June 8, 1943. M. WEINBERG 2,320,989

KNITTING MACHINE

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Fig. 1.

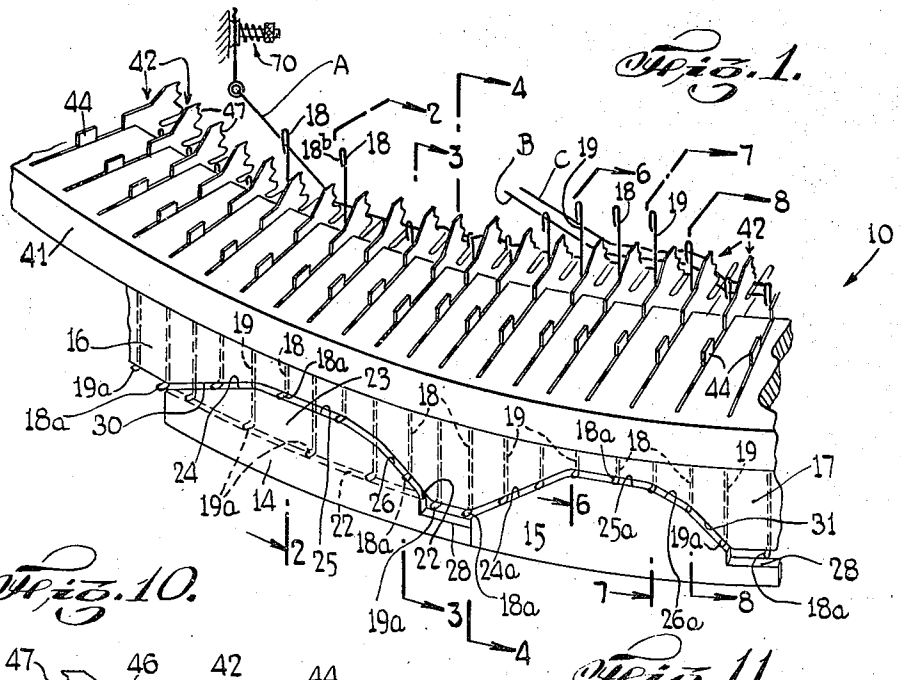


Fig. 10.

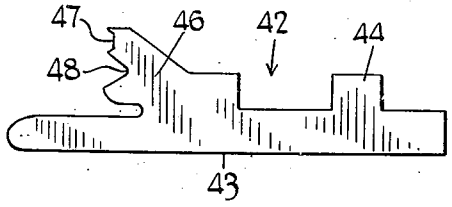


Fig. 11.

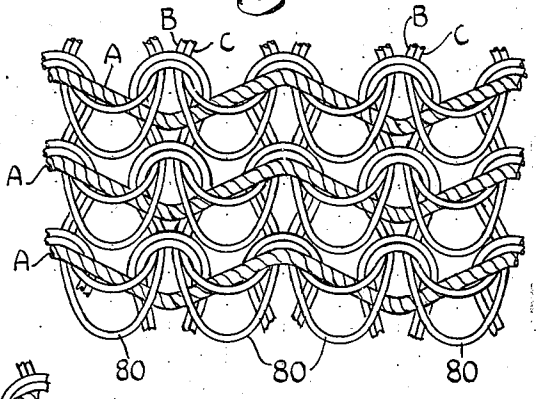
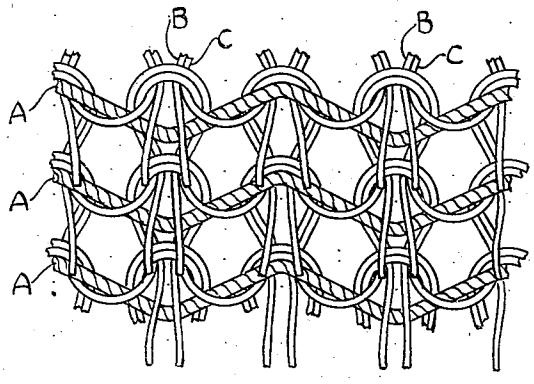


Fig. 12.



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June 8, 1943. M. WEINBERG 2,320,989

KNITTING MACHINE

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Fig. 2.

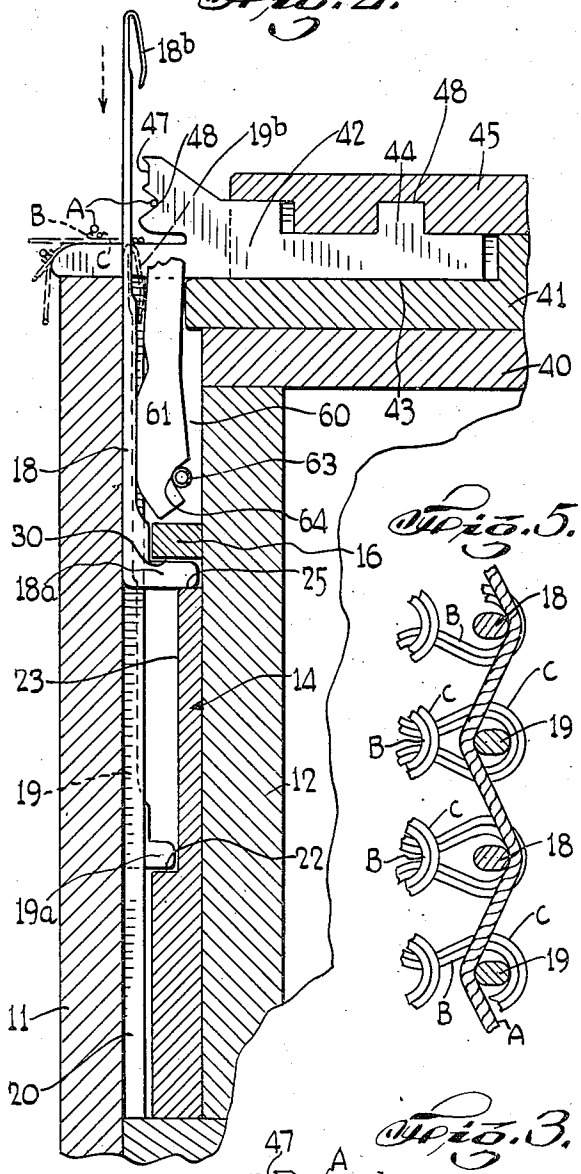


Fig. 4.

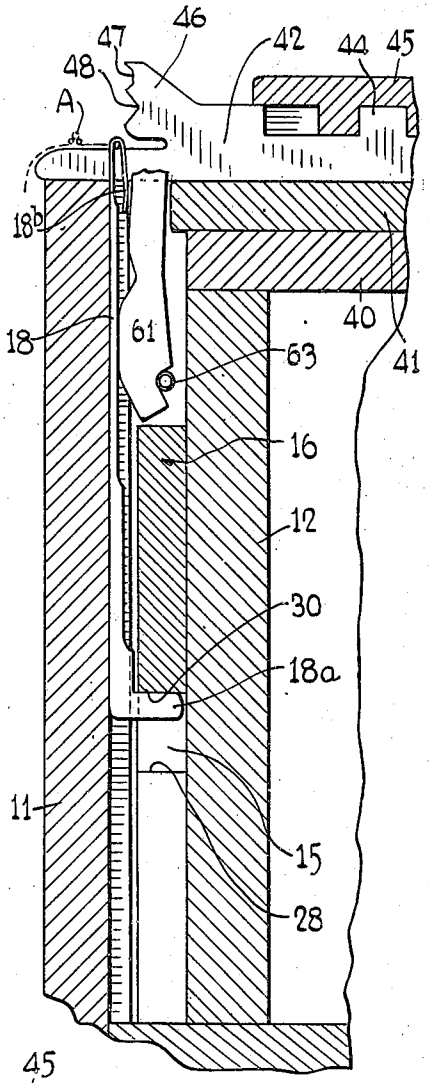
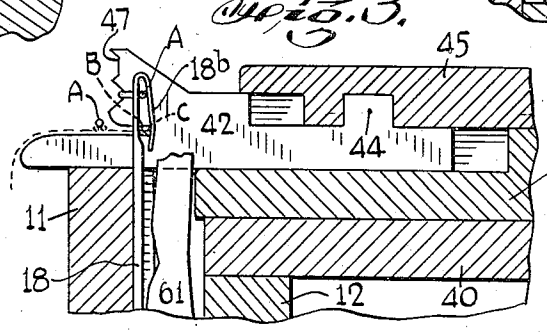


Fig. 5.

Fig. 3.



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KNITTING MACHINE

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Fig. 7.

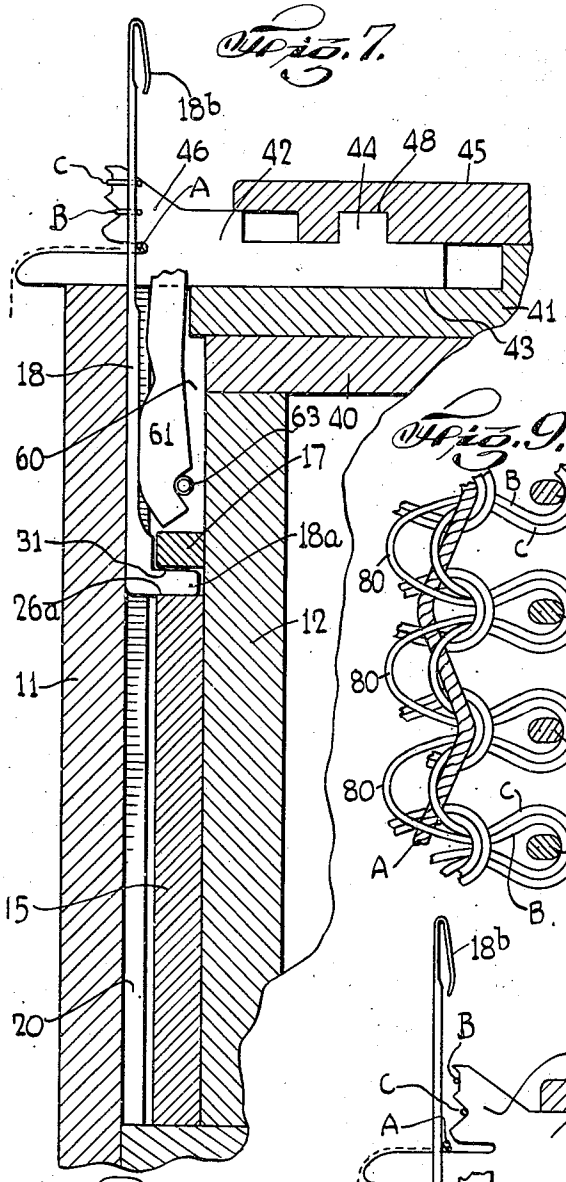


Fig. 8.

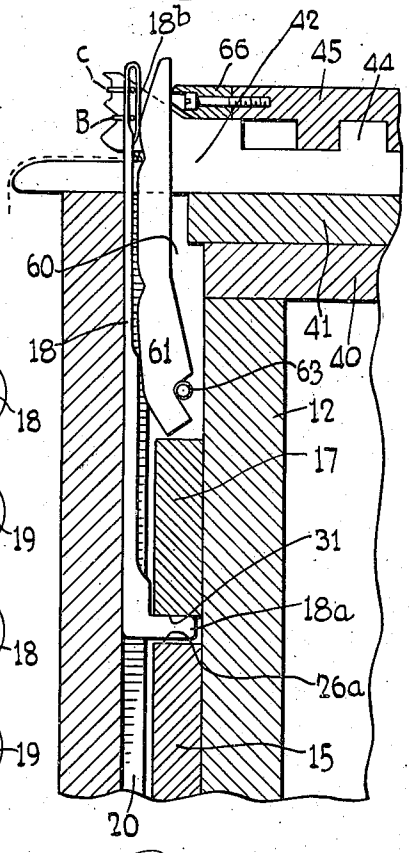


Fig. 9.

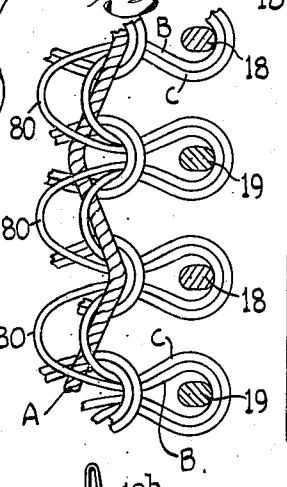


Fig. 13.

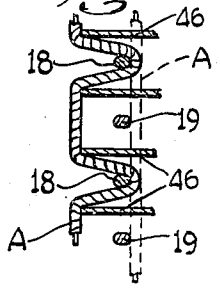
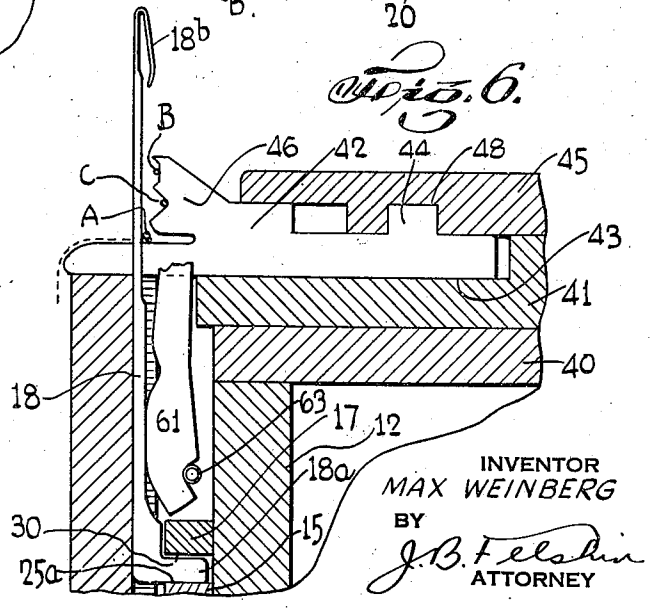


Fig. 6.



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Patented June 8, 1943 2,320,989

UNITED STATES PATENT OFFICE

2,320,989

KNITTING MACHINE

Max Weinberg, Brooklyn, N. Y., assignor to Harrison Mills, Inc., East Newark, N. J.

Application August 27, 1940, Serial No. 354,340

1 Claim. (Cl. 66—12)

This invention relates to knitting machines. It is particularly directed to a machine for making elastic knitted material.

An object of this invention is to provide a machine of the character described having means for knitting with a double yarn, and for producing loops with one of the yarns, which may be later sheared to produce a velvet, and means for laying in an elastic yarn during the knitting operation to produce an elastic knitted cloth. When the loops of this cloth are later sheared or brushed, an elastic knitted velvet results.

A further object of this invention is to provide a strong, durable and compact machine of the character described, which shall be relatively inexpensive to manufacture, smooth and positive in operation, which will produce an attractive and improved cloth, and which shall yet be practical and efficient to a high degree in use.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts which will be exemplified in the construction hereinafter described, and of which the scope of application will be indicated in the following claim.

In the accompanying drawings, in which is shown one of the various possible illustrative embodiments of this invention,

Fig. 1 is a perspective view of a portion of the knitting machine embodying the invention, with the sinker cam and presser bars removed;

Fig. 2 is an enlarged, cross-sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a cross-sectional view taken on line 3—3 of Fig. 1;

Fig. 4 is a view similar to Fig. 2, but showing the rubber yarn cast off;

Fig. 5 is a diagrammatic view illustrating laying in of elastic thread before knitting;

Fig. 6 is a cross-sectional view taken on line 6—6 of Fig. 1;

Fig. 7 is a cross-sectional view taken on line 7—7 of Fig. 1;

Fig. 8 is a cross-sectional view taken on line 8—8 of Fig. 1;

Fig. 9 is a diagrammatic view showing the elastic thread knitted to the inelastic yarn;

Fig. 10 is a side elevational view of one of the sinkers;

Fig. 11 is a diagrammatic view of the elastic knitted cloth;

Fig. 12 is a view similar to Fig. 11, but showing the loops severed to produce an elastic knitted velvet; and

Fig. 13 is a diagrammatic view showing the sinkers pushing the elastic thread forward to allow short butt needles to come up on opposite side of thread.

Referring now in detail to the drawings, 10 designates a portion of a circular rotary knitting machine embodying the invention. The same comprises an inner cylindrical rotary needle ring 11, and an outer fixed cylindrical cam ring 12, spaced from the needle ring. Fixed to the outer cam ring are a pair of lower cams 14 and 15, and a pair of upper cams 16 and 17 cooperating therewith to raise and lower the needles in any desired phase, as will appear hereinafter.

The combined angular extent of the lower cams 14 and 15 constitute one repeatable section of the knitting machine which may be repeated any desired number of times around the machine. The knitting needles are of two kinds, numbered 18 and 19, respectively. They are similar, except that the needles 18 have long butts 18*a*, whereas, the needles 19 have short butts 19*a*. The needles 18 have beards 18*b* and needles 19 have beards 19*b*.

The long and short butt needles 18 and 19 alternate and are slidably mounted for vertical movement in vertical slots 20 in the needle ring 11, whereby said needles rotate about the axis of the ring as they are moved up and down by the cams, as will appear hereinafter in greater detail.

Cam 14 is formed on the inner surface thereof with a substantially horizontal shoulder 22, so that the upper portion 23 of the cam is thinner than the lower portion. Said upper portion 23 has an upwardly sloping edge 24 at its forward end, a substantially horizontal intermediate edge 25 and a downwardly sloping edge 26. Cam 15 is of full thickness and has upper edges 24*a*, 25*a* and 26*a*, similar to the edges 24, 25 and 26 of cam 14. Between the edges 26 and 24*a* of the cams 14 and 15, are lowered or cut-away portions 28.

The cam 16 which is above the cam 14, has a lower edge 30 substantially parallel to, and spaced above the edges 24, 25 and 26 of cam 14. Cam 17 has a lower edge 31 substantially parallel to and spaced above the cam edges 24*a*, 25*a* and 26*a* of cam 15. As the inner cam ring rotates, the long butt needles 18 are raised and then lowered by the cams 14 and 16, because the butts 18*a* thereof overlap the edges 24, 25 and 26 of cam 14. The short butts 19*a* of the short butt needles 19, however, do not overlap the edges 24, 25 and 26

of the cam 14, and hence contact the shoulder 22 of said cam and are not raised as the needles pass cams 14 and 16. All of the needles, however, are raised and lowered by the cams 15 and 17, since cam 15 is thicker and engages both the short as well as the long butts of the needles 19 and 18, respectively.

Fixed to the upper edge of the outer fixed cylinder or ring 12, is a flat annular ring 40, extending outwardly therefrom. Rotatably mounted on ring 40 is a ring 41, on which there are slidably mounted a plurality of similar, radial, equally spaced sinkers 42, shown in detail in Fig. 10 of the drawings. The sinkers are slidable radially on ring 41 between the needles 18 and 19, in the manner and for the purpose hereinafter appearing.

The sinkers are flat and have a straight bottom edge 43 contacting the top of ring 41. Each of the sinkers is provided with an upwardly extending projection 44 for engagement with a sinker cam 45, to slidably move the sinkers radially in a particular phase, as will be described hereinafter.

Each sinker, furthermore, has a projection 46 formed at the inner edge thereof, with a pair of spaced upper and lower grooves 47 and 48. The lower groove 48 is deeper than the upper groove 47, and is hence spaced radially outwardly of the upper groove. All of the sinkers are disposed in vertical planes passing through the axis of the knitting machine.

Fixed to the ring 40 in any suitable manner, is a sinker cam 45 formed with cam grooves 48 receiving the projections 44 for radially moving the sinkers inwardly and downwardly in a predetermined sequence or phase relative to the up and down movement of the knitting needles 18 and 19 by the cams 14, 15, 16 and 17, as the needles and sinkers rotate about the vertical axis of the machine. The cam 45 has an angular extent equal to the angular extent of combined cams 14 and 15, and is repeated similarly around the machine.

The cam groove 48 is shaped to retract the sinkers as the long butt needles are moved upwardly by cam edge 24, and to push the sinkers between the cam needles as the long butt needles pass edge 25a of cam 16.

Within the space 60 between the needle ring 11 and the cam ring, and above cams 16 and 17, and in back of each needle 18 and 19, is a vertical presser bar 61, disposed between each pair of adjacent sinkers 42. The upper ends of the presser bars are normally held away from the beards 18b and 19b of the needles 18 and 19 by an annular coil tension spring 63, engaging within notches 64 in the lower ends of said presser bars, in the well known manner.

Fixed to the sinker cam plate 45 is a presser cam 66 adapted to press the upper ends of the presser bars inwardly to close the beards 18b and 19b, when the needles are pulled downwardly, as shown in Fig. 8 of the drawing, as said needles pass the edge 26a of the cam 15, to permit the needles to cast off stitches already made.

The knitting needles as well as the sinkers and the presser bars are disposed entirely around the cylinder of the machine and rotate about the axis of said machine. The fixed needle cams, the sinker cams and presser cams are repeated any suitable number of times around the machine, to repeat the knitting operation as many times as yarn is fed to the machine.

In Fig. 1 there is shown one section of the machine indicating one complete phase of operation. In said figure, the presser bars and presser cam have been omitted for the sake of clearness.

Means is provided to feed an elastic yarn A under tension between the raised long butt needles 18 and the retracted sinkers at a point where the sinkers are retracted by the sinker cams substantially above the cam edge 25 of the cam 14. Any suitable spring pressed yarn tension device 70 may be employed to tension the yarn A, as it is fed to the machine.

Any suitable means is provided to feed a pair of inelastic yarns B and C to the machine at the point where the needles are raised by the edge 25a of cam 15. Yarns A, B and C are fed to the machine at repeated intervals the same number of times as the needle cams, sinker cams and presser cams are repeated.

In Fig. 1, the arrow indicates the direction of movement of the needles and sinkers around the axis of the machine. The rubber yarn A is laid in between the long butt needles and the sinkers, as shown in Fig. 2 of the drawings, said yarn being received in the lower groove 48 of the sinkers. As the long butt needles are lowered to the position shown in Fig. 3, and the sinkers are moved between the needles, the elastic yarn A is received in the beards 18b of the long butt needles, and the portions of the yarn between adjacent long butt needles are pushed by pairs of sinkers between adjacent long butt needles radially inwardly, so that when all of the needles are subsequently raised, the rubber yarn will be laid in to the knitted goods and will pass back and forth around the needles 18 and 19, as shown in Fig. 5 of the drawings.

As the needles 19 move down from the position shown in Fig. 3 to the position shown in Fig. 4, the rubber yarn A is pulled off the projection 46 of the sinkers. As all of the needles are raised from the position shown in Fig. 4 to the position shown in Fig. 6, the loop yarn B is fed to the upper grooves 47 of the sinkers and the knit yarn C is fed to the lower grooves 48 of the sinkers, whereas, the rubber yarn A remains below the projection 46 of the sinkers.

As the machine continues to move, all of the needles are pulled down as the sinkers are again moved radially inwardly to push the yarns B and C against the shanks of the needles as shown in Fig. 7 of the drawings. As the needles are then lowered by the cam 17, the yarns B and C move into the beards 18b and 19b, and said beards are then closed by the presser bars under the action of the presser cam 66, as shown in Fig. 8 of the drawings, so that the needles will cast off the rubber yarn, while knitting the double yarns B and C.

The loop yarn B which is pushed more forwardly by the sinker cam produces loops 80 which may later be cut by a shearing machine or in any other suitable manner to produce a velvet. The elastic yarn A is thus laid into the knitted yarns B and C to produce a knitted elastic cloth, and when the loops 80 of the cloth are sheared, an elastic knitted velvet is produced.

It will thus be seen that there is provided a device in which the several objects of this invention are achieved, and which is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein set forth or shown in the accompanying

drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

A knitting machine comprising a rotating member having means to support a plurality of parallel, alternating long and short butt needles for sliding movement, fixed means to raise the long butt needles without raising the short butt needles, as said rotating member rotates, means for raising both the long and short butt needles, as said rotatable member rotates, a radial sinker disposed between each pair of adjacent needles, each of said sinkers being formed with a pair of notches one disposed above the other and one radially outwardly of the other, means to move the sinkers between the needles when the long butt needles alone are raised, means for feeding an elastic yarn between the needles and the sinkers at a point where the long butt needles alone are raised, and before the sinkers are moved in between the needles, and means for feeding a pair of non-elastic yarns between the needles and the sinkers at a point where both the long and the short butt needles are raised with said pair of yarns engaging the upper and lower notches of said sinkers, whereby said pair of yarns are knitted with one of the yarns producing loops which may be cut to produce velvet and such elastic yarn is laid into the knitted fabric.

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