June 13, 1944. P. M. ROGERS 2,351,546

METHOD AND MEANS FOR THE MANUFACTURE OF FLAT MOPS

Filed Jan. 20, 1942 5 Sheets-Sheet 1

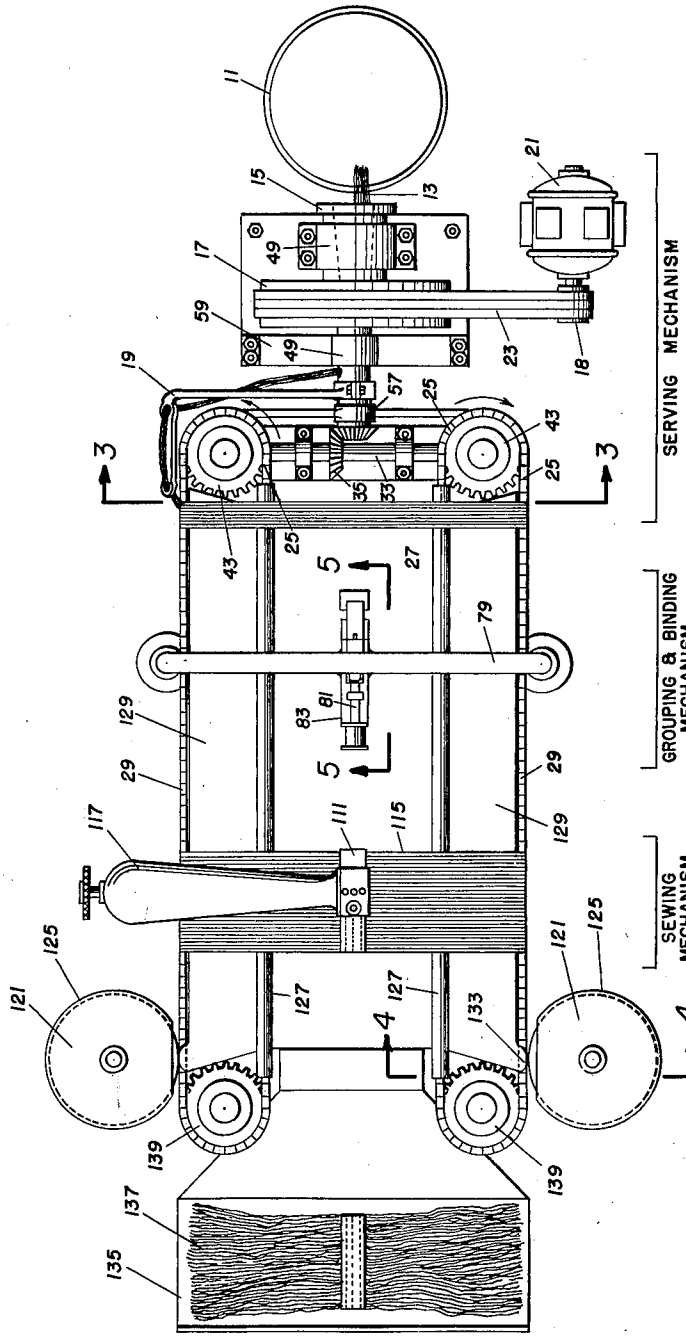


FIG. 1

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METHOD AND MEANS FOR THE MANUFACTURE OF FLAT MOPS

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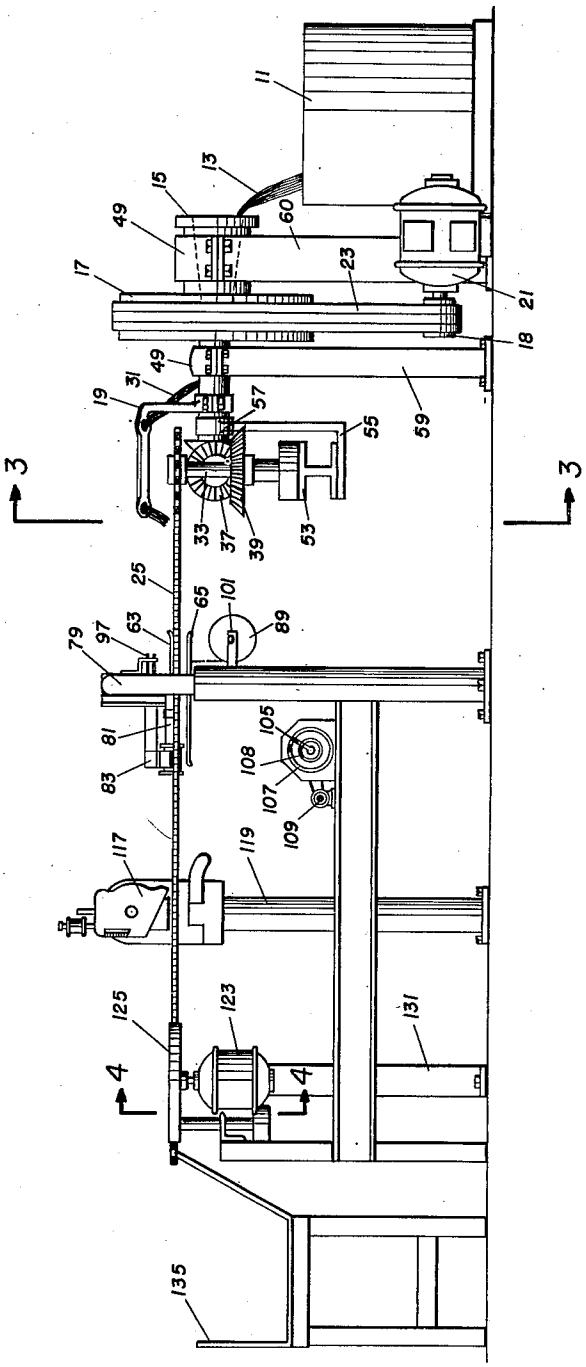


FIG. 2

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METHOD AND MEANS FOR THE MANUFACTURE OF FLAT MOPS

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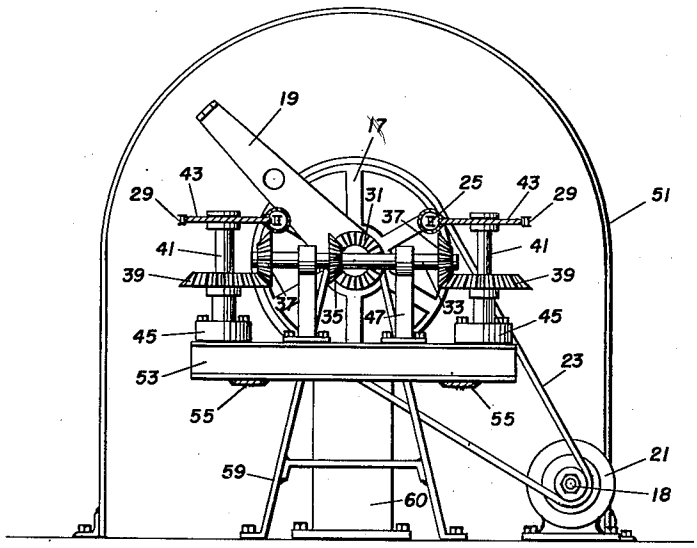


FIG. 3

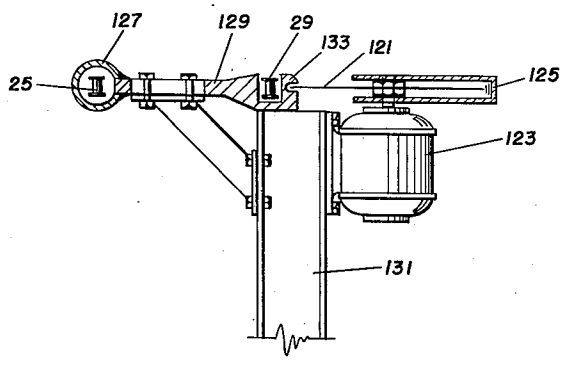


FIG. 4

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METHOD AND MEANS FOR THE MANUFACTURE OF FLAT MOPS

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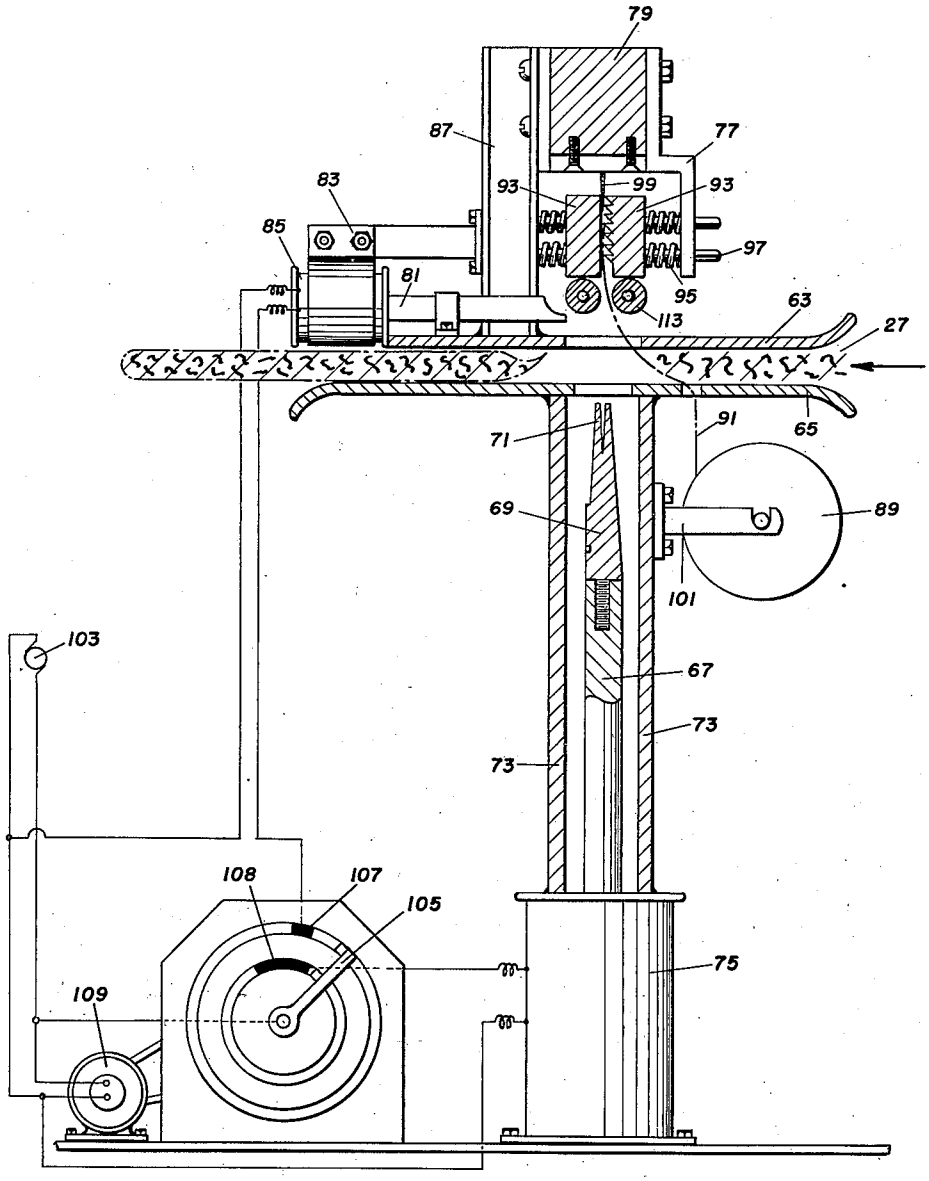


FIG. 5.

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METHOD AND MEANS FOR THE MANUFACTURE OF FLAT MOPS

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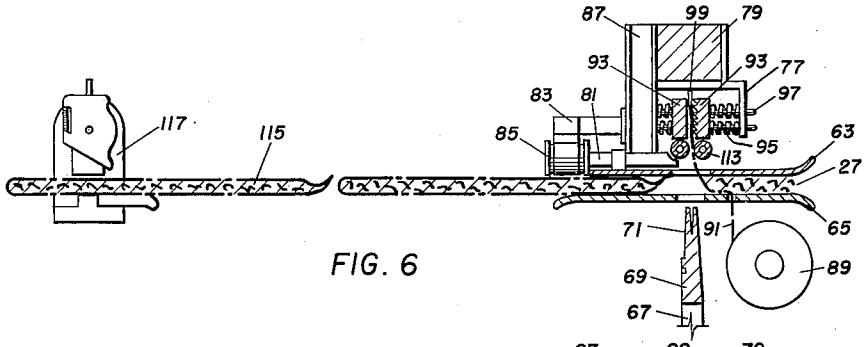


FIG. 6

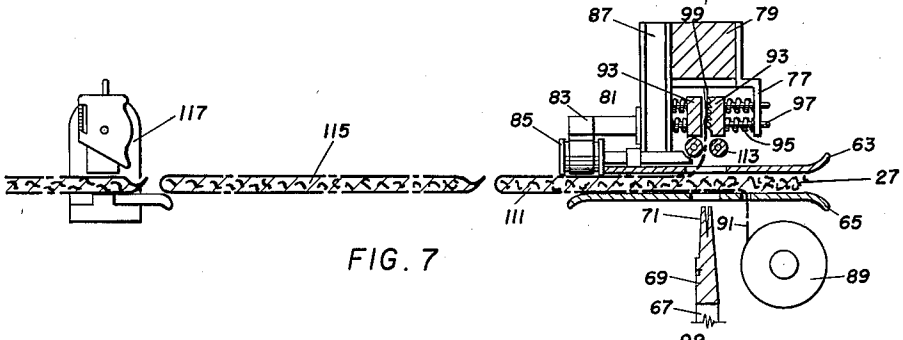


FIG. 7

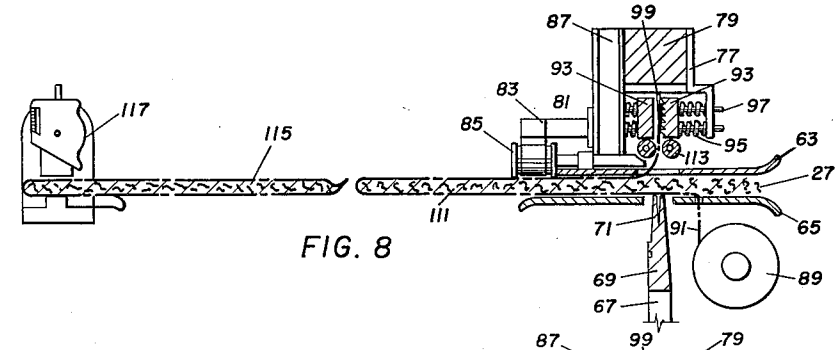


FIG. 8

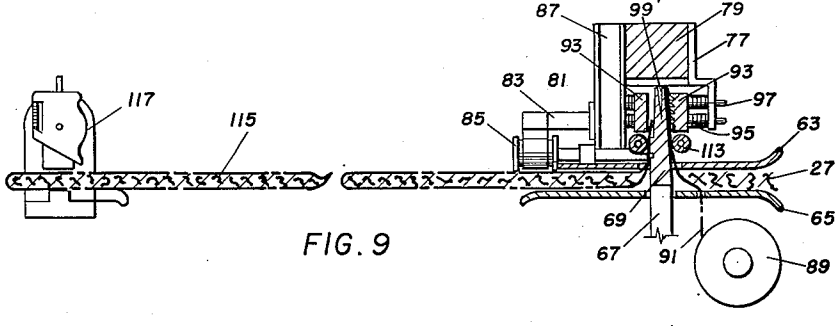


FIG. 9

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Patented June 13, 1944

2,351,546

UNITED STATES PATENT OFFICE

2,351,546

METHOD AND MEANS FOR THE MANUFACTURE OF FLAT MOPS

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Application January 20, 1942, Serial No. 427,416

5 Claims. (Cl. 300—16)

The present invention relates to the manufacture of mops and more particularly to a method and machine for the production of flat mops, those which consist of a bundle of yarns arranged in parallel alignment and bound together at their midpoint by a tape or stitching applied at right angles to the yarns. This type—known in the trade as a janitor's mop—is sold separately from the handle or stick which is provided with any one of numerous devices designed to fasten the mop head to the handle.

Heretofore, mops of this type have generally been made by hand, an operator seated at a sewing machine assembling the yarns in the proper position, wrapping a fabric tape about the strands, stitching the yarns to the tape to anchor them securely in position, and finally cutting off the yarns at the appropriate length to form the mop head.

It is the chief purpose of the present invention to provide a mechanism and method whereby mops of this type may be fabricated entirely by automatic machinery, the human element being completely eliminated except as it is necessary to insure that the supplies of materials are maintained and that the completed mops are removed at intervals.

It is well known that a product which is entirely fabricated by machine is generally more uniform both as to physical dimensions and as to quality than the equivalent hand-made product. This is true in the present instance and, in addition, the rate of production is tremendously increased; a single machine turning out more mops in a given unit of time than ten operators working by hand and, it may be added, that one man can easily tend six machines of the present design. Thus it will be seen that the labor cost has been reduced to an extremely small percentage of its former value. And it must be remembered that this saving is accompanied by an increase rather than a decrease in quality.

Other features and advantages of the present method and machine will be apparent from the following description when read in connection with the accompanying drawings, in which similar reference numerals denote similar parts.

Figure 1 is a plan view of a mop making machine incorporating the present invention, the mop yarns having been removed at certain points to more clearly illustrate the construction of the device.

Figure 2 is an elevation to the mop making machine shown in Figure 1.

Figure 3 is a section, in elevation, taken in plane 3—3.

Figure 4 is a section, in elevation, taken in plane 4—4.

Figure 5 is a section, in elevation, taken in plane 5—5 showing the tape-securing portion of the mechanism.

Figure 6 is a diagrammatic elevational view showing the relationship of the parts at the first step in the cycle of manufacturing a mop.

Figure 7 is a view similar to Figure 6 illustrating the second step in the manufacture of a mop.

Figure 8 is a view similar to Figure 6 illustrating the third step in the manufacture of a mop.

Figure 9 is a view similar to Figure 6 illustrating the fourth and last step in the manufacture of a mop.

Referring to the drawings and more particularly to Figures 1 and 2, the machine may be divided, for purposes of description, into four major parts, a serving mechanism, a grouping and binding mechanism, a sewing mechanism, and a cutting mechanism.

Taking up each of these divisions of the machine in the foregoing order, it will be seen that the yarns from which the mops are made are supplied in the form of large balls or bundles, the yarn used being made up with many ends and with a reverse twist, the purpose of which will appear at a later point in this description. The supply of yarn is not limited to the size of a single ball however because any number of balls may be joined together. In this way the supply of yarn may be made continuous for all practical purposes. In the drawings, for ease of explanation, a single ball of yarn, not shown, is kept within can 11, the yarn 13 being drawn through the hollow rotating spindle 14, mounted in bearing blocks 49 and carrying serving arm 19, the spindle deriving its motion from motor 21 through any suitable means of power transmission, shown in these drawings as belting 23 and pulleys 17 and 18. Inasmuch as the function of the serving arm 19 is to apply a wrapping of yarns about chains 25 and thus form a fabric web 27, its radius must obviously be so adjusted as not to interfere with other portions of the machine. Details of chains 25 and their associated mechanism will be described in another part of this specification; for the present it may be stated that they are driven so that the two outside portions of the chain 29, which support the edges

of web 27 are continuously moving in a direction away from serving head 17.

It will be apparent that the speed of the chains 25 must bear a definite relation to the speed of rotation of serving arm 19 and also to the size and weight of yarns 13. In other words, chains 25 should be driven at such a speed that they will remove a web of the correct weight from the point of application of serving arm 19 as fast as it is formed, for example, the weight of a given mop may be increased either by decreasing the speed of the chains or by increasing the speed of the serving head.

As previously mentioned, rotating serving arm 19 and spindle 15 are driven by motor 21 through an appropriate mechanism. From what has already been said it will be clear that the speed of chains 25 must bear a predetermined unvarying relation to the rate of application of yarns 13 which is of course a function of speed of spindle 15. There are many satisfactory means of correlating the speed of these two portions of the equipment, one of the simplest and most satisfactory being to drive the former from the latter through a conventional gear train.

Figure 3 illustrates a typical arrangement in which a bevel drive gear 31 is affixed to one end of spindle 15 thus driving shaft 33 through a similar gear 35. Identical bevel gears 37 are provided at opposite ends of shaft 33 and through these cooperating gears 39 and vertical shafts 41 are rotated, thus actuating sprockets 43. In this way, sprockets 43 are driven in opposite directions at identical speeds and at an unvarying relationship to the speed of serving arm 19. Obviously also, the combinations of gears may be changed to vary this relationship. (For example, when a bulky yarn 13 is used the speed of sprockets 43 must be faster as compared to the speed of serving arm than when a light-weight yarn is used if a web of the same density is to be obtained.) The bearings 45 and shaft hangers 47 are not described in detail since they are of a type well known in the art and it will also be seen that the safety guard 51 which encloses the rotating serving arm 19, is not shown in Figures 1 and 2 since it would tend to obscure other parts of the mechanism. For obvious reasons, provision should be made for mounting the bearings so that the distance between chains 29 may be varied since this determines the length of the completed mop; that is, shafts 41 with their associated mechanism should be moved closer together or further apart if a smaller or larger mop is desired.

From an examination of the drawings it will be apparent that the machine will be inoperative if any supports lie in the path of the yarn as it is served upon the chain. It is for this reason that the end of the yarn carrying assembly nearest serving arm 17 is supported on a cross beam 53 which in turn is held by bracket 55 hung from bearing 57 on spindle 15. Because the inclusion of these parts would confuse the drawings, they are omitted from Figure 3 although standards 59 and 60 for supporting the rotating spindle are shown.

Mention is made of the fact that the ball of yarn 13 as supplied to the machine is made up with a reverse twist. From the manner of applying the yarn to the chains to form a web, it will be seen that a twist is placed in the yarn with each revolution of serving arm 19. However, if a reverse twist has previously been placed in the yarn it will lie flat and without tendency to kink when applied to the chains.

At this stage in the manufacture of the mop a web of uniform density and weight has been formed and is being continuously replenished as it moves into the succeeding manufacturing operations. The next step is to divide the web into bundles of yarn, each of which contains the number of yarns required in a finished mop. This operation is performed by the grouping and binding mechanism which also places a temporary binder about each bundle.

This portion of the mechanism is illustrated in detail in Figure 5, from which it will be seen that the web 27, shown diagrammatically in this drawing, passes between guide plates 63 and 65 which serve to compress the web into a compact mass. In general it may be said that that portion of the device which lies below the guide plates comprises a plunger 67 carrying an anvil 69 and tines 71. The plunger, which moves between guide bars 73, is actuated by a solenoid 75. Normally the plunger is in the retracted position shown in Figure 5, but under the impulse of the solenoid the plunger, and therefore the anvil 69 and tines 71, may be projected between the guide plates into the stapling and cutting mechanism 77 held directly above the web by the cross bar 79. In the extended position of plunger 67 the anvil 69 cooperates with ram 81 of a stapling device 83 which is similarly operated by a solenoid 85. The stapler may be one of many commercial types now available. As illustrated here it consists simply of a ram and a staple carrier 87.

Attached to any suitable support 101 below guide plate 65 is a spool 89 of tape 91 which, during the cycle of manufacture, is gripped between jaws 93 under pressure exerted by springs 95 arranged on pins 97. At intervals the tape is cut by knife 99 and the ends are temporarily secured together by the stapling mechanism 87, to form a loosely bound bundle of yarns of predetermined number.

The energy required by solenoids 75 and 85 is supplied by any suitable source of electrical energy 103 and their motion is controlled by the position of contact arm 105 which, at regular intervals, passes over contacts 107 and 108 completing the respective circuits. Contact arm 105 may be driven at a constant speed, for example by a synchronous motor 109 as illustrated, or it may be directly coupled by a mechanical connection with chains 25 or sprockets 43 so that the position of the contact arm bears a definite relation to the motion of the chain. Whatever the type of mechanism which is used, it is essential that plunger 67 be projected, driving tines 71 through web 27 after a predetermined, unvarying number of yarns has passed between guide plates 63 and 65. In this way the web is regularly divided into groups of yarns and, while the plunger is in this position solenoid 85 must be actuated, securing the cut ends of the tape 91 by means of a staple in a manner which will presently be described in detail.

The sequence of cutting and stapling the tape and the steps in the cycle will be illustrated by reference to Figures 6, 7, 8, and 9 of the drawings. The starting position of the machine is illustrated in Figure 6 in which both plunger 67 and ram 81 are in retracted position, and one end of tape 91 is secured by the jaws 93. As the web continues to progress, drawn between the guide plates 63 and 65 by the motion of chains 29, it carries

before it a portion of tape 91 drawn from spool 89 through a slot in plate 65 thus forming a loop 111. This condition is shown in Figure 7. When a predetermined number of yarns are grouped within loop 111, plunger 67 is impelled upwards by solenoid 75. It will be seen that the tape 91 passes over tines 71 thus forcing a loop of tape through web 27. As previously explained, the number of yarns held within loop 111 is adjusted to give the correct weight of mop.

In rising, tines 71 carrying tape 91 are guided between jaws 93 by rollers 113 affixed to each jaw. The last step in the cycle is illustrated in Figure 9 which shows plunger 67 in its extreme extended position, knife 99 having severed tape 91 in passing between tines 71. As anvil 69 is momentarily held in this position ram 81 is impelled forward carrying a staple with it and securing the two ends of loop 111.

Finally, due to the motion of contact arm 105, the circuits actuating solenoids 75 and 85 are opened, permitting plunger 67 and ram 81 to return to their normal position urged by springs which are not shown. The freshly cut end of tape 91 is still held between jaws 93 however because of the fine teeth in the face of the jaw with which it is in contact. The stapled ends of loop 111 however are drawn from between the anvil and the roller by the continuing motion of the web as a whole. At this stage, the mechanism has returned to the original position shown in Figure 6.

The temporarily fastened group of yarns 115 is now finally stitched by a sewing machine 117 which securely sews the yarns and the overlying and underlying tapes into a firmly-locked mass. Preferably the sewing machine used is of the triple-stitch type so that three binding threads are employed. It may be noted that a sewing machine of this type will not be harmed if the needle occasionally hits one of the staples which are of course formed of light wire.

The final step in the manufacture of mops according to my improved method is to sever the yarns in order to cut the loop ends. From Figure 1 it will be seen that as the yarns are carried along chain 29 they will impinge on projection 133 which lifts the yarns away from chain 29 so that they may be cut by rotary knife 121, shown in detail in Figure 4. From that figure, which is a section taken just beyond the point where the yarns have been cut, it will be seen that projection 133 serves both to protect the blade of rotary knife 121 from contact with chain 29 and also assures that each yarn must be severed inasmuch as the knife projects into a groove in the inclined exterior surface of the projection. As indicated in the drawings a suitable guard 125 is provided for the knife which is rotated at high speed at all times while the mop making machine is in operation by electric motor 123 mounted on supporting column 131.

It should be noted that the inner portion of chain 25, which is moving in a direction opposite to that of the yarns during the formation of the mop, is enclosed in a pipe 127 fastened to plate 129 so that the yarns cannot come in contact with it and thus be caught or torn.

After the strands have been cut, the completed mops 137 drop upon table 135 from which they are removed from time to time for packing and shipment.

While a specific embodiment of the present invention has been described in detail it is to be understood that many modifications and substitution of equivalents may be made by those skilled in the art without departing from the invention as defined in the following claims.

What I claim is:

1. In mechanism of the class described, a web supporting means, means for serving yarns on said web supporting means, means for dividing the web into groups of yarns of predetermined number and means for encircling each group of yarns with a loop of tape.

2. Apparatus of the type described comprising a web supporting means, means for applying a layer of yarns to said web supporting means, means for grouping said yarns into bundles of predetermined size, means for forming a loop of tape about each bundle and means for stitching the bundles of yarns into unitary masses.

3. A mop making machine comprising mechanism for grouping predetermined numbers of yarns into bundles, means for encircling each bundle with a loop of tape, means for sewing the yarns into permanent bundles, means for severing said yarns and means for moving a web of yarns through said grouping, securing, sewing and severing means.

4. The method of manufacturing flat mops which comprises the steps of serving a yarn about a pair of advancing chains to form a continuous web, interrupting the web at intervals to form bundles of yarns, passing a loop of tape about each bundle, permanently sewing the yarns in each bundle to form a unitary mass and finally severing the bundles of yarns to form individual mops.

5. The method of claim 4 in which the yarn to be served is made up with a reverse twist to compensate for the twisting imposed on the yarn by the serving operation.

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