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H. H. MERWIN ET AL
MATERIAL SERVING APPARATUS

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2 Sheets-Sheet 1

FIG. 1.

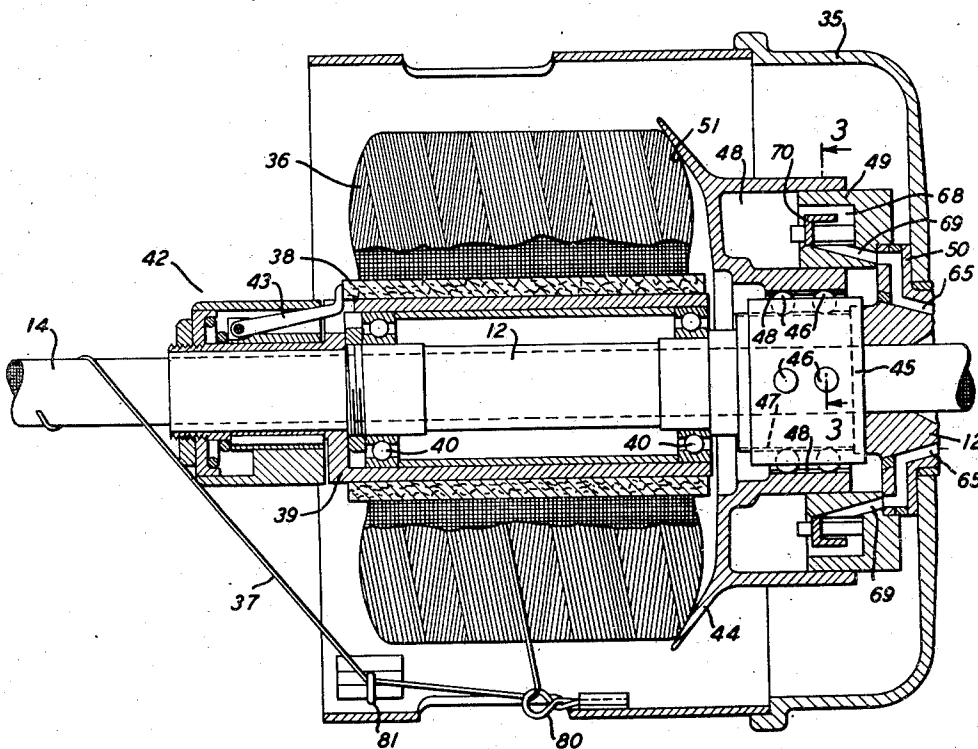
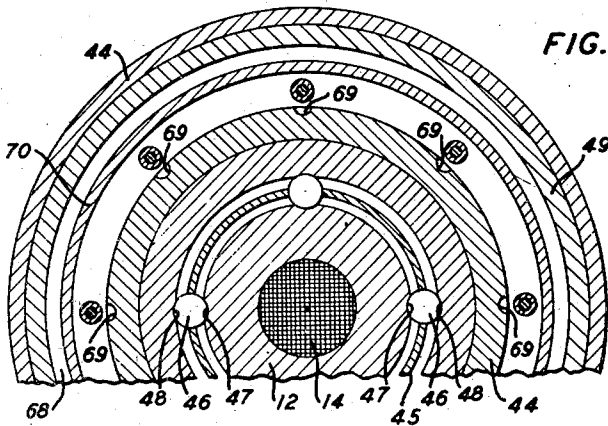


FIG. 3.

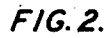


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2,430,358

MATERIAL SERVING APPARATUS

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Application September 11, 1946, Serial No. 696,127

5 Claims. (Cl. 57—18)

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This invention relates to material serving apparatus, particularly those for serving materials spirally on longitudinally advancing cores.

In the manufacture of cables for use in the communication arts, certain types of cables are composed of individual pairs of insulated electrical conductors led from their supply reels through a face plate which locates each pair of conductors according to the position it is to assume in the cable. After leaving the face plate, the pairs of conductors may then pass through a forming die which groups the pairs into a cylindrical cable core. The core upon leaving the forming die passes through a cotton serving head where a cotton binding is applied and continues through a stranding mechanism to a take-up reel upon which the cable thus formed is wound. The present invention relates to the cotton serving head where the speed of advancement of the pairs of conductors and eventually the completed cable core depends upon the efficiency at which the cotton strand may be served on the core under a substantially constant tension without danger of breaking the strand and thus necessitating stopping the apparatus to tie the broken ends of the strand.

An object of the invention is to provide a material serving apparatus wherein tension in the material being served is maintained constant to enable serving of the material on an advancing core at a rate of speed higher than that normally employed.

With this and other objects in view the invention comprises a material serving apparatus including the rotatable hollow shaft through which a core is advanced longitudinally, the core in the present instance being composed of a plurality of insulated electrical conductors. A hollow spindle disposed concentric with the shaft and free to rotate thereon, supports a supply of material, such as a textile strand to be wound spirally on the core while the core advances through the shaft. The spindle and the supply of material are rotated through the pulling force of the material drawn from the supply, the minimum speed of rotation of the material and spindle being greater than the speed of rotation of the shaft. A braking element is mounted for rotation with the shaft and for movement axially of the shaft whereby it may be moved to engage the supply of material throughout the serving of the material on the core. Means controlled by a fluid under a constant pressure moves the brake element toward the supply to cause the element to apply a varying braking force to the

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supply of material comparable to variations in the size of the supply as the material pays off. In effect, the braking element has a contoured surface which will translate the constant force from the fluid pressure into a varying braking force with variations in the lever arm of the supply of material as the supply decreases in diameter during the serving operation.

Another feature of the invention is embodied in the counteracting effect of the fluid, namely air under pressure and the lubricating means for the various bearings supporting the shaft. It is necessary for the air under pressure to travel into and through passageways in the hollow shaft to the brake element and in so doing, certain of the passageways are located in a highly lubricated portion of the apparatus. It is therefore arranged whereby the lubricating liquid will prevent leakage of the air under pressure into the bearings and in a similar manner the air under pressure will prevent seepage of the lubricating oil into the passageways for the air under pressure.

Other objects and advantages will be apparent from the following detailed description when considered in conjunction with the accompanying drawings, wherein

Figs. 1 and 2 combined represent a vertical sectional view of the material serving apparatus;

Fig. 3 is an enlarged fragmentary sectional view taken along the line 3—3 of Fig. 1.

The apparatus is mounted in a horizontal position on a suitable support or frame 10 and includes a main housing 11 centrally apertured for a hollow shaft 12. The shaft 12 is of varying cross-sectional contours throughout its length but extends from one end of the apparatus to the other, that is, through both Figs. 1 and 2 and it is through this shaft that a cable core 14 is advanced longitudinally. The hollow shaft 12 is driven by belts 15 extending from any suitable power source about a pulley 16 mounted upon the right end of the shaft. A plurality of bearings are mounted in the housing 11 to support the shaft 12, bearings 18 and 19 being positioned near the outer ends of the housing, while bearings 20 and 21 are positioned near the center of the housing. Suitable cover plates 23 including fluid sealing members 24 are disposed concentric with the shaft 12 to close their respective ends of the housing. A cover plate 25 closes the upper end of the housing and in this plate a suitable oil cup 26 enables the operator to fill the reservoir 27 with a liquid lubricant for the various

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bearings. Wicks 28 positioned in tubular members 29 in the housing supply oil from the reservoir 27 to their respective pairs of bearings. The lower hollow portion of the housing 11 constitutes a chamber 30 to receive the lubricant after it has passed to the bearings.

Beyond the housing 11 at the left, the shaft 12 supports a cup or guard 35 which rotates with the shaft. A supply of material 36, which in the present instance is a textile strand 37 initially wound on a core 38, is removably mounted on a spindle 39 supported for free rotation on bearings 40 disposed at spaced positions on the shaft 12. A latching unit 42 which is the subject matter of the copending application of G. C. Spillman, Serial No. 696,125, filed September 11, 1946, is mounted on the end of a reduced portion of the spindle. This unit has spaced arms 43 movable from the locking position shown in Fig. 1 where the arms, only one of which is shown, engage the core 38 and hold it in place on the spindle, and a loading position where the ends of the arms are positioned within the periphery of the spindle.

A brake element 44 of the cross-sectional contour shown in Fig. 1 is connected by a driving unit 45 to the shaft 12, the driving unit being the subject matter of the copending application of H. H. Merwin, Serial No. 696,126, filed September 11, 1946. The unit 45 in the present embodiment includes ball members 46 positioned in concaved grooves or recesses 47 and 48 in the shaft 12 and the element 44 respectively to form a positive driving connection between the shaft and the element leaving the element free for axial movement relative to the shaft. The brake element 44 has an annular chamber 48, in the open end of which an annular member 49 is disposed, the member 49 being fixedly mounted on an enlarged portion 50 of the shaft 12. The face or braking surface 51 of the element 44 is of a given contour, as illustrated, to engage the adjacent end of the supply 36 to create a brake drag, on the material, which varies effectively as the material 37 pays off the supply.

The means for applying a constant force to the brake element 44 includes fluid such as air under pressure received from a supply line 55 through a fixed reducing valve 56, an adjustable reducing valve 57 and through a line 58 into the housing 11. The first reducing valve 56 reduces the pressure of the air from that of the supply (90 pounds) to a given lower pressure (10 pounds). A further reduction of the pressure of the air is accomplished through adjustment of the valve 57, the pressure of the air in the line 58 being indicated by the pressure gage 60. The line 58 extends through the reservoir 27 and empties into a passageway 61 in the housing 11. The passageway 61 communicates with passageways 62 extending laterally at spaced positions in the shaft 12. A sleeve or inner portion 63 of the shaft 12 provides passageways 64 which connect the passageways 62 with passageways 65, these passageways extending through the enlarged portion 50 of the shaft 12 as shown in Fig. 1. The annular member 49 has an annular recess or hollow portion 68 connected by passageways 69 to the passageways 65 and also to the hollow compartment 48 of the brake element 44. To assure against irregular pressures effecting the braking force of the element 44 against the supply 36, particularly when the apparatus begins its operation and the valve 57 is initially opened, a baffle 70 is mounted in the recess 68 to deflect the jets

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of air into the annular recess 68 before passing into the chamber 48 of the element 44.

Attention is again directed to Fig. 2 at the exit end of the line 58 where the housing 11 is provided with annular ribs 72 forming annular compartments 73 between the bearings 20 and 21 and upon each side of the passageways 62. The chambers 73 have outlets 74 which empty into a passageway 75 in the housing, the passageway 75 leading on the outside of the bearings 20 and 21 to the chamber 30 at the bottom of the housing 11. With this structure the lubricant or oil in the reservoir 27 fed to the bearings through the wicks 28 will be separated from the airline and its passageways 62 by the ribs or walls 72 and the annular chambers 73. However, small quantities of the oil may seep into the chambers 73 beneath the outer ribs 72. In a like manner, there may be a seepage of air from the passageway 61 beneath the inner ribs 72 and into the chambers 73. The resulting effect will be that whatever oil may enter the chambers 73 will be forced through the outlets 74 and through the passageways 75 into the chamber 30 by the counteracting force of the small quantity of air which may seep out, maintaining the air passageways free of the lubricant.

Before considering the operation of the apparatus, the steps for loading the apparatus with a supply of material will be considered. At this time the airline 58 may be closed at the valve 57 removing the pressure from the brake element 44. If desired, means may be provided such as an additional valve to open the passageways for the escapement of air from the chamber 48 so that the brake element 44 may be moved to the right for the mounting of a full supply 36 of material 37 on the spindle 39. When the supply 36 is mounted upon the spindle and locked in place by the unit 42, the strand 37 may be threaded through eyelets or guides 80 and 81 to the core 14, the eyelets being mounted at fixed positions within the cup 35. The leading end of the strand 37 is secured in any suitable manner to the core 14 after which the apparatus is set in motion, the valve 57 having been opened to admit air at predetermined pressure indicated by the gage 60 to pass through the line 58 and the various passageways into the chamber 48 to establish a given braking force on the material of the supply to create a given tension in the strand 37 as it is wound spirally on the core. During this time the core is advanced at a given rate of speed and the shaft 12 is rotated in a direction to wind the strand material on the core. The cup 35 and the brake element 44 rotate with the shaft at the same rate of speed. The supply 36 in the present instance is caused to rotate in the same direction, as the shaft and brake element, by the pulling of the strand 37 off the supply. The speed of rotation of the supply 36, which is greater than the speed of the brake element at all times, will increase as the supply decreases in size, decreasing the lever arm of the supply. This in itself will tend to increase the tension in the strand 37 in that increasing pulling force is required to rotate the spindle and the supply at the increasing rate of speed during the decreasing diameter of the supply. It is important therefore that the brake element, to create a constant tension in the strand 37, apply its maximum braking force when the supply is full, that is, at the beginning of the serving operation, and to successively decrease its braking force on the supply as the supply decreases in size. This is made possible

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through the contouring of the surface 51 which is so formed that a smaller area thereof will engage the supply 36 as the supply decreases in size. In this manner, the constant force applied to the brake element 44, through air under pressure, will be translated into a variable or decreasing braking force applied to the material of the supply to maintain a constant tension in the strand 37. The braking element 44, although rotating with the shaft 12 in the same direction as the supply 36 but at a slower speed, will be moved axially of the shaft to engage the supply at all times and apply its desired braking force to the material.

Although specific improvements of the invention have been shown and described, it will be understood that they are but illustrative and that various modifications may be made therein without departing from the scope and spirit of this invention as defined by the appended claims.

What is claimed is:

1. A material serving apparatus comprising a hollow shaft through which a core is advanced longitudinally, means to rotate the shaft, a spindle, for supporting a supply of material to be wound spirally on the advancing core, mounted for free rotation on the shaft, means rotated by the shaft to wind the material from the supply onto the core and cause rotation of the supply by the paying off of the material at a rate of speed faster than the speed of rotation of the shaft, a brake element disposed concentric with the shaft and having a surface formed to engage the supply and apply a diminishing braking force to the supply with the diminishing diameter of the supply as the material pays off the supply during application of a constant force to move the element, and fluid operated means to apply a predetermined constant force to the brake element to move the element axially of the shaft to create a substantially constant tension in the material as it is wound on the core.

2. A material serving apparatus comprising a hollow shaft through which a core is advanced longitudinally, means to rotate the shaft, a spindle, for supporting a supply of material to be wound spirally on the advancing core, mounted for free rotation on the shaft, means rotated by the shaft to wind the material from the supply onto the core and cause rotation of the supply by the paying off of the material at a rate of speed faster than the speed of rotation of the shaft, a brake element disposed concentric with the shaft a surface formed to engage the supply and apply a diminishing braking force to the supply with the diminishing diameter of the supply as the material pays off the supply during application of a constant force to move the element, the brake element having a chamber therein open at one side opposite the supply, a fluid directing member rotatable with the shaft and formed to close the open end of the chamber, and means to direct a fluid under pressure through the member into the chamber to move the element axially of the shaft to create a substantially constant tension in the material as it is wound on the core.

3. A material serving apparatus comprising a hollow shaft through which a core is advanced longitudinally, means to rotate the shaft, a spindle, for supporting a supply of material to be wound spirally on the advancing core, mounted for free rotation on the shaft, means rotated by the shaft to wind the material from the supply onto the core and cause rotation of the supply by

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the paying off of the material at a rate of speed faster than the speed of rotation of the shaft, a brake element disposed concentric with the shaft and having a surface formed to engage the supply and apply a diminishing braking force to the supply with the diminishing diameter of the supply as the material pays off the supply during application of a constant force to move the element, the brake element having a chamber therein open at the one side opposite the supply, a fluid directing member rotatable with the shaft and formed to close the open end of the chamber, means to direct a fluid under pressure through the member into the chamber to move the element axially of the shaft to create a substantially constant tension in the material as it is wound on the core, and a baffle controlling the flow of the fluid from the member into the chamber.

4. A material serving apparatus comprising a hollow shaft through which a core is advanced longitudinally, means to rotate the shaft, a spindle, for supporting a supply of material to be wound spirally on the advancing core, mounted for free rotation on the shaft, means rotated by the shaft to wind the material from the supply onto the core and cause rotation of the supply by the paying off of the material at a rate of speed faster than the speed of rotation of the shaft, a brake element disposed concentric with the shaft and having a surface formed to engage the supply and apply a diminishing braking force to the supply with the diminishing diameter of the supply as the material pays off the supply during application of a constant force to move the element, a driving unit interposed between the shaft and the brake element and including ball members to form a positive driving connection therebetween and leave the brake free to move axially on the shaft relative to the supply, and fluid operated means to apply a predetermined constant force to the brake element to move the element axially of the shaft to create a substantially constant tension in the material as it is wound on the core.

5. A material serving apparatus comprising a hollow shaft through which a core is advanced longitudinally, means to rotate the shaft, a housing apertured for the shaft and having a reservoir for a liquid lubricant, bearings mounted in the housing to rotatably support the shaft, a spindle, for supporting a supply of material to be wound spirally on the advancing core, mounted for free rotation on the shaft, means rotated by the shaft to wind the material from the supply onto the core and cause rotation of the supply by the paying off of the material at a rate of speed faster than the speed of rotation of the shaft, a brake element mounted to rotate with the shaft and to move axially of the shaft relative to the supply, the brake element being formed to engage the supply and apply a diminishing braking force to the supply with the diminishing diameter of the supply as the material pays off the supply during application of a constant force to move the element, means to direct the liquid lubricant to the bearings, means effected by air under pressure to force the brake element to apply a given brake drag on the supply to create a substantially constant tension in the material as it is wound on the core.

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