June 7, 1966 S. REISCH 3,254,859

COILING STRIP AND ASSEMBLY

Filed April 16, 1962 3 Sheets-Sheet 1

FIG. 2a

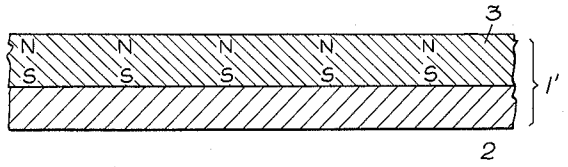


FIG. 2b

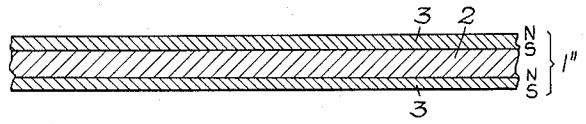


FIG. 3

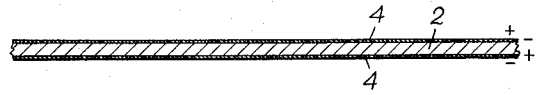


FIG. 1

FIG. 4

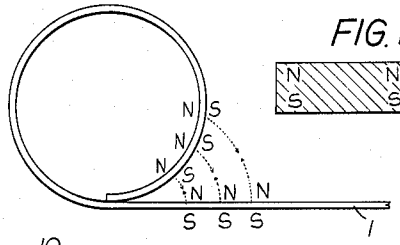


FIG. 5

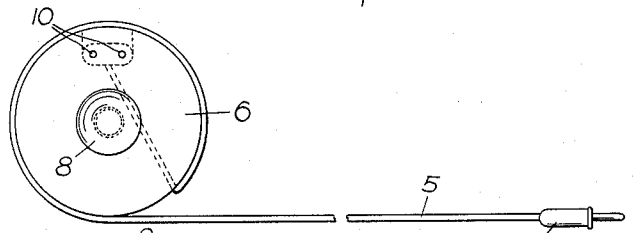


FIG. 6

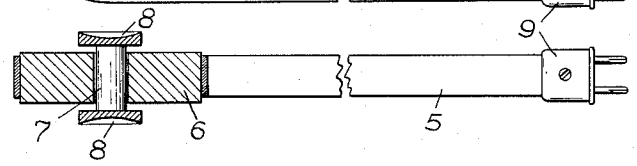
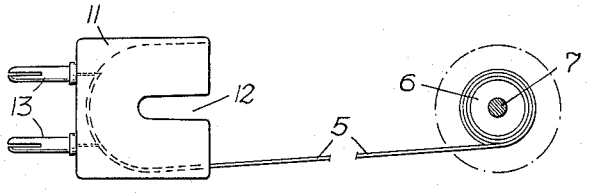


FIG. 7



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COILING STRIP AND ASSEMBLY

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FIG. 8

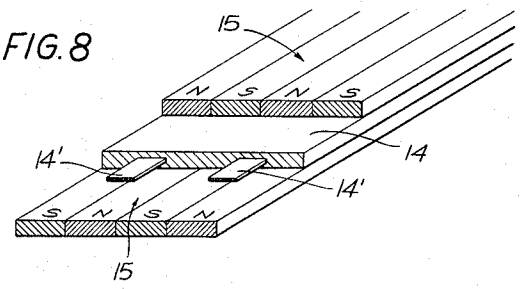


FIG. 9

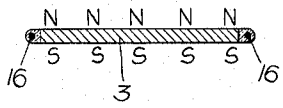


FIG. 10

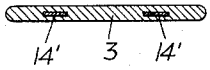


FIG. 11

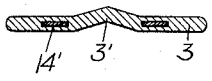


FIG. 12

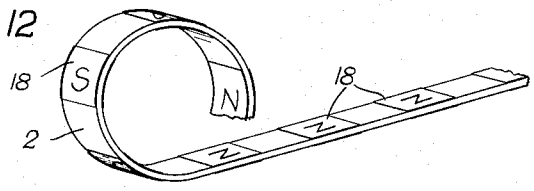
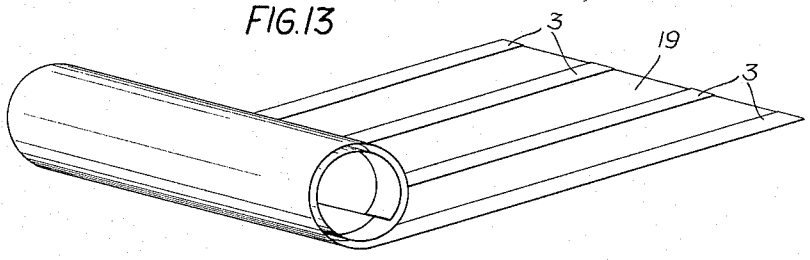


FIG. 13



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COILING STRIP AND ASSEMBLY

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FIG. 14

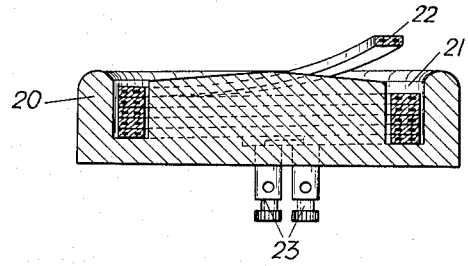


FIG. 15

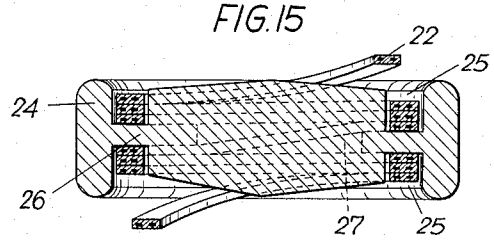
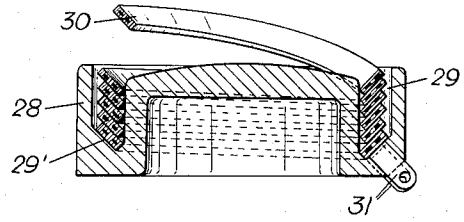


FIG. 16



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3,254,859

COILING STRIP AND ASSEMBLY

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Claims priority, application Austria, Apr. 29, 1961, A 3,397/61
21 Claims. (Cl. 242—68.5)

This invention relates to a coiling strip having a tendency to coil, for various applications and basically comprehends all kinds of flexible striplike elements as well as wide webs which are used in extended position and kept in a coiled condition. Of the numerous purposes to which the tapes according to the invention may be applied, the following may be mentioned only as examples: Measuring tapes, clotheslines, dragropes for vehicles and other pulling and retaining ropes, information carriers in tape form, such as punched tapes for teletype and similar systems, also multi-core electric leads for portable appliances for domestic use, for traveling or other purposes, such as flatirons, cooking appliances, handsets, electric shavers, fans, flash units, electromedical equipment, laboratory and surveying instruments and others.

Particularly the last-mentioned electric leads give rise to substantial difficulties in the practical use of the appliances and with regard to esthetic aspects, which are highly important in modern engineering. For this reason electric leads, e.g., for handsets and flatirons, have often been provided in the form of elastic wire coils. These coils, however, have only a limited application because the coiling tendency of the extended lead exerts an undesired pull on the appliance, which is held in most cases with the hand, and the lead does not ensure a favorable utilization of space and attractive design when coiled up.

According to the invention, strips having a coiling tendency and suitable for the above-mentioned applications are designed to consist, of at least one thin, flexible layer of a material which establishes a field of force which provides such surface polarization that there will be no attraction between the length portions of the strip when the same is extended whereas during coiling up the adjacent outside surfaces of opposite polarity attract each other to resist uncoiling of the strip.

The magnetic tape used for manufacturing the coiling strips according to the invention may consist, e.g., of a vinyl tape containing magnetic particles in such a fine division that it has permanent-magnetic properties throughout its surface. The polarization may be chosen in view of the intended application. Such magnetic tapes are being sold in the United States, e.g., under the name Magnyl.

As has been mentioned hereinbefore, the flexible carrier layer of the coiling strip may be provided at least on one side with appropriately spaced elements of magnetic material which is polarized in a direction normal to the surface.

In another embodiment of the strip according to the invention, the flexible carrier layer is provided on both sides with a magnetic tape, known per se, having alternating longitudinal zones of opposite polarity, opposite pole strips being disposed close to each other at the side edges.

Where the coiling strip consists of a two-core electric lead, each of the cores of the lead may be individually and directly connected to a magnetic tape. For instance, an insulated electrical conductor may be attached to each of the two edges of a magnetic tape. In another modification, electrical conductors may be embedded into a magnetic tape.

The magnetically polarized strip according to the invention may be coiled up in all geometric configurations which are conceivable for this purpose. In the simplest

case it will be spirally coiled with adjoining outside surfaces or in the form of a helical surface wound on edge or in the shape of a cone. In the two arrangements mentioned last, the strip will be twisted about its longitudinal axis when extended.

In a preferred embodiment of the coiling strip, the same is secured at one end to a coil former, which is freely rotatably mounted on a shaft having two finger grips. In this case the outer end of the strip is suitably connected to a flat housing, the side walls of which are provided with longitudinal slots for inserting the shaft which carries the coil former. Where this embodiment is used for electrical leads, the housing has attached to it the plug for connection to the mains and the coil former is provided with plug sockets for connection to the load.

In accordance with the basic principle of the invention, webs which can be coiled up, such as plans, drawings, projection screens, wall maps, roller blinds or the like, may be provided with magnetic tapes having a coiling tendency on one side or both sides at least on the two longitudinal edges of the web and, if desired, in the form of a plurality of equally spaced strips.

Several embodiments of strips having a coiling tendency are shown by way of example in the drawing.

FIG. 1 is a longitudinal sectional view of a coiling strip element consisting of a magnetic tape layer.

FIGS. 2*a* and 2*b* are longitudinal sectional views showing strip elements having coverings of magnetically polarized material.

FIG. 3 is another longitudinal sectional view showing a thin strip element having electrostatically polarized coverings.

FIG. 4 shows a magnetic strip as it begins to coil up.

A magnetic tape with an embedded electric lead on a coil former is shown in

FIG. 5 in a side elevation and in

FIG. 6 in a sectional view taken through the coil former.

FIG. 7 shows a similar electric line with a housing for the coiled-up strip.

FIG. 8 shows a two-core electric lead with another embodiment of the magnetically polarized covering.

FIGS. 9, 10 and 11 are transverse sectional views showing three further magnetic strips which can be coiled up and are provided with electric conductors.

FIG. 12 shows a strip provided with spaced magnetic coverings.

FIG. 13 shows a wide web provided with a plurality of striplike magnetic coverings.

FIGS. 14, 15 and 16 show three embodiments of striplike electric leads inserted in the form of horizontal or inclined adjoining helical convolutions in a housing.

FIG. 1 shows the simplest form of a magnetic strip **1** which may be coiled up and which consists only of a thin, permanent-magnetic tape which is polarized in a direction normal to its surface.

The strip **1'** shown in FIG. 2*a* consists of two layers, namely, a thin carrier layer **2** of soft, flexible material having no inherent coiling tendency and designed for the respective application, e.g., for use as a measuring tape, and a magnetic tape **3** which is polarized transversely to its surface and firmly bonded to the layer **2** throughout its length.

FIG. 2*b* shows a suitable embodiment of a strip 1", in which the intermediate carrier layer **2**, which may consist of two electrical conductors embedded in a flat insulating covering, is covered on both sides with a transversely polarized magnetic layer **3**. In the two embodiments shown in FIGS. 2*a* and 2*b*, one surface zone forms a magnetic north pole and the other a south pole throughout the strip element **1'** or 1".

FIG. 3 shows a strip element which is similar in construction to that of FIG. 2*b* but has a carrier strip **2** provided on both sides with electrostatically polarized coverings **4** of a suitable material. Owing to the relatively small force action, this embodiment provided with coverings having an electrostatic effect may be used primarily in very thin strips, e.g., measuring tapes or, possibly, carriers of stored information.

These laminated strip elements illustrated here only by way of example do not exhibit any coiling tendency when extended because the carrier layer is non-elastic and the magnetically or electrostatically polarized edge zones establish only stray fields.

On the other hand, if the coiling operation is initiated, as is illustrated in FIG. 4, the oppositely polarized edge zones, e.g., north and south poles or positive and negative poles, will lie close to each other and the effective forces of attraction will first promote further coiling and will hold the strip coiled up in spiral shape with sufficient strength. In the simplest case the strip may consist only of a magnetic tape **1** which is polarized transversely to the tape surface and which is designed to form, e.g., a measuring tape or a punched tape for teletype. In the case of FIG. 2*a*, the forces of attraction must act through the carrier layer **2**, which for this reason must be thin enough. A correspondingly stronger action will be achieved with strip elements having a magnetic covering on both sides.

When the strip **1** is coiled, the first corresponding areas in one convolution are in registry with the second corresponding areas in an adjacent convolution so that coiling is facilitated and uncoiling is resisted.

For most practical applications of the strips according to the invention it will be sufficient if the coiling is effected by hand. With suitable dimensioning of the entire strip, however, the forces of attraction effective after the formation of the first convolution may be sufficient for a fully automatic further coiling of the strip. This will obviously depend on a coaction of various factors, such as the force of attraction per unit of area and the counteracting forces to be overcome, e.g., the stiffness of the strip and any gravity components which may be effective.

FIGS. 5 and 6 show a particularly desirable design of a coiling strip **5**, which is here indicated to consist of a two-core electric lead. The strip **5** having oppositely polarized surfaces is secured at one end to a disc-shaped coil former **6**, which has inserted in its central bore a shaft **7** with two grip plates **8**, at which the coil former may be gripped with the fingers to initiate the coiling operation. The strip **5** is provided at its outer end with the plug **9** and the coil former **6** is provided at its end face with a pair of plug sockets **10** for connection to the load. These plug sockets may alternatively be disposed on the peripheral surface of the coil former.

A development of this electric lead having a coiling tendency is shown in FIG. 7, where the outer end of the strip **5** is secured to a flat housing **11**, which is provided in both end walls with a longitudinal slot **12** and carries at its bottom the plug prongs **13** for connection to the mains. This housing **11** serves for accommodating the completely wound-up coil, the shaft ends **7** of the coil former **6** being inserted into the longitudinal slot **12**.

FIG. 8 shows a strip element having a different magnetic covering: The carrier tape **14** of insulating material has two electric conductors **14'** embedded therein and is provided on both sides with a commercially available magnetic tape element **15** having the pole arrangement shown, i.e. comprising longitudinally extending magnetic zones of alternating polarity N–S–N–S. Tape elements thus magnetized will not exhibit any magnetic activity on the outside surface alone and must be bonded to both sides of the carrier tape as indicated and in relatively inverted positions so that zones of opposite polarities will be provided at opposite sides of each longitudinal edge. It is apparent that the same attraction effect as in the above-described examples having coverings magnetized transversely to their surface will be achieved between the surfaces contacting each other during the coiling operation.

FIGS. 9 and 10 show two particularly simple designs for coiling two-core electric leads. In the first case, shown in FIG. 9, two insulated electric conductors **15** are attached to opposite edges of a magnetic tape **3** polarized transversely to its surface. According to FIG. 10, longitudinally extending, insulated electric conductors **14'** are embedded in the cross-section of a magnetic tape **3**, which is polarized transversely to its surface.

FIG. 11 shows a suitable profile of a coiling strip similar to FIG. 10, which is formed with a longitudinal groove **3'** to prevent a transverse displacement in the strip coil.

FIG. 12 shows another modification of the coiling strip, in which the flexible carrier layer **2** is provided on both sides with spaced flat elements **18** of magnetic material. It is obvious that these elements must contact each other when the strip is being coiled up.

FIG. 13 illustrates a general field of application of the coiling strip elements according to the invention. In this application, relatively wide webs **19**, such as plans, drawings, projection screens, wall maps, roller blinds or the like are provided with coiling magnetic tapes **3** at least on both longitudinal edges and preferably in the form of a plurality of equidistant strips. These wide webs may be provided with the magnetic tapes on both sides and will be provided only at the edges in elements having an outside surface serving a specific purpose, such as plans, wall maps etc.

FIGS. 14, 15 and 16 show two desirable embodiments of electric leads which are helically coiled and accommodated in a housing, with which they are firmly connected to an appliance, such as a telephone set.

FIG. 14 shows a low, box-shaped housing **20** formed with an annular groove **21**. The magnetic tape **22** having the electric conductors embedded therein is secured at one end to the bottom of this guide groove and during the coiling operation is helically inserted into the groove **21** with opposite surfaces abutting. The terminals **23** are attached to the outside of the housing **20**.

FIG. 15 shows a modification of FIG. 14. The housing **24** is provided on each end face with a groove **25** and the partition **26** is formed with an oblique slot **27**, through which the magnetic tape extends, which is secured, e.g., by being clamped, approximately at the middle so that the magnetic tape is inserted into the two grooves **25** on both sides during the coiling operation, which is analogous to the preceding example in other respects.

In the embodiment shown in FIG. 16, the housing **28** is formed with an annular groove **29**, the bottom **29'** is bevelled in conical shape. A magnetic tape **30** having a surface which is inclined to the coil axis is helically coiled into this groove. Soldering tags **31** are attached to the outside of the housing.

It is obvious that helically coiled magnetic strips having flat or inclined convolutions cannot be extended to a flat condition but will be twisted in accordance with their number of convolutions. Provided that the dimensions of the strip are appropriately selected, this will not adversely affect the utility of the strip for the practical applications which are contemplated. For instance, a lead about 2 meters long and, e.g., 8–10 mm. wide, will have only 5–6 convolutions in a coil **12** to 10 centimeters in diameter.

I claim:

1. A coiling strip of flexible material having at least portions thereof of magnetic material so polarized that corresponding areas of one face of said strip are of a single magnetic polarity opposite to that of the corresponding areas of the opposite face, whereby when said strip is coiled said first corresponding areas in one convolution are in registry with said second corresponding areas in an adjacent convolution so that coiling is facilitated and uncoiling is resisted.

2. A coiling strip as set forth in claim 1, which comprises a thin, flexible, neutral carrier strip having on both sides a covering of electrostatically polarized material.

3. A coiling strip as set forth in claim 1, which consists only of a thin magnetic tape polarized in a direction normal to its surface.

4. A coiling strip as set forth in claim 1, which comprises a thin, flexible, neutral carrier layer and an active layer on one side of said carrier layer of a material which is magnetically polarized in a direction normal to its surface.

5. A coiling strip as set forth in claim 1 which comprises a flat, flexible carrier layer which is provided on each face with a magnetic layer which is polarized in a direction normal to its surface, the outside surfaces of the entire strip having opposite polarities.

6. A coiling strip as set forth in claim 1, which comprises a flat, flexible carrier layer provided at least on one side with elements of magnetic material polarized in a direction normal to its surface.

7. A coiling strip comprising a flat, flexible central carrier layer, and a magnetic tape forming an active layer on each side of said carrier layer having alternating polarities in successive longitudinal zones, said magnetic tapes providing zones of opposite polarity at the side edges of the strip, whereby when said strip is coiled zones of opposite polarity in adjacent convolutions are in registry to facilitate coiling and resist uncoiling.

8. A coiling strip as set forth in claim 1, in which said strip includes electrical conductors, and an insulated portion surrounding said conductors.

9. A coiling strip as set forth in claim 1 which comprises a magnetic tape forming an active layer and two insulated electric leads attached to opposite longitudinal edges of said tape.

10. A coiling strip as set forth in claim 1, in which said strip comprises a magnetic tape forming said active layer and at least one electric conductor embedded in said tape.

11. A coiling strip as set forth in claim 1, in which said strip is formed with a longitudinal groove.

12. A coiling strip as set forth in claim 1, which is adapted to be formed into a helical coil having adjoining convolutions, the side edges of which are in alignment in the axial direction of the coil.

13. A coiling strip as set forth in claim 1, which is adapted to be formed into a helical coil having an axis relative to which the surface of said strip is inclined when the strip is thus coiled.

14. A coiling strip as set forth in claim 1, in which said strip comprises a web carrying strips of magnetic tape forming such active layers at both longitudinal edges of the web.

15. A coiling strip assembly comprising a shaft, a reel rotatable ond said shaft, a strip of material having flexible characteristics permitting coiling, said strip having at least portions thereof of magnetic material so polarized that one face of said strip is of a single magnetic polarity opposite to the opposite face in corresponding areas of said strip, whereby when said strip is coiled areas of opposite polarity in adjacent convolutions are in registry to facilitate coiling and resist uncoiling.

16. A coiling strip assembly as set forth in claim 15, which comprises a flat housing having laterally spaced end walls which are formed with registering longitudinal slots open at one end and adapted to receive each end of said shaft, said strip being secured to said housing at the end opposite to the end secured to said reel.

17. A coiling strip assembly as set forth in claim 16, in which said strip comprises a multicore electric lead and said housing carries a plug electrically connected to said lead and adapted to be electrically connected to an electric supply, and said reel carries plug sockets electrically connected to said lead and adapted to be electrically connected to a load.

18. A coiling strip assembly comprising a housing having a cylindrical outer wall open at one end, an end wall closing the opposite end, a cylindrical winding reel formed within said housing on said end wall and accessible from the opened end, and a flat coiling strip of a dimension to be wound with a flat surface against said end wall of said housing and around said cylindrical reel with the side edges adjacent said reel, said strip having at least portions thereof of magnetic material so polarized that one face of said strip is of a single magnetic polarity opposite to the opposite face in corresponding areas, whereby when said strip is coiled corresponding areas of opposite polarity in adjacent convolutions are in registry to facilitate coiling and resist uncoiling.

19. A coiling strip assembly as set forth in claim 18, in which said strip comprises an electric lead and has one end secured to said housing and in which fixing means are attached to the outside of said housing.

20. A coiling strip assembly according to claim 18, wherein said cylindrical housing is opened at each end and wherein said end wall is a partition wall with a cylindrical reel member being formed on each side thereof, said housing accommodating said coiling strip around each of said reeling members at each end thereof.

21. A coiling sheet comprising a flat web member having a plurality of longitudinally extending portions with magnetic material on each face polarized so that one face of said web in the area of said magnetic portion is of a single magnetic polarity opposite to the polarity of the opposite face in corresponding areas along the length of said web, whereby when said strip is coiled corresponding areas of opposite polarity are in registry to facilitate coiling and resist uncoiling.

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