July 10, 1956 A. WEINKLE ET AL 2,754,114

STRIP MATERIAL PULLER

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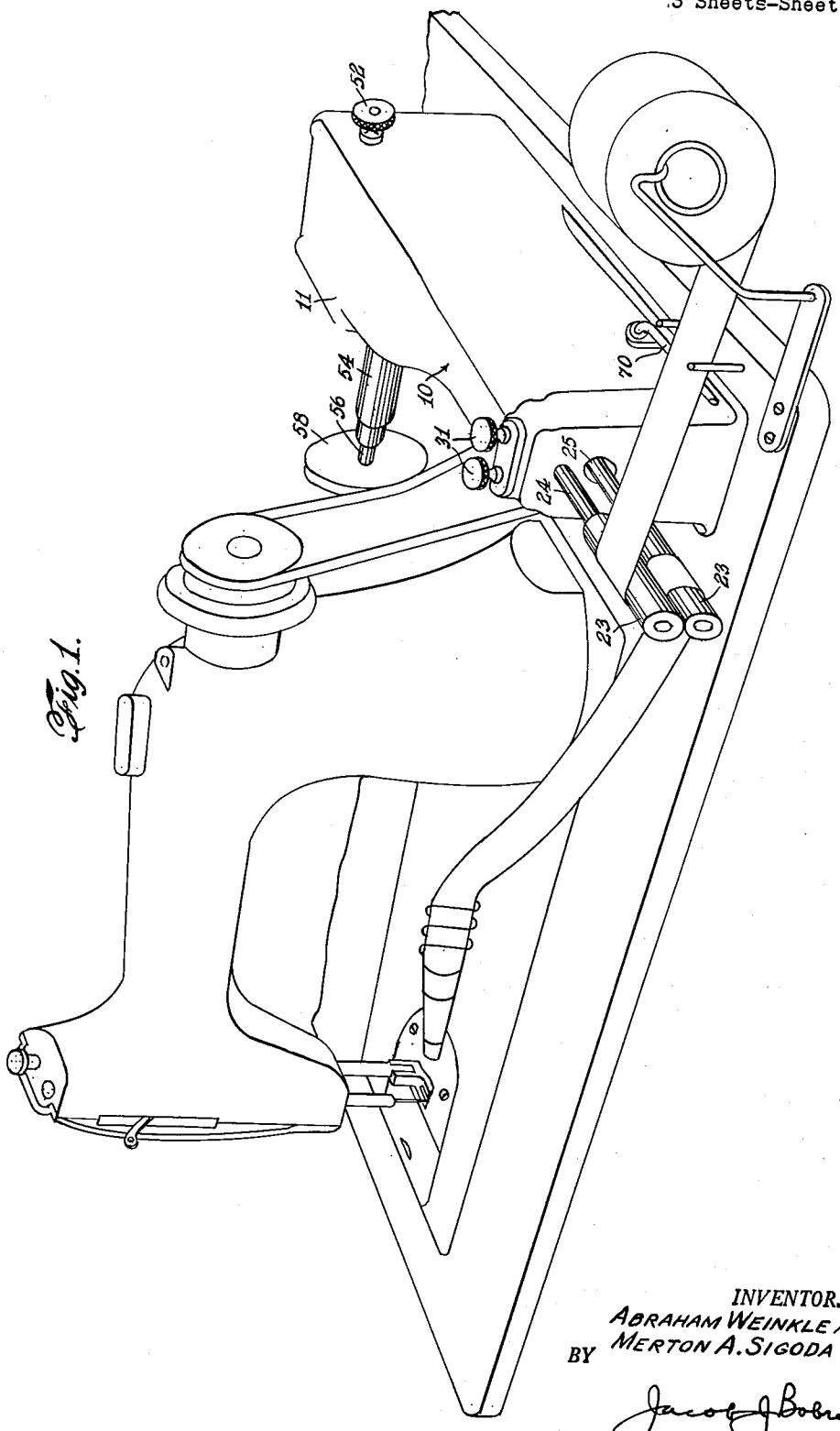


Fig. 1.

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Fig. 2.

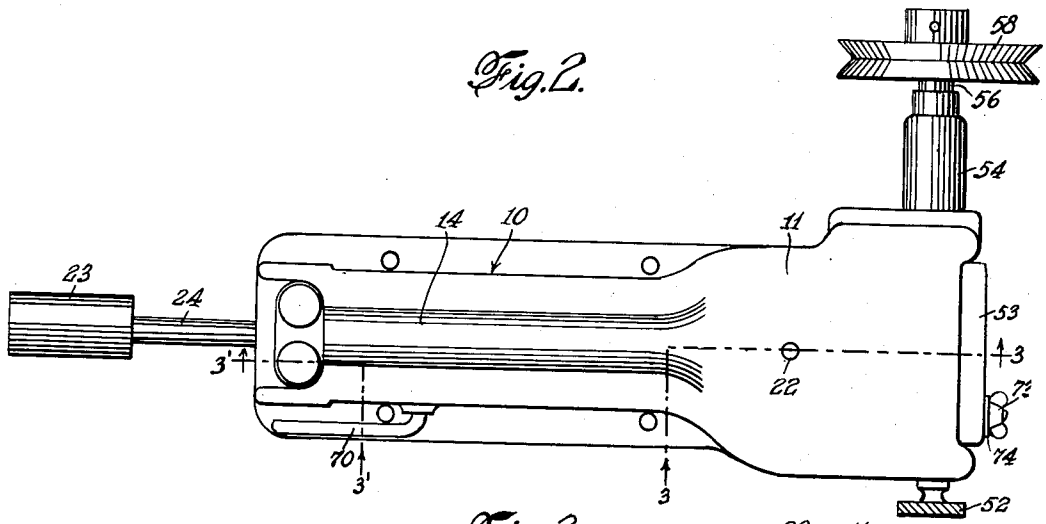


Fig. 3.

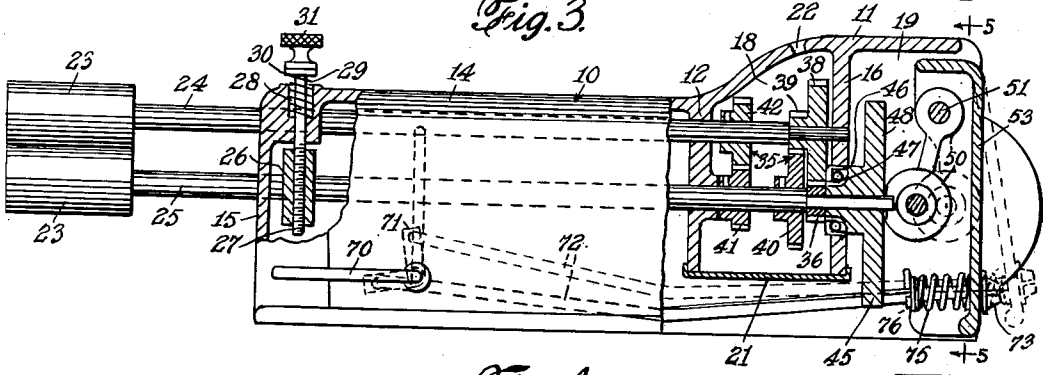


Fig. 4.

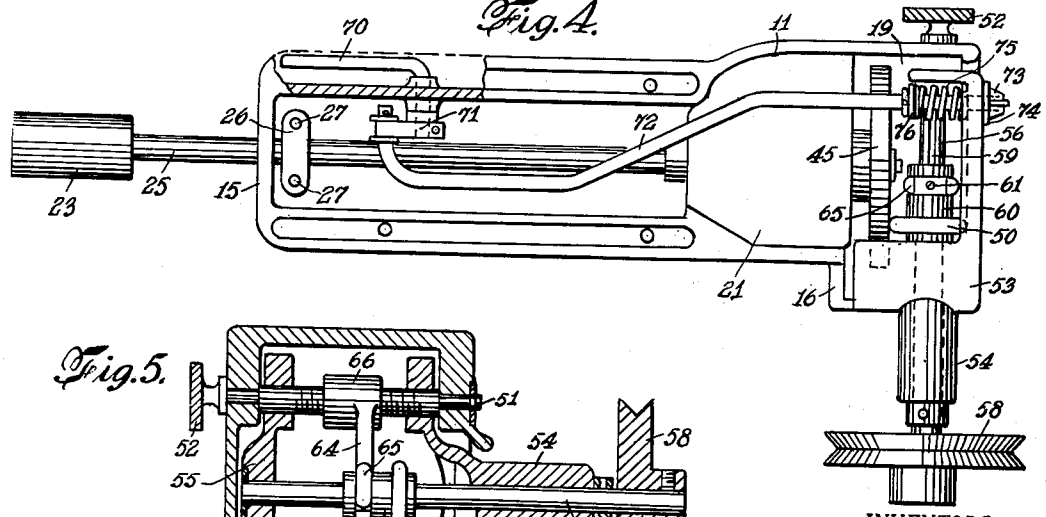


Fig. 5.

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Fig. 6.

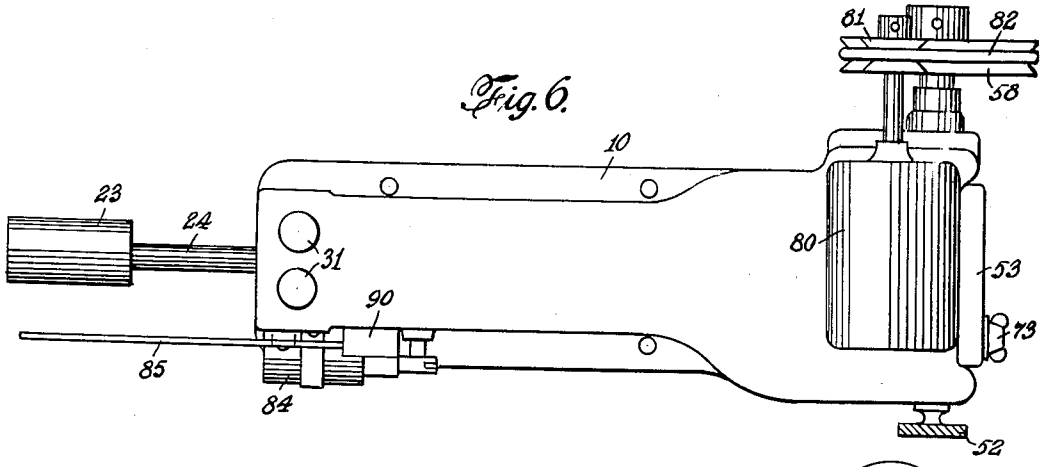


Fig. 7.

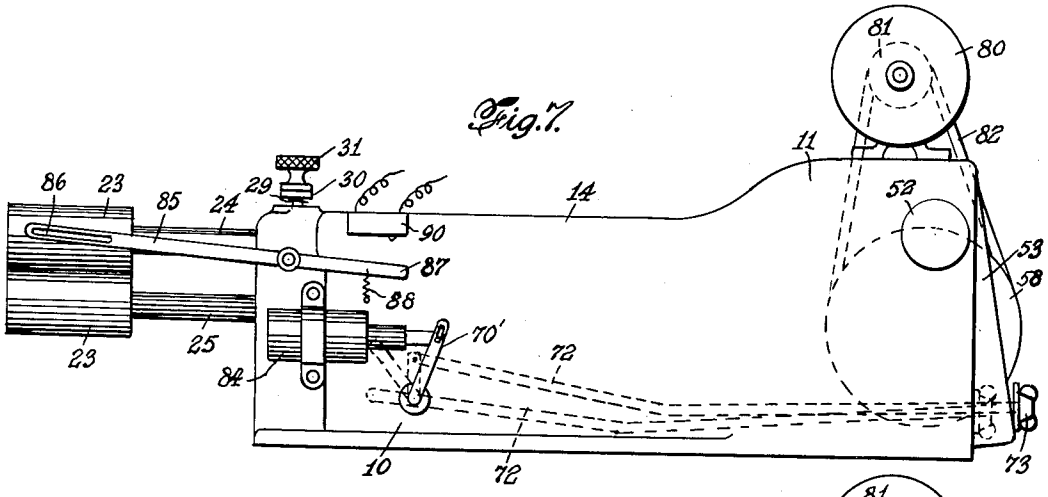


Fig. 8.

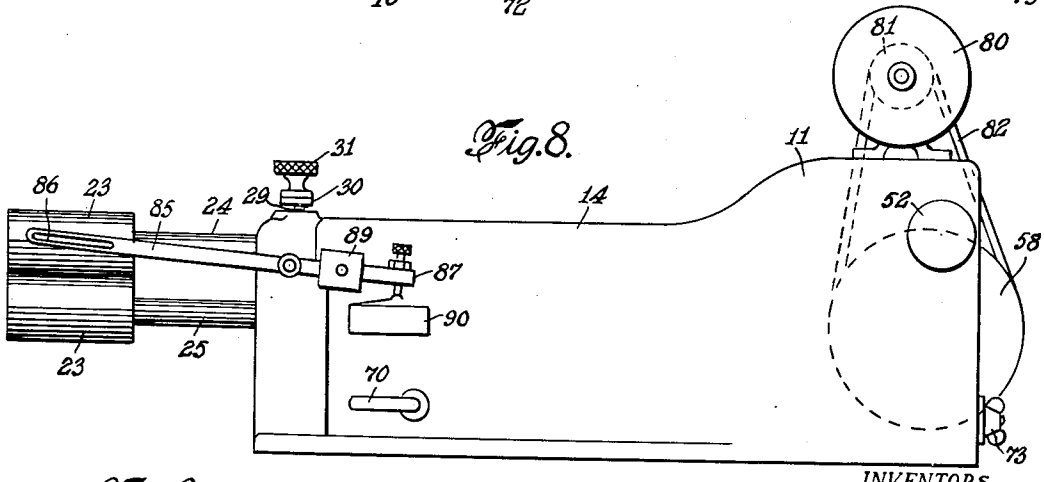


Fig. 9.

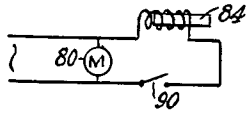
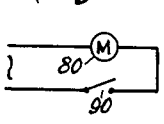


Fig. 10.



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United States Patent Office 2,754,114 Patented July 10, 1956

2,754,114

STRIP MATERIAL PULLER

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Application May 8, 1950, Serial No. 160,621

7 Claims. (Cl. 271—2.3)

This invention relates to an automatic apparatus for feeding strip materials such as lace, tape, edging, gimp, looping, piping or cording from a supply reel to the operator of a sewing machine in accordance with consumption thereof in the course of sewing together garments such as feminine apparel in the nature of slips, nightgowns or the like.

Such strip materials may be applied for ornamentation to various parts of such garments, as for example, the bottom edge of a slip or along the neckline, etc. These strip materials are supplied on spools, rolls, carded or sometimes in bulk. Usually, that which is supplied on cards or in bulk is rewound on a spool or reel as there are in use supports for spools or reels which can be mounted in the vicinity of the sewing machine and from which the strip may be unwound.

The operator unwinds a small quantity by hand, and after this free quantity is consumed by application to the work, a further quantity is unwound. If too much is unreeled, the strip may reach the floor and become soiled, tangled or snarled, or occasionally caught on some projecting part of the machine, etc.

A careful operator will therefor usually rewind the excess to avoid such difficulties. To obtain a balance between demand and supply, the operator is required to unwind and rewind the reel frequently.

Many of the strip materials now being supplied are synthetic fibres, such as, typically, "nylon," which are thermoplastic. In producing the rolls of such strip materials, the supplier finds it convenient to wind a wide roll, which is then parted into smaller sections of suitable width by means of slitting knives. The friction exerted in this severing action is sufficient to cause the edges of the strip to fuse between the layers which makes it necessary to separate the layers in unwinding the roll.

Such distractions lower the productivity of the operator. In these days of high production requirements management makes every effort to reduce or eliminate nonproductive operations.

This has led to the use of various types of supported spools or unwinding reels, some of which have been provided with anti-friction bearings. These are not effective because the diameter of the spool or reel becomes smaller continually as the strip is unwound and the resistance to unwinding not only changes, but increases to such an extent that too much tension may be placed on the strip material being applied.

This is not solved by using motorized spools. If the motor operates at a constant rate of speed, it unwinds too much at first and not enough later on, as the diameter of the spool changes. The sewing machine is not operated either constantly or at a fixed rate of speed as this is governed by the intricacy of the work. The operator is therefor required to control the motor operation constantly to equalize supply and demand, and little is thereby gained.

It is therefore a purpose of this invention to provide an automatic puller or feeding device for such strip materials which will furnish a constant supply in proportion to the demand therefor. This is accomplished by driving the apparatus only when the sewing machine operates and only at a rate in proportion to the speed of operation of the sewing machine. Hence, the operator need give no other attention to the puller than to adjust it to set the feed rate which will supply the strip in proportion to the demand therefor.

It is therefor a further object to provide in such apparatus an easily accessible means which can be manipulated to adjust the amount of feed so that the strip may be fed at a constant, predetermined rate, regardless whether the spool is full, partly unwound or almost completely unwound, as the diameter of the spool does not affect the rate of feed of the strip.

It is another object to provide in such a device, means whereby it may be quickly and easily rendered inoperative during those periods when its use is not necessary. This is accomplished by simple manipulation of a readily accessible lever.

It is a further object to provide an apparatus of this nature which is self contained and therefore readily attachable or removable from a sewing machine table. To accomplish this the device has been incorporated in a novel unitary housing which serves both as a mounting for and to conceal the operating mechanism. Such a housing eliminates the possibilities of damage to the work or to the operator by keeping the gears and other operating parts from being exposed.

Other objects have been to provide modifications of the basic structure which can be readily motorized so that the device may be made independent of the drive of the sewing machine where this is an advantage or a necessity, as, for example, where the belt drive is concealed or inaccessible. In such modifications a sensing means is provided to control the feed so that it will be proportioned to the demand for strip material as the sewing machine is operated. One such version utilizes a continuously operating motor with switching means to energize a solenoid which engages the clutch means in accordance with the demand for strip material as the sewing machine operates, and another version utilizes an intermittently operated motor which is switched on and off in accordance with the demand for strip material. In this latter version, the clutch means is manually operable.

Other objects and advantages will in part appear and in part be obvious from the following description of the presently preferred embodiment and the modifications thereof, taken in conjunction with the drawings in which:

Fig. 1 is a perspective view showing the strip material puller mounted on a sewing machine table adjacent to and in operating relationship with a conventional standard type sewing machine having a belt drive, the latter being utilized to drive the puller;

Fig. 2 is a plan view of the strip puller;

Fig. 3 is a front elevation corresponding to Fig. 1, the housing being broken away to show portions of the operating mechanism in detail, sections being taken on lines 3—3 and 3'—3' of Fig. 2;

Fig. 4 is a bottom view corresponding to Figs. 1 and 2, partly in section with a portion of the housing broken away to show the disconnecting linkage in detail;

Fig. 5 is a sectional view looking at the back of the puller taken on line 5—5 of Fig. 3 showing the clutch means and the variable speed change means;

Fig. 6 is a plan view of a modification which has been motorized and in which the motor is operated continuously, and in which the demand sensing means operates a switch which causes a solenoid to be energized to engage the clutch means in accordance with demand for strip material as determined by the sensing means;

Fig. 7 is a front elevation corresponding to Fig. 6

showing the demand sensing means, the switch, the solenoid, and the operating connection with the lever controlling engagement of the clutch members;

Fig. 8 is a front elevation of a further modification, corresponding generally to Fig. 6, but in which the motor is operated intermittently, the clutch engagement being manually operable, and in which the sensing means operates a switch which causes the motor to become energized to drive the puller in proportion to demand for strip material as determined by the sensing means;

Fig. 9 is a schematic diagram showing the electrical circuit for the version illustrated in Figs. 6 and 7;

Fig. 10 is a similar schematic diagram for the version illustrated in Fig. 8.

Referring now to the drawings, the puller consists generally of a pair of cooperating rollers **23** mounted on a pair of drive shafts **24**, **25** partly concealed within and suitably journalled in housing **10**, within which are mounted in operating relationship, a gear reduction train **35**, a clutch means **45**, **50**, and a variable speed change means **51**, **60**, **64**. Rollers **23** are adjustable to any desired fixed position along shafts **24**, **25** by means of set screws.

Housing **10** has a main head portion **11** in which the operating mechanism is mounted and concealed separated by wall **12** from elongated neck portion **14** which is closed off at one end **15**. Main head portion **11** is divided by wall **16** into two compartments, one of which **18**, serves as a gear box for the reduction gear train **35** and the other **19**, as an enclosure, completed by a pivotally mounted end casting **53**, within which are mounted and concealed the clutch means and the variable speed change means. The lower ends of walls **12** and **16** are sealed by means of a gasket and plate **21**, and thus compartment **18** may also serve as an oil reservoir in which the reduction gear train **35** may operate, lubricant being introduced through oil port **22** in the top of head **11**.

Top shaft **24** is journalled in housing **10**, one bearing being in wall **15**, another in wall **12**, and a third in wall **16**. Lower shaft **25** is also journalled in wall **12**.

Adjacent wall **15** within neck **14**, shaft **25** is journalled in a resiliently mounted bearing block **26** supported from neck **14** by two thumbscrews **27** passing through counterbored recesses **28** in neck **14** and threaded into block **26**. Compression springs **29** are retained in recesses **28** about screws **27** and between the bottom of the counterbores and washers **30** under the heads **31** of screws **27**. As heads **31** are manipulated tension on springs **29** is affected, resulting in either raising or lowering shaft **25** with respect to shaft **24**, thereby either bringing about engagement or disengagement and any desired degree of pressure of the rollers **23** on the strip being fed.

Shaft **25** being of relatively long length and comparatively small cross-section, is quite limber or elastic and therefore can deflect to the extent required as screw heads **31** are manipulated to adjust the position of block **26**. A small amount of clearance about shaft **25** is also provided in wall **12** for this same purpose. This allows adjustment for such variables as thickness, stretch and coefficient of friction occurring in different materials. This arrangement also makes it possible to readily insert the strip between rollers **23** merely by bearing down on the heads **31**, thereby depressing block **26** and lowering shaft **25**, thus effecting the desired separation of the rollers for insertion of the strip.

Within the compartment **18**, gear train **35** drives shafts **24**, **25** at a selected speed reduction. A reduction of 9 to 1 is shown but any other ratio might be employed. This gear train is driven from a friction plate **45** located externally of wall **16** and mounted for free rotation on a reduced section of shaft **25**, which is thus journalled within friction plate **45**. Friction plate **45** has a contoured hub portion **46** journalled in the inner race of a combined thrust and radial bearing **47** inserted in wall **16**. This type of bearing normally has provision to

tolerate small amounts of misalignment so that the described deflection of shaft **25** will not prevent rotation thereof due to binding. In commercial practice, the fit of the gears provides enough play so that deflection of shaft **25** does not interfere with proper operation of the device.

Hub **46** has a gear portion **36** which meshes with compound gear **38** freely mounted on a reduced section of shaft **24**. The small gear section **39** of gear **38** in turn meshes with gear **40** which is fast on shaft **25**. A drive gear **41** fast on shaft **25** in turn meshes with a similar gear **42** on shaft **24**, thereby assuring that both rollers **23** are rotated.

Friction plate **45** is driven by a friction wheel or gear **50** in engagement with face **48** the speed of rotation of plate **45** being determined by the radial position of friction wheel **50** on face **46**. By shifting friction wheel radially from center to the outer periphery of face **48**, any desired feed ratio from zero to the top speed obtainable through the gear reduction train **35** is available. If friction wheel **50** is disengaged from the face **48** of friction plate **45**, rollers **23** will be inoperative.

End casting **53** which is freely mounted on shaft **51** in compartment **19** so that it may rock away from friction plate **45**, carries the friction wheel **50** and means to shift it laterally to vary the feed ratio of the puller. End casting **53** is provided with bearing bosses **54** and **55** in which drive shaft **56** is journalled. Pulley **58** which engages the belt of the sewing machine is mounted on the external end of shaft **56**.

Shaft **56** is provided with a longitudinal slot or keyway **59**. A roller **60** is freely mounted on shaft **56** and provided with a mating pin or key **61** to fit the slot **59**. Roller **60** may therefor be shifted longitudinally along shaft **56** as it rotates with it.

Roller **60** carries friction wheel **50** fast upon it and is provided with a peripheral slot **62** which receives the yoke **65** of an arm **64**. Arm **64** has a hub portion **66** internally threaded for lateral movement along a mating thread on shaft **51**.

Shaft **51** is suitably journalled in head **11**, one end being provided with a knob **52** by which it may be turned. As arm **64** is held from turning by engagement of yoke **65** with roller **60** on shaft **56**, manipulation of knob **52** will cause arm **64** to shift laterally along shaft **51**. In turn roller **60** will shift longitudinally along shaft **56**, changing the position of friction wheel **50** radially along face **46**, thus providing the variable speed ratio mentioned. Friction wheel **50** is preferably a long wearing, oil resistant material such as some of the synthetic rubbers or flexible plastics.

Manipulation of hand lever **70** will disengage friction wheel **50** from face **48**. Lever **70** has a shaft portion which is journalled in the side wall of housing **10**, attached to which at a suitable offset angle is a bar **71**. A rod **72** connects bar **71** and the end casting **53**, the portion passing therethrough being threaded for a thumbnut **73**, which mounts thereon and is separated from the back wall of end casting **53** by a washer **74**. A compression spring **75** is held between the inner wall of end casting **53** and a washer **76** held in position on rod **72** as for example by a cotter pin **77**.

Adjustment of thumbnut **73** affects the tension of spring **75** and thus changes the contact pressure of the clutch members when engaged, thereby allowing takeup for wear and for optimum engagement of the clutch members.

This arrangement also provides a rapid and positive means of disengagement of the clutch members. When the clutch members are disengaged, rod **72** and associated parts are in the relative positions shown in broken line in Fig. 3. At such time, rod **72** is disposed perpendicularly to the inside wall of end casting **53** and spring **75** lies concentrically about rod **72**, without any distortion. When lever **70** is moved to the clutch engaging position shown in solid line in Fig. 3, spring **75** undergoes an addi-

tional compression as rod **72** shifts its position so that it no longer lies perpendicular to the inside wall of end casting **53**, thereby distorting and compressing spring **75** between said wall and washer **76**. When lever **70** is then thrown to the position shown in broken line, the energy thus stored in spring **75** causes end casting **53** to snap away, thereby effectively separating the clutch members. End casting **53** may be held in a locked position in which the clutch members are disengaged by throwing lever **70** to a position 180 degrees from that shown in Fig. 2.

The clutch members are held in position which avoids accidental disengagement when lever **70** is thrown as shown in Fig. 2, because bar **71** is then disposed so that connecting rod **72** lies below and beyond the center of rotation of lever **70**, which locks lever **70** against any but intentional movement.

Connecting rod **72** may be suitably bent so that it will clear the operating mechanism regardless of the position of lever **70**.

The puller is mounted on the sewing machine table as shown in Fig. 1 so that pulley **58** can engage the drive belt. When hand lever **70** is thrown to the position shown in Fig. 2, the puller will run only when the machine operates. The machine operator need only adjust the speed of the puller to suit the strip material being applied to the work, and automatically thereafter, enough strip will be pulled from the supply reel to replace that which is consumed in the sewing operation. The amount furnished is independent of the changing diameter of the supply reel and of the frictional resistance of the reel support, as the constant draw exerted by the puller will cause the supply reel to unwind until enough strip is available.

Once set, the speed of the puller rollers need not be varied unless this becomes desirable. It is then simply a matter of manipulating knob **52**. This feature is particularly useful when elastic strip is being unwound, as it sometimes is desirable to apply such strip to the work in a stretched state. When the tension on the strip is released after stitching, a gathered or ruffled effect will be produced in the work. By adjusting the puller speed so that the rollers operate slowly enough to provide the required tension, this effect may be readily obtained.

Sometimes sewing machines are so arranged that it is inconvenient to obtain access to the drive belt, in which case it may be of advantage to utilize a motorized version of the puller as shown in Figs. 6, 7 and 8. This version may be conveniently mounted anywhere in the vicinity of the machine arranged so that lever **85** is between feed rolls **23** and the folder of the sewing machine. Accordingly the device shown in Figs. 6, 7 and 8 would be positioned oppositely to the device shown in Fig. 1.

A small motor **80** mounted on head **11** is provided with a pulley **81** for a belt **82** which drives pulley **58**. Such a motor may be operated continuously as shown in Figs. 6 and 7, or intermittently as shown in Fig. 8.

Where the motor is operated continuously, means are provided to engage the clutch members as often as required to keep the strip supply constant. This may consist of a solenoid **84** mounted on the side wall of housing **10** linked to a modified lever **70'** so that when the solenoid is energized from the line by the closing of a switch, the clutch members will become engaged. This condition is illustrated in Fig. 7 in broken line. The deenergized position of the solenoid armature, lever **70'**, connecting rod **72** and end casting **53** is shown in solid line.

When the motor is operated intermittently, as shown in Fig. 8, the motor is energized from the line by closing a switch. In this arrangement, lever **70** must be thrown to the position indicated so that the clutch members will be in engagement continuously.

Turning the motor on and off as required will cause rollers **23** to feed the strip material in accordance with the demand therefor.

In both versions, the rollers **23** are caused to feed by

means of a sensing device which determines when feeding is required and which operates the switch which in the first version, causes solenoid to be energized, and in the second version causes the motor to be energized.

This sensing device consists of a lever **85** pivotally mounted on the side of housing **10** and provided with a slot **86** through which the strip may be threaded after it leaves the rollers **23** and on its way to the folder on the sewing machine. A spring **88** as shown in Fig. 7, or an adjustable counterweight **89**, as shown in Fig. 8, may be provided to hold lever **85** in such position that end **87** of lever **85** does not operate switch **90**. The switches shown are of the normally open circuit type; that of Fig. 8 is of the type which closes the circuit when the leaf spring actuator is allowed to rise.

When sufficient strip material is between the rollers **23** and the folder on the machine, lever **85** will be in the raised position shown, and the switch **90** will be open and no current will flow. As soon as the strip tightens between the folder and the rollers **23**, lever **85** will be drawn downwardly, at which time its end **87** will operate switch **90**, allowing current to flow, and thereby causing the puller to operate.

The simple electrical circuitry required is illustrated in Figs. 9 and 10.

The invention therefor provides a versatile apparatus which will automatically provide a sufficient supply of strip material to the operator of a sewing machine in accordance with the consumption thereof.

While the presently preferred embodiment of the invention has been described in detail for the purpose of explanation and illustration, it is to be understood that the invention is not limited to the details of construction and arrangement shown and described, but is to be construed broadly within the purview of the claims.

What is claimed is:

1. In web feeding apparatus for drawing strip material to the stitching mechanism of a sewing machine, a housing adapted to be mounted adjacent the sewing machine, a friction plate mounted within said housing, a member pivotally mounted in one end of said housing, a friction wheel drive shaft journalled in said member, drive means for operating said shaft, a friction wheel carried by said drive shaft, and means to rock said member about its axis to cause said friction wheel to come into operating contact with and to drive said friction plate.

2. In web feeding apparatus for drawing strip material to the stitching mechanism of a sewing machine, a housing adapted to be mounted adjacent the sewing machine, said housing having a main portion separated by a bearing wall from an elongated neck portion, said main portion being divided by a second bearing wall into a compartment adapted to act as an oil reservoir in which a gear train may operate and an enclosure for cooperating clutch members, a friction plate mounted within said enclosure portion of the housing, a member pivotally mounted in the enclosure portion of said housing, a friction wheel drive shaft journalled in said member, drive means for operating said shaft, a friction wheel carried by said drive shaft, and means to rock said member about its axis to cause said friction wheel to come into operating contact with and to drive said friction plate.

3. In web feeding apparatus for drawing strip material to the stitching mechanism of a sewing machine, a housing adapted to be mounted adjacent the sewing machine, a friction plate mounted within said housing, said friction plate having a hub, said hub being adapted to be seated in a bearing mounted in a wall of said housing and to pass therethrough, the portion of said hub passing therethrough being provided with gear teeth adapted to engage a mating gear train mounted within said housing, a member pivotally mounted in one end of said housing, a friction wheel drive shaft journalled in said member, drive means for operating said shaft, a friction wheel

carried by said drive shaft, and means to rock said member about its axis to cause said friction wheel to come into operating contact with and to drive said friction plate.

4. In web feeding apparatus for drawing strip material to the stitching mechanism of a sewing machine, a housing adapted to be mounted adjacent the sewing machine, a friction plate mounted within said housing, a threaded shaft mounted in one end of said housing having a portion manipulatable externally of the housing a member pivotally mounted on said threaded shaft, a friction wheel drive shaft journalled in said member, a friction wheel mounted on said drive shaft adapted to rotate therewith and to be shifted longitudinally along said shaft, means to shift said friction wheel laterally including said threaded shaft, an arm carried thereby engaging with and adapted to shift said friction wheel when the threaded shaft is manipulated, and means to rock said member about said threaded shaft to cause said friction wheel to come into contact with and to drive said friction plate.

5. In web feeding apparatus for drawing strip material to the stitching mechanism of a sewing machine, a housing, friction gear members mounted in said housing, drive means for said friction gear members including a member pivotally mounted in one end of said housing carrying one of said friction gear members and rockable to bring said gear members into operating engagement, means to rock said member to bring about operating engagement of said gear members and to lock them in such operating position including a lever having a shaft portion journalled in said housing, a second lever carried by said shaft, a rod connecting said second lever and the rockable member, said second lever and said rod being arranged so that when said lever is thrown into said locking position, said rod lies beyond and below the center of rotation of said lever.

6. Apparatus according to claim 5 in which the means to lock said friction members into operating engagement also includes means to cause said members to snap out of engagement when said lever is thrown to a disconnecting position, said means comprising a resilient member mounted for compression on said connecting rod by the rockable member when the first lever is thrown to the locking position, thereby storing sufficient energy to cause said rockable member to rotate to bring about disengagement of the gear members when the first lever is moved from the locking position.

7. Apparatus according to claim 6 together with means to vary the amount of compression which said resilient member may sustain when the friction gear members are locked in engagement.

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