck and the inner member **15** is thus seen to be effectively precluded.

The chuck assembly **12** is prevented from sliding within the large diameter core of the paper roll **10** by an annular shoulder **37** on one end of each of the adapter leaf members **30**. This collar formed by shoulders **37** engages the end of the core **13** to position the chuck **12** therein. The adapter leaf members **30** are held in surrounding relation on the chuck leaves **20** by means of coil springs **38** which lie in grooves **39** on the adapter leaf members **30**.

To mount a roll of paper **10** having a large diameter core **13** on a shaft **11**, the inner member **15** of a chuck **12** of the type described above is secured onto the shaft **11**. The separate chuck leaves **20** are held on this inner member with the cam faces of each in mutual engagement by the coil spring **24** and the tightening nut **25**. The adapter leaf members **30** are then placed around the chuck leaves **20** and held thereon by the coiled springs **38**. The shaft is then inserted through the core of the roll and a second chuck is then secured on the shaft with one end engaged within the core. A spanner wrench or the like is engaged with the nuts on both of the chucks which are rotated to expand the leaves against the tension exerted by the coil springs and into engagement with the inner surface of the core. The cam action achieved by the undulating cam faces causes the leaves to expand uniformly to center the shaft in the core. A secure grip between the chuck and the core is achieved because the outer edges of the radial walls **32** of the adapter leaf members **30** bite into the relatively soft inner surface of the paper roll core **13**.

A novel core member has thus been described which adapts a conventional paper roll chuck for use with paper rolls having larger than ordinary internal diameter and which maintains the perfect centering and uniform expansion features of the chuck and at the same time securely grips the paper roll core to prevent the paper roll from slipping or coasting relative to the chuck and the shaft on which it is mounted.

By providing a supplementary adapter leaf corresponding to each chuck leaf and alining the adapter leaf with its associated chuck leaf, the built-up paper roll chuck is adapted for use with the large diameter core paper rolls. Accordingly, perfect centering of the built-up chuck is attained.

The ridges on the adapter chuck leaf **30** formed by the walls **32** in the indentations formed by the slots **31** are effective in preventing rotation between the adapter leaves of the built-up chuck, the chuck leaves and the paper roll. The ridges bite into the inner surface of the core, as described above, in an embossing action to slightly transform the core. In this manner the grip between the core and the roll is enhanced, effectively preventing a shift between them.

I claim as my invention:

1. A built-up expanding chuck for mounting paper rolls having large diameter cores on a shaft, the chuck including an inner tubular member adapted to be secured on the shaft, a plurality of quadrant-shaped chuck leaves concentric with said inner member and expansible towards engagement with the paper roll upon axial movement relative to the inner member, said inner member and said chuck leaves having mutually engaging cam faces thereon, and means for moving said leaves axially relative to the inner member, a plurality of quadrant-shaped adapter chuck leaves corresponding in number to said chuck leaves and adapted to be interposed between the chuck leaves and the paper roll for engaging the paper roll core, each of said adapter chuck leaves having an arcuate outer surface, a radially extending slot opening into said outer surface, said slot having radial walls, the outer edges of said walls adapted to bite into the inner surface of the paper roll core and deform the same into said slots, a radially extending key on one of said chuck leaves adapted to engage at least one of said adapter chuck leaves for preventing relative rotation between said chuck leaves and said adapter chuck leaves, and a plurality of tension springs surrounding said adapter chuck leaves to hold the same in engagement with said chuck leaves.

2. A built-up expanding chuck for mounting paper rolls having large diameter cores on a shaft, the chuck including an inner member adapted to be secured to the shaft, a plurality of segmental leaves concentric with said inner member and having cam means for radially expanding them toward engagement with the paper roll, a plurality of annular segmental adapter leaves corresponding in number to said first named segmental leaves and adapted to be interposed between said leaves and the paper roll core, and locking means interposed between at least one of said segmental adapter leaves and its associated leaf for preventing relative rotation between said leaves when the latter has been forcibly expanded into firm gripping engagement with the paper roll core, the outer surface of at least one of said adapter chuck leaves having spaced ridges with interposed indentations to provide embossing engagement between said ridges and the core incident to said forcible expansion.

3. A built-up expanding chuck having adapter chuck leaves for mounting paper rolls having large diameter cores on a shaft, said expanding chuck including an inner member telescopically mounted on and secured to the shaft and a plurality of outer leaves concentric with said inner member and expansible towards engagement with the core of the paper roll upon axial movement thereof relative to the inner member and means for moving said leaves axially relative to the inner member, said expanding adapter chuck leaves being in the form of sectors surrounding the outer leaves of said expanding chuck and adapted to be interposed between said expanding chuck and the inner base of the core of the paper roll, one of said outer leaves having a pair of spaced projections on the outer surface thereof, and a radial wall on one of said adapter chuck leaves engageable with said projections for preventing the relative rotation of said outer leaves and said adapter chuck leaves.

4. A paper roll chuck for securing core mounted paper rolls on a shaft, comprising in combination an inner member adapted to be fastened to the shaft, a plurality of axially extending leaves circumferentially surrounding said member, said leaves and said member having mutually engaging cam faces thereon for forcibly separating the former from the latter upon axial movement therebetween, a plurality of angular segmental adapter leaves surrounding said first named leaves, means for keying at least one of said adapter leaves to a corresponding leaf to prevent rotation of said adapter leaf thereon, and means for moving said first named leaves axially relative to said inner member to expand said annular segmental adapter leaves radially into firm gripping engagement with the inner surface of the paper roll core.

5. A paper roll chuck for securing core mounted paper rolls on a shaft, comprising in combination an inner member adapted to be fastened to the shaft, a plurality of axially extending segment-shaped leaves circumferentially surrounding said member, said leaves and said member having mutually engaging cam faces thereon for forcibly separating the same upon axial movement there-

between, a key on one of said leaves, a plurality of annular segmental adapter leaves corresponding in number to said first named leaves and circumferentially surrounding the same, at least one of said adapter leaves having a slot for cooperating wtih said key, a coil spring surrounding said adapter leaves and holding the same around the first named leaves, and means for moving said leaves axially relative to said inner member to expand said adapter leaves radially against the tension of said spring and into gripping engagement with the inner surface of the paper roll core.

6. A paper roll chuck for securing core mounted paper rolls on a shaft, comprising in combination an inner member telescopically mounted and fastened to the shaft, a plurality of axially extending segment-shaped leaves circumferentially surrounding said member, said leaves and said member having mutually engaging cam faces thereon for forcibly separating the former from the latter upon axial movement therebetween, a plurality of annular segmental adapter leaves surrounding said first named

leaves, each of said adapter leaves having a radially extending slot opening into the outer surface thereof, said outer surface thereby being adapted to bite into the inner surface of the paper roll core and deform the same into said slots, means for keying at least one of said adapter leaves to a corresponding leaf to prevent rotation of the same on said leaves, a coil spring surrounding said adapter leaves and holding the same around the first named leaves, and means for moving said first named leaves axially relative to said inner member to expand said adapter leaves radially against the tension of said spring and into firm gripping engagement with the inner surface of the paper roll core.

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