Jan. 13, 1953 T. A. McARN 2,625,338

EXPANSIBLE ROLL SHAFT

Filed March 8, 1951 3 Sheets-Sheet 1

FIG. 1.

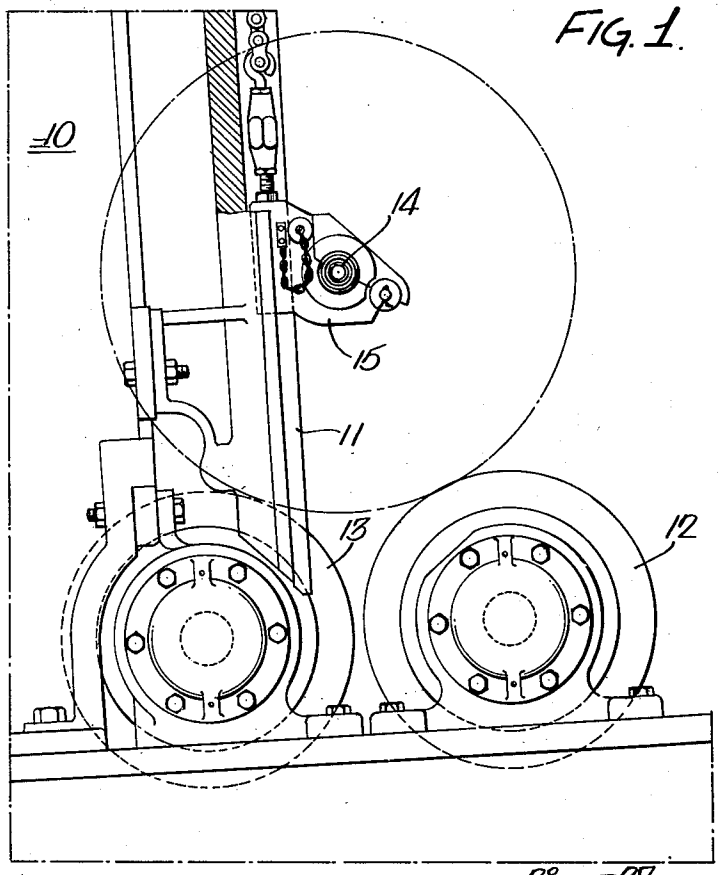


FIG. 10.

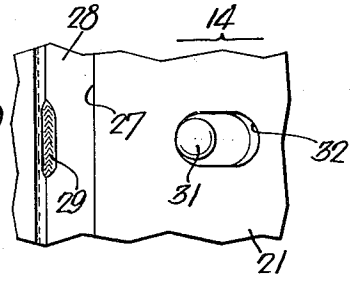


FIG. 9.

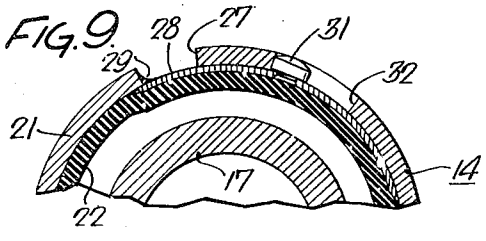
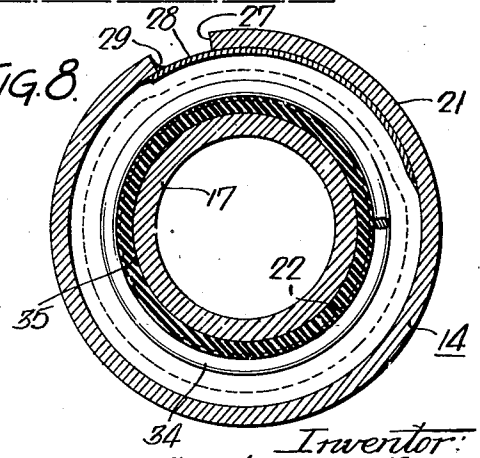


FIG. 8.



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Jan. 13, 1953 T. A. McARN 2,625,338

EXPANSIBLE ROLL SHAFT

Filed March 8, 1951 3 Sheets-Sheet 2

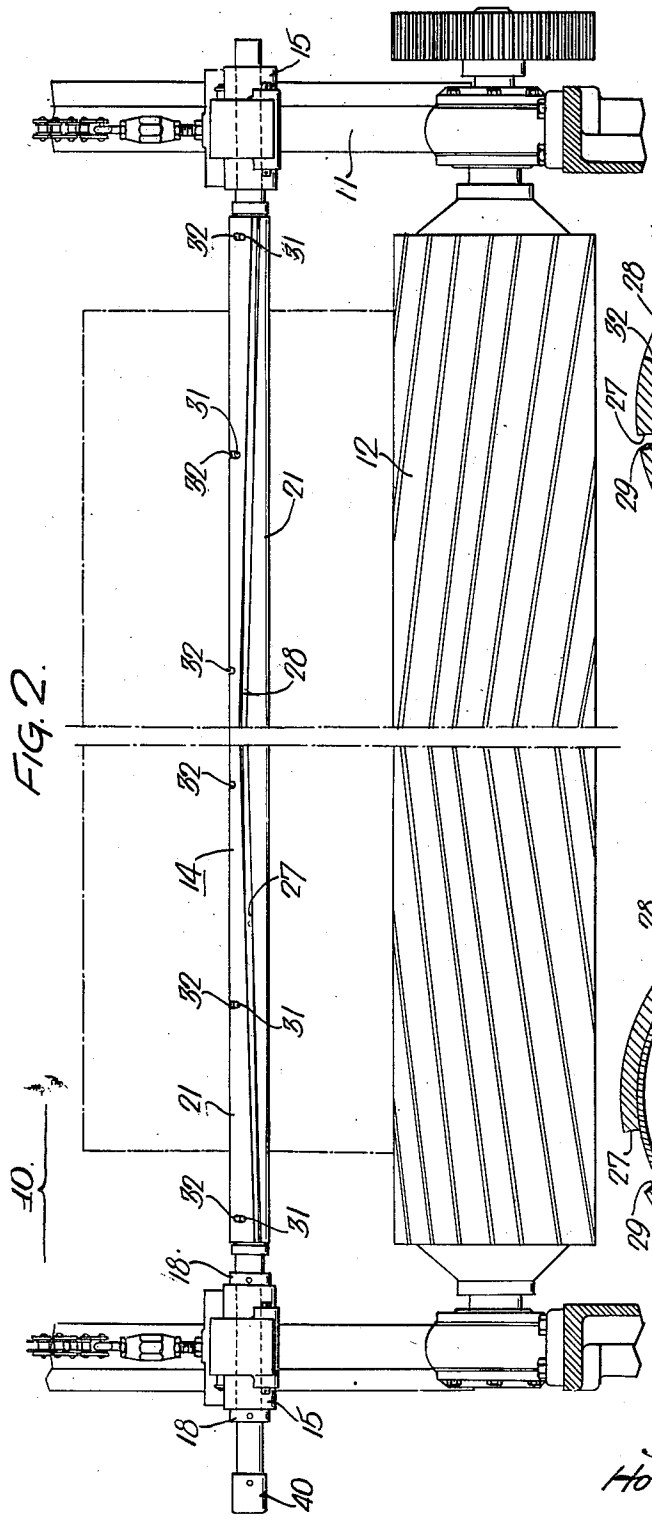


FIG. 2.

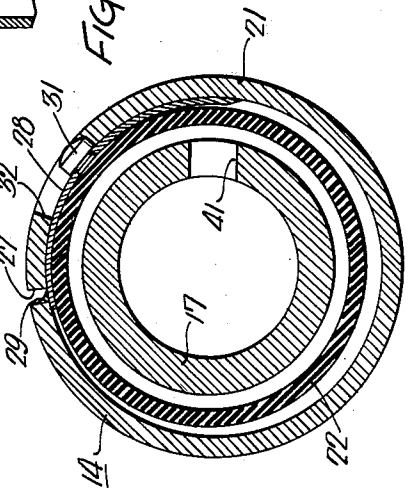


FIG. 7.

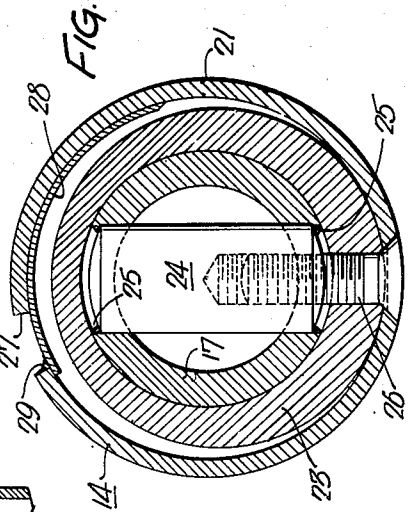


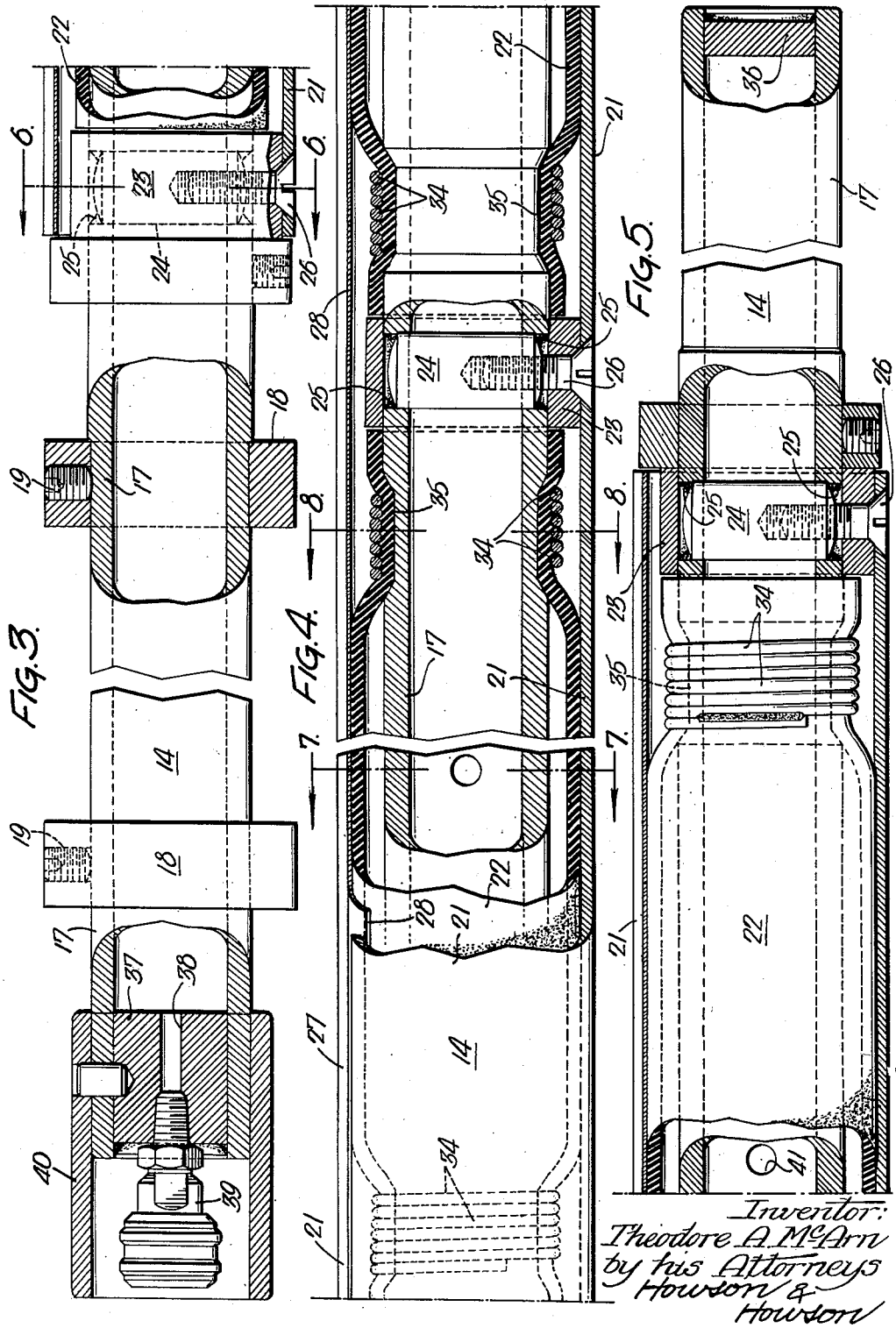
FIG. 6.

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Jan. 13, 1953 T. A. McARN 2,625,338

EXPANSIBLE ROLL SHAFT

Filed March 8, 1951 3 Sheets-Sheet 3



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2,625,338

UNITED STATES PATENT OFFICE

2,625,338

EXPANSIBLE ROLL SHAFT

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Application March 8, 1951, Serial No. 214,494

4 Claims. (Cl. 242—72)

1

The present invention relates to new and useful improvements in removable shafts for winding rolls, for example, paper, in a paper making machine. More particularly the present invention relates to improvements in shaft constructions having means for maintaining the shaft in an expanded condition during the winding operation and for contracting the shaft when it is desired to remove it from the roll wound thereon.

In the manufacture of paper, it is customary to provide means at the end of a paper making machine for winding the paper into a roll as it leaves the machine, and it has been the practice to construct such shafts so that they may be expanded and contracted as desired. Prior to the present invention such shaft constructions, for the most part, utilized cam or wedge devices of various form which could be operated to expand the shaft for the winding operation and then contracted to reduce the shaft diameter and permit its easy removal from the roll. This type of expansible shaft construction is not too satisfactory since the working parts frequently become jammed necessitating the use of a hammer to force the shaft out of the roll with resulting damage to the shaft.

With the foregoing in mind the principal object of the present invention is to provide a novel shaft construction of the stated type wherein means are provided for expanding or contracting the shaft as desired.

Another object of the present invention is to provide a novel expansible roll shaft as set forth which is of rugged construction and which is entirely reliable and fool-proof in operation and use.

A further object of the present invention is to provide a novel expansible roll shaft having the features and characteristics set forth which is of comparatively simplified construction having substantially no moving parts and which is less costly than prior expansible shaft constructions.

These and other objects of the present invention and the various features and details of the operation and construction thereof are hereinafter more fully set forth and described with reference to the accompanying drawings in which:

Fig. 1 is a fragmentary side elevational view partially in section of a drum winder supporting an expansible roll shaft made in accordance with the present invention;

Fig. 2 is a fragmentary end elevational view of the drum winder illustrated in Fig. 1;

Fig. 3 is a fragmentary elevational view partially in section of one end of an expansible roll shaft embodying the present invention;

2

Fig. 4 is a fragmentary elevational view partially in section of the central portion of an expansible roll shaft made in accordance with the present invention;

Fig. 5 is a fragmentary elevational view partially in section of the other end of the expansible roll shaft illustrated in Figs. 3 and 4;

Fig. 6 is a sectional view taken on line 6—6, Fig. 3 showing the means for securing the outer shell of the expansible roll shaft to the central shaft portion;

Fig. 7 is a sectional view taken on line 7—7, Fig. 4 with the expansible roll shaft in a contracted position;

Fig. 8 is a sectional view taken on line 8—8, Fig. 4 showing the means for securing the rubber inner-tube to the central shaft;

Fig. 9 is a fragmentary sectional view, similar to Fig. 7 with the roll in an expanded condition; and,

Fig. 10 is a fragmentary elevational view of a portion of the surface of the expansible roll shaft showing the means for limiting the expanded and contracted positions.

Referring more specifically to the drawings, and particularly to Figs. 1 and 2, reference numeral 10 designates generally a drum winder of conventional type comprising a frame 11 and a pair of drum rolls 12 and 13 supported by the frame 11 in a spaced parallel relationship. Positioned above and centrally between the drum rolls 12 and 13 is an expansible roll shaft 14 made in accordance with the present invention. The shaft 14 is rotatably mounted in brackets 15 carried by the frame 11 and adapted for relative vertical movement therewith as the paper roll, wound on the shaft 14 increases in diameter.

With reference to Figs. 3, 4, and 5, the expansible roll shaft 14 comprises a tubular central shaft 17 which extends coaxially the full length of the shaft 14. A pair of collars 18 are adjustably secured to one end of the central shaft 17 by means of set screws 19 and prevent longitudinal shifting of the roll shaft 14 with respect to the brackets 15.

The shaft illustrated in the drawings comprises a split outer expansible tubular shell 21 which is secured to one side of the central shaft 17 in the manner shown in Fig. 6, and an expansible rubber inner-tube 22 which is positioned between the inner shaft 17 and the outer shell 21. (See Fig. 7.) The outer shell 21 is held in a spaced relationship with the central shaft 17 by means of collars 23 positioned eccentrically on the central shaft 17 as shown in Figs. 3, 4, 5 and 6. A

pin 24 extends transversely through the central shaft 17 beneath each of the collars 23, and is secured thereto by means of welds as indicated at 25. A screw 26 threaded into the pin 24 is provided to secure the outer shell 21 tightly against the eccentric collar 23.

Diametrically opposite the point where the outer shell 21 is secured to the central shaft 17 is a slot 27 extending the full length of the outer shell. The slot 27 is disposed angularly along the outer shell 21 from one end to the central portion and then back towards the other end. This angular positioning of the slot 27 prevents a ridge being formed in the roll of paper wound on the shaft 14. A cover plate 28 is provided which is secured to the underside of the outer shell at one edge of the slot 27 and extends transversely across the slot. The cover plate 28 may be fastened to the outer shell 21, for example, by welds as indicated at 29. A resilient material, such as steel, properly heat treated, is used for the outer shell 21, and the shell normally returns to and remains in its contracted position as indicated in Fig. 7 due to its inherent resiliency. A plurality of pins 31 secured to the cover plate 28 and extending outwardly therefrom into circumferential slots 32 in the outer shell 21 limit the expanded and contracted position of the outer shell.

In the illustrated embodiment of the present invention, the expansible rubber inner-tube 22 has reduced portions at each end and at its midpoint secured to the central shaft 17 by means of wire 34 wrapped tightly around the inner-tube 22. Under-cut portions 35 are provided on the central shaft 17 to prevent longitudinal movement of the wire 34 and inner tube 22 with respect to the shaft 17. In order to expand the shaft 14, air is admitted under pressure centrally of the shaft 17 and from there to the expansible rubber inner-tube 22 thereby causing the outer shell 21 to expand.

Plugs 36 and 37 secured to each end of the shaft 17 prevent escape of air therefrom. An axial opening 38 is provided in the plug 37 and an air valve 39 is secured therein for the purpose of controlling the air pressure interiorly of the shaft 17 and of the expansible rubber inner-tube 22. Positioned co-axially along the shaft 17 and extending outwardly therefrom is a sleeve 40 adapted to prevent the valve 39 from being damaged. The air admitted under pressure centrally of the shaft 17 is allowed to escape from the shaft 17 through openings 41 therein and react on the expansible rubber inner-tube 22. When air is passed through the air valve 39, the inner-tube 22 is caused to expand, which in turn expands the outer shell 21. The outward expansion of the shell 21 is limited by the stops 31 as previously mentioned. Opening the valve 39 allows the air to escape from the inner tube 22, in turn permitting the outer shell 21 to contract to its normal position.

In operation, the expansible roll shaft is placed on the bearings of the drum winder in an expanded condition and the paper (not shown) is wound thereon. After the roll of paper has reached its desired size and is removed from the drum winder, the valve 39 is opened thus permitting the expansible roll shaft 14 to contract and allowing the shaft 14 to be freely withrawn from the roll.

From the foregoing, it will be observed that the present invention provides a novel expansible roll shaft which will always return to the contracted position when desired and which may be easily removed from the roll of paper. Furthermore, the present invention provides a novel expansible roll shaft which is substantially more durable than the present type of roll shafts and which will not be damaged by heavy knocks or blows.

While certain embodiments of the present invention have been illustrated and described herein, it is not intended to limit the invention to such disclosures, and changes and modifications may be incorporated and embodied therewith within the scope of the following claims.

I claim:

1. A shaft for winding material thereon comprising a tubular inner shaft having a plurality of outlet openings therein, plugs secured in air tight relation at each end of said inner shaft, an expansible tubular outer shell mounted on said inner shaft in spaced circumscribing relation thereto and having a slot extending lengthwise therein to allow the outer shell to be expanded from a normally contracted condition, a cover plate secured to the underside of said outer shell at one edge of said slot and extending transversely across said slot, an inflatable tubular liner surrounding said inner shaft and operable when inflated to expand said outer shell, a valve secured in one of said plugs for controlling passage of a gaseous medium interiorly of said inner shaft and through said outlet openings therein into said liner to inflate the same, and pins secured to said cover plate projecting into circumferential slots in said outer shell to limit expansion of the outer shell.

2. A shaft for winding material thereon comprising a tubular inner shaft having a plurality of outlet openings therein, plugs secured in air tight relation at each end of said inner shaft, an expansible tubular outer shell positioned about said inner shaft and having a slot extending lengthwise therein to allow the outer shell to be expanded from a normally contracted condition, means mounting said outer shell in spaced circumscribing relation to said inner shaft, a cover plate secured to the underside of said outer shell at one edge of said slot and extending transversely across said slot, an inflatable tubular liner surrounding said inner shaft and operable when inflated to expand said outer shell, a valve secured in one of said plugs for controlling passage of a gaseous medium interiorly of said inner shaft and through said outlet openings therein into said liner to inflate the same, and pins secured to said cover plate projecting into circumferential slots in said outer shell to limit expansion of the outer shell.

3. A shaft for winding material thereon comprising a tubular inner shaft having a plurality of outlet openings therein, a plurality of spacers eccentrically mounted on said inner shaft, an expansible tubular outer shell positioned about said inner shaft and having a slot extending lengthwise therein to allow the outer shell to be expanded from a normally contracted condition, means on said outer shell diametrically opposite said slot securing said outer shell to said eccentric spacers so that the outer shell is eccentric with respect to inner shaft in the contracted condition and concentric with the inner shaft in its expanded condition, a cover plate secured to the underside of said outer shell at one edge of the slot and extending transversely across said slot, an inflatable tubular lining interiorly of

said outer shell and surrounding said inner shaft operable when inflated to expand said shell, means to inflate said liner, and pins secured to said cover plate projecting into circumferential slots in said outer shell to limit expansion of the outer shell.

4. A shaft for winding material thereon comprising a tubular inner shaft having a plurality of outlet openings therein, plugs secured in air-tight relation at each end of said inner shaft, a plurality of spacers eccentrically mounted on said inner shaft, an expansible tubular outer shell positioned about said inner shaft and having a slot extending lengthwise therein to allow the outer shell to be expanded from a normally contracted condition, means on said outer shell diametrically opposite said slot securing said outer shell to said eccentric spacers so that the outer shell is eccentric with respect to inner shaft in the contracted condition and concentric with the inner shaft in its expanded condition, a cover plate secured to the underside of said outer shell at one edge of the slot and extending transversely across said slot, an inflatable tubular lining interiorly of said outer shell and surrounding said inner shaft operable when inflated to expand said shell, a valve secured in one of said plugs for controlling passage of a gaseous medium interiorly of said inner shaft and through said outlet openings therein into said liner to inflate the same, and pins secured to said cover plate projecting into circumferential slots in said outer shell to limit expansion of the outer shell.

THEODORE A. McARN.

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