

Dec. 30, 1947.

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2,433,346

RIBBON CABLE AND METHOD OF MANUFACTURING SAME

Filed Feb. 5, 1943

FIG. 1.

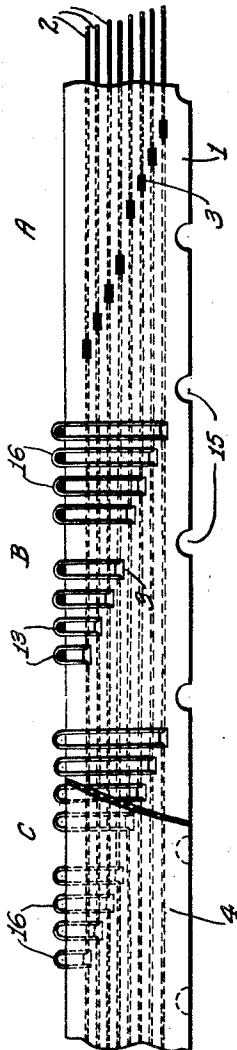
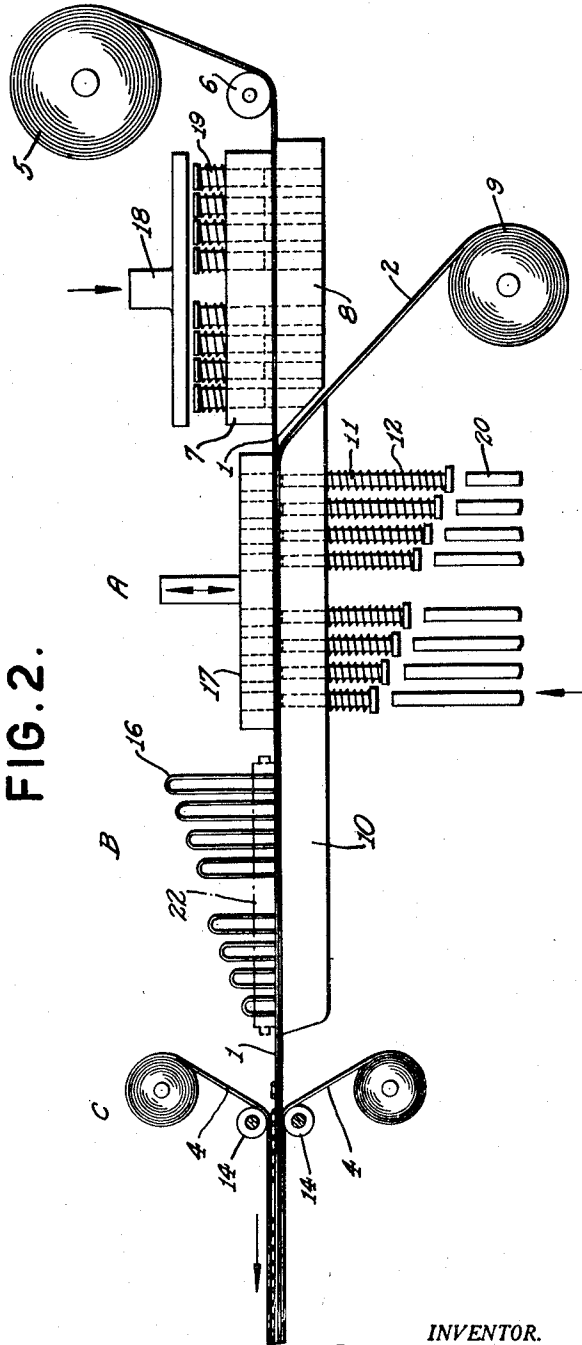


FIG. 2.



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2,433,346

RIBBON CABLE AND METHOD OF
MANUFACTURING SAME

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Application February 5, 1943, Serial No. 474,817

4 Claims. (Cl. 154—2.24)

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This invention relates to a ribbon cable for multiplying switch terminals banks in automatic telephone and other tele-communication systems and to methods of fabricating such cables.

An object of the invention is the provision of a ribbon cable which is inexpensive to manufacture, which is simple in construction, which permits the use of non-hygroscopic insulating material, which permits the conversion of raw material into finished cable in a minimum of time, and which is suitable for easy storage in appropriate lengths in flat trays.

According to a feature of the invention a ribbon cable of the type described comprises a thin strip of insulating material and a plurality of spaced bare wire conductors running parallel along the length of the strip, each wire being formed with loops which extend through holes punched in the strip and then bent to project over an edge thereof. Thin ribbons of plasticized paper, i. e. a paper impregnated with an insulating and plasticizer compound or other suitable insulating material secure the wire to the surfaces of the strip.

The ribbon cable is composed of patterns, each a multiple of the other. Each pattern is completed in four operations; (1) holes are punched in the strip of insulating material, (2) loops are formed in the wire conductors, (3) the loops are flattened against a surface of the strip, and (4) the wire conductors and loops are secured in position and insulated.

In the accompanying drawing Fig. 1 is a plan view of a ribbon cable according to the invention showing the different stages in its production, whilst Fig. 2 is an elevation illustrating diagrammatically the method of manufacture.

The cable consists essentially of a thin plastic or treated fiber paper strip 1, eight or any desired other number of thin bronze or copper wires 2 which run down the length of the strip and two plasticized insulating strips 4 attached one on either side of the strip 1. Loops of wire 16 of different lengths are drawn through holes 3 which are punched in staggered lines across the width of the strip 1 as shown at A, the wire loops being afterwards flattened against the surface of the strip 1 so that they lie at right-angles to the length of the strip and project an equal short distance over one edge as shown at B. The two surfaces of the strip 1 and the exposed wires are then covered by plasticized insulating strips 4 as shown at C.

In manufacturing the cable, the strip or tape 1 from roll 5, Fig. 2, is drawn under a roller 6

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between a punch block 7 and base plate 8 and between a further block 17 and plate 10. A member 18 then depresses the punches 19 and punches eight elongated holes 3 as shown in Fig. 1 in the tape 1. The tape 1 is then stepped to position A together with eight wires 2 from eight rollers such as 9: the wires 2 are spaced across the width of the tape 1 so that each passes centrally across one of the punched holes 3. The member 17 is drilled with eight holes which register with the holes 3, whilst the base plate 10 is provided with eight plungers or pins 11 which also register with the holes 3 but are of slightly smaller cross-sectional area. The ends of the pins 11 are rounded and formed with grooves or slots to engage the wires 2 where they extend across the holes 3. By means of plungers 20 the pins 11 are forced against the tension of springs 12 against the eight wires 2, forcing them upwardly through the holes in member 17 to form loops of graduated lengths as shown at 16. The plungers 20 are then retracted, the pins 11 are withdrawn under the action of the springs 12 and the member 17 is lifted leaving the loops 16 elevated. When this operation is going on member 18 is punching a series of holes for the following cable pattern. Each series of eight loops is called a pattern.

The tape 1 and the wires 2 are now advanced a further step to position B in which the loops 16 are flattened against the upper surface of the tape 1 as for example by a roller 22. The loops 16 are held fast in their flattened position by a series of pins or hooks 13 shown at B in Fig. 1.

The tape 1 and the flattened loops 16 are then advanced a further and final step to position C in which two thin ribbons 4 of plasticized paper or other suitable insulating material are applied one to each surface of the tape 1 to hold the wires 2 and loops 16 in position. The assembly then passes between two rollers 14 where the ribbons 4 are firmly attached to the tape 1 by heat or pressure or both.

It will be appreciated that all the various stages of operation may be simultaneously carried out after each forward movement of the assembled ribbon. Moreover the loops may be formed and flattened against the strip whilst the assembly is in the same position.

Semi-circular indentations 15 in the edge of the tape are spaced to register with corresponding grooves in the base of the terminal bank and may be automatically punched out during the manufacture of the ribbon cable.

The cable may be cut into sections of suit-

able length and placed in flat trays without being rolled. The construction of the cable permits cutting between patterns without fear of causing short-circuits. The wire should be of a gauge as small as possible consistent with the required mechanical strength and should be suitable for effecting electrical connection with the terminals by welding or soldering.

Since, in practice, the distance between patterns or a series of patterns will vary, it is necessary that the space between patterns be adjustable. This may be carried out in the manufacture of the cable by displacing the punch block 7 and base plate 8 the required additional distance to the right as necessary, as for example by means of suitable cam-controlled mechanism.

What I claim is:

1. The method of fabricating ribbon cable for a telecommunication system which comprises feeding lengthwise thereof a continuous strip of insulating material having a series of holes in spaced relation and aligned lengthwise of said strip, delivering a continuous length of bare conductor wire so as to extend along a face of said strip lengthwise thereof in register with said holes, projecting portions of said continuous wire through said holes one after the other to form successive loops in said wire at the opposite face of said strip, laying said loops in flat relation to said opposite face of said strip and extending transversely of the length of the strip, and fastening said loops in position on said face of the strip.

2. The method of fabricating ribbon cable for terminal banks in a telecommunication system which comprises punching a set of holes in a strip of insulating material in spaced relation transversely of the length of the strip, extending a plurality of continuous lengths of bare conductor wires along a face of said strip lengthwise thereof in spaced parallel relation to each other and respectively in register with said holes, projecting portions of said continuous wires through the respective holes to form loops of said wires at the opposite face of said strip, laying said loops in flat relation to said opposite face of said strip with the loops of the respective wires extending transversely of the strip in spaced relation to each other, and fastening upon said strip and looped wire assembly a strip of insulating material extending along the length thereof to provide an insulating covering for said loops.

3. The method of fabricating ribbon cable for terminal banks in a telecommunication system which comprises punching holes in a strip of insulating material in spaced relation in a row extending diagonally of the length of said strip, extending parallel to the length of the strip along

a face thereof a plurality of continuous lengths of bare conductor wires in spaced relation to each other and respectively in line with and spanning said holes, pressing upon the portions of the respective wires which span said holes to form loops of said wires projecting from said holes at the opposite face of said strip, and laying said loops upon said opposite face of the strip in parallel relation to each other and extending transversely of the length of the strip, said pressing step being effective to produce lengths of the respective loops which are sufficient when laid upon said opposite face to extend beyond the edge of said strip.

4. A continuous process for the manufacture of multiple-conductor ribbon cable suitable for use in switch terminal banks of automatic telecommunication systems which includes feeding a continuous thin flat strip of insulating material in intermittent advancing movements, forming at a first station a set of perforations in said strip spaced from each other transversely of the strip, delivering a plurality of continuous bare electrical conductors into contact with one face of said strip so that they extend lengthwise thereof in spaced relation transversely of said strip with each conductor spanning one of said perforations, projecting at a second station the portions of said conductors which span said perforations through the respective perforations to form loops of conductor extending beyond the opposite face of said strip at right angles thereto, laying said loops upon the opposite face of said strip so that they lie parallel to each other transversely of said strip and extend slightly beyond one edge of said strip, feeding a ribbon of insulating material into contact with each of the faces of said conductor-strip assembly and, at a final station, combining said ribbons with said conductor-strip assembly under pressure, said perforating, projecting and laying operations occurring simultaneously, at their respective stations, between successive advancing movements of the strip.

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