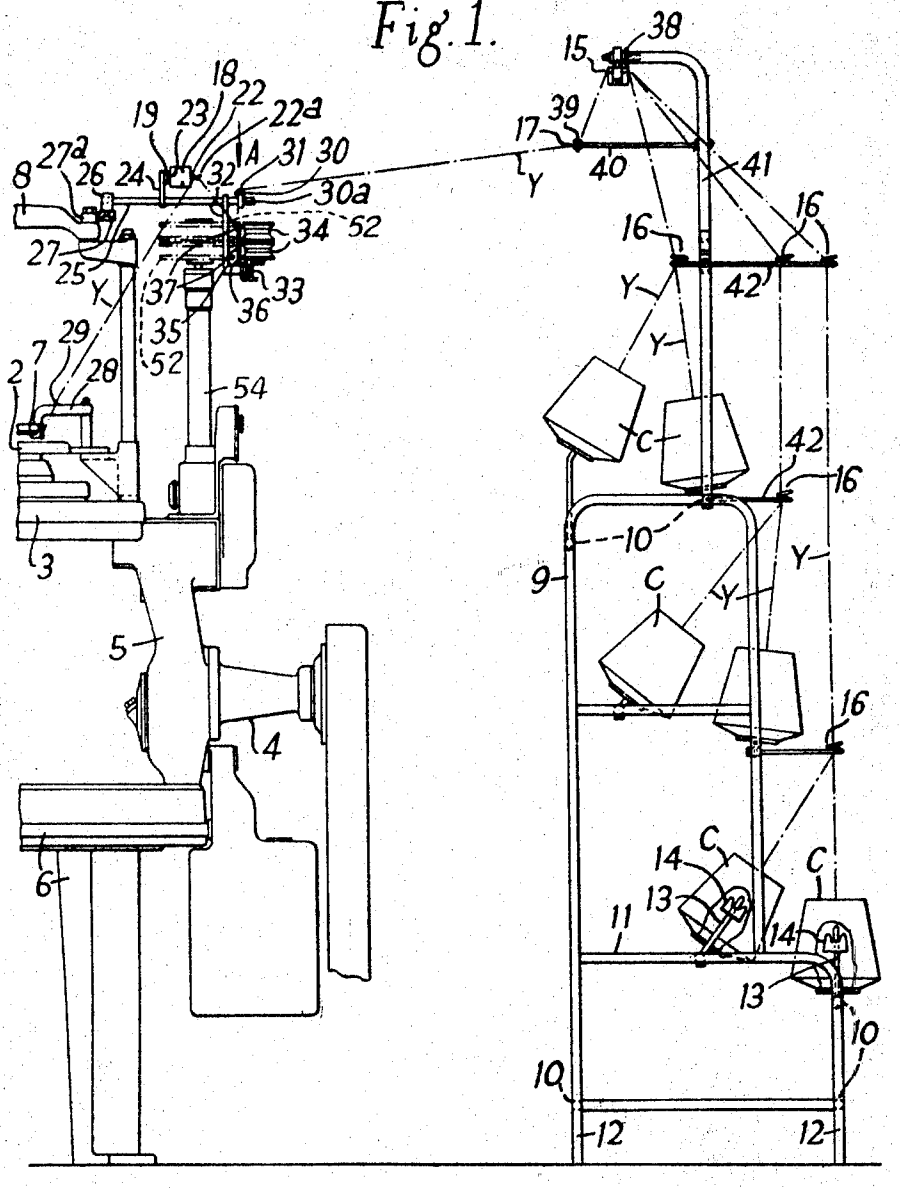
Aug. 19, 1969 C. G. BALLARD 3,461,691

MULTIFEED CIRCULAR KNITTING MACHINES

Filed May 26, 1966 6 Sheets-Sheet 1

Fig. 1.



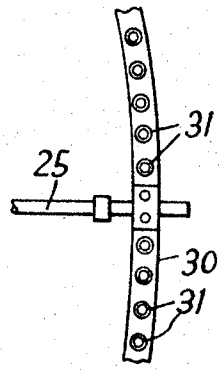


Fig. 2.

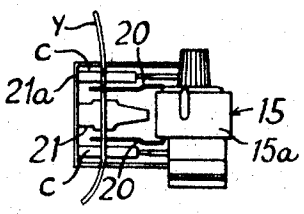


Fig. 5.

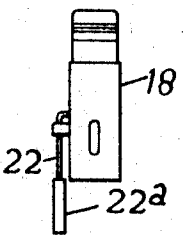


Fig. 6.

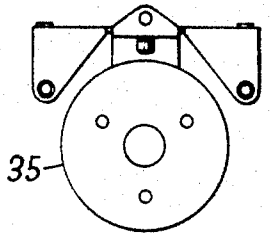


Fig. 7.

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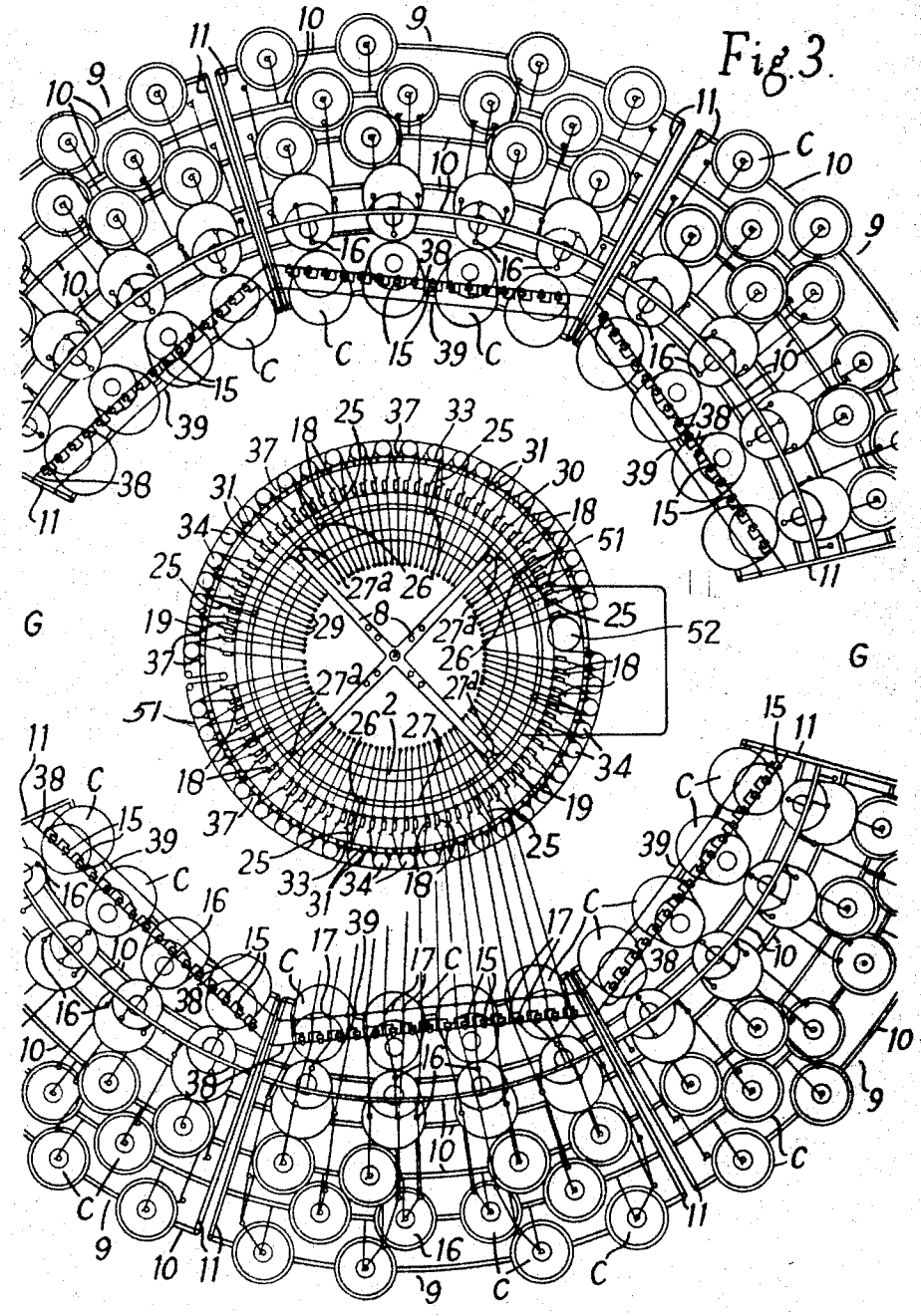
Fig. 3.



MULTIFEED CIRCULAR KNITTING MACHINES

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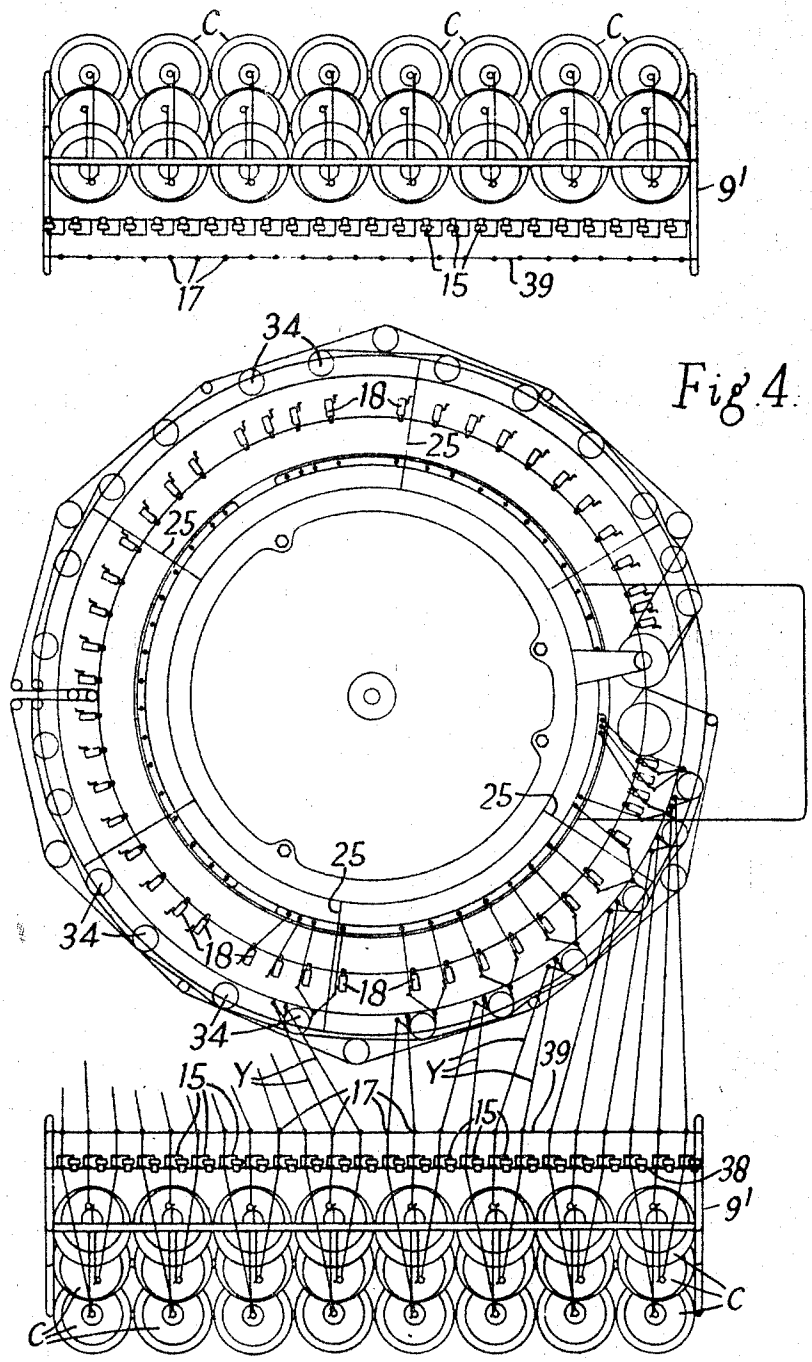

Fig. 4.

MULTIFEED CIRCULAR KNITTING MACHINES

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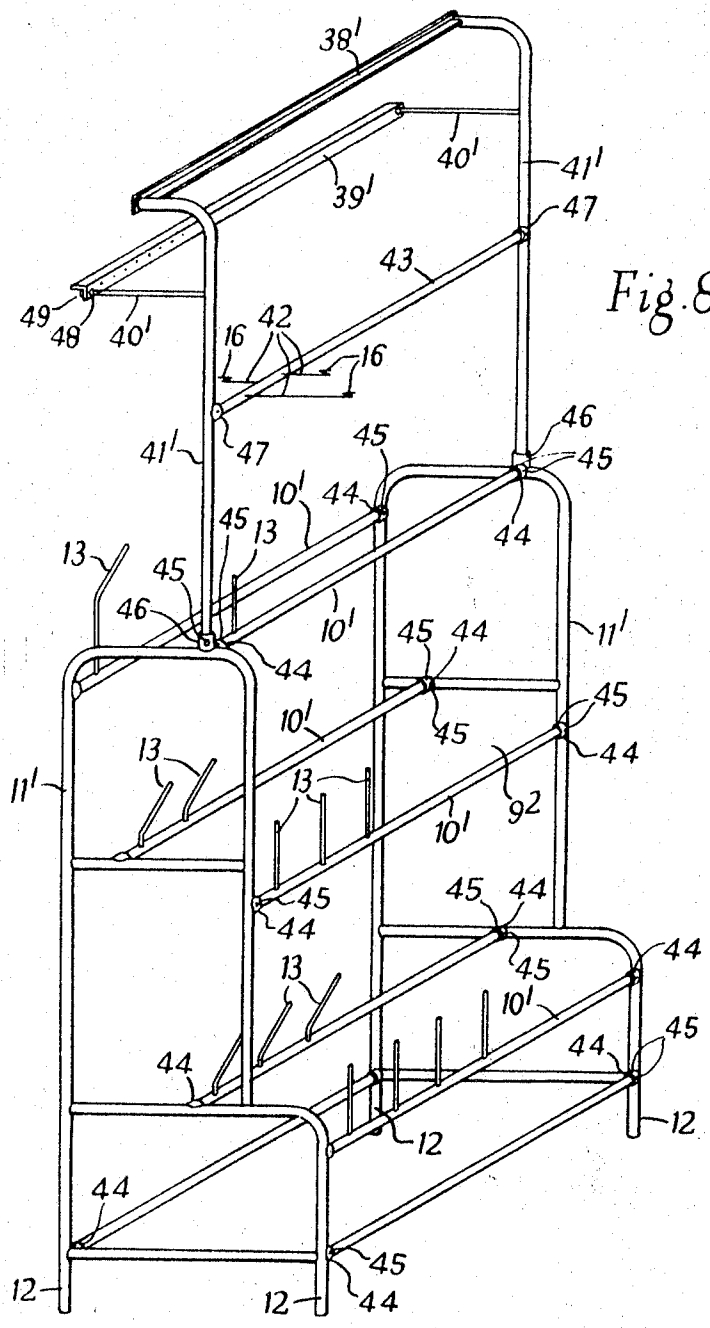

Fig. 8.

MULTIFEED CIRCULAR KNITTING MACHINES

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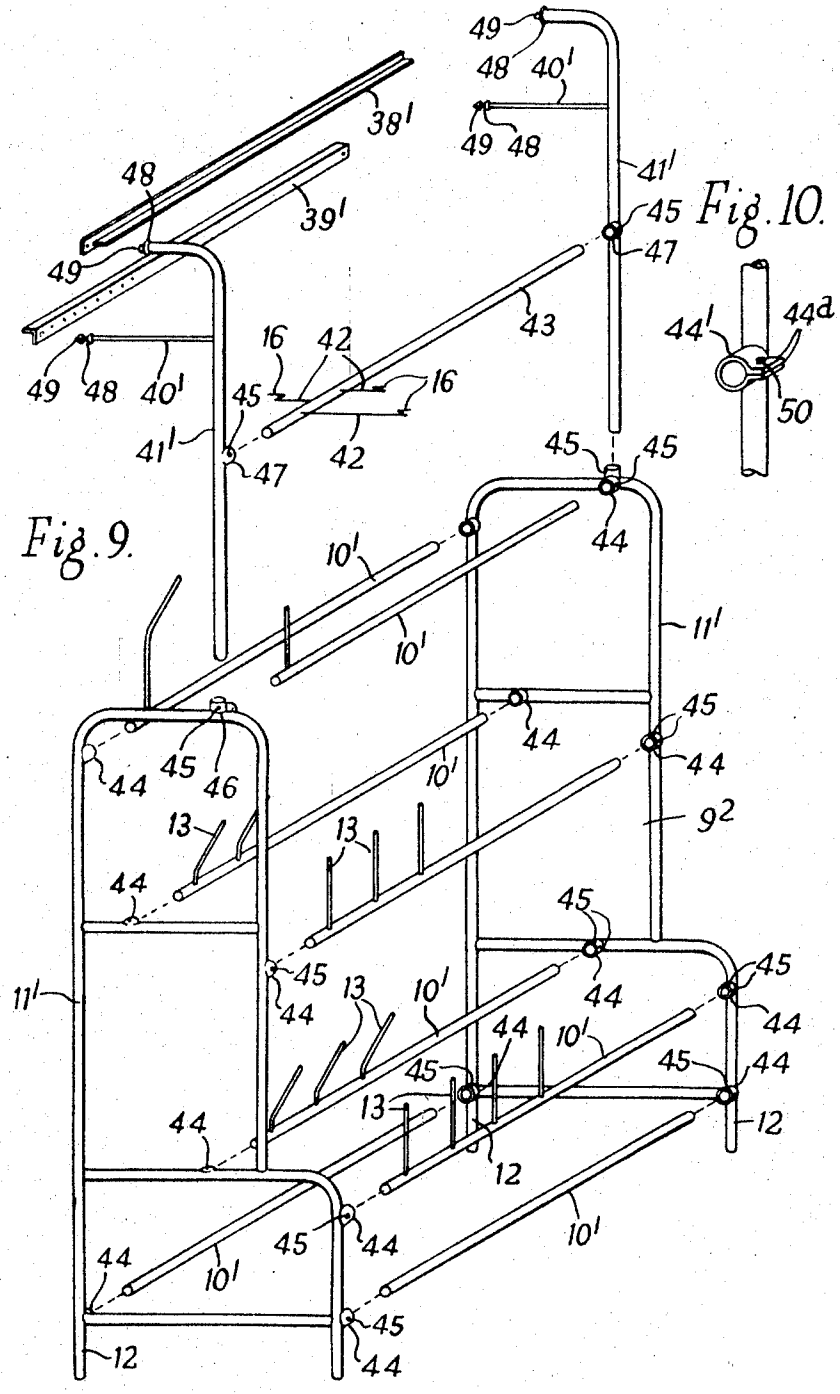

Fig. 9.

Fig. 10.

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MULTIFEED CIRCULAR KNITTING MACHINES

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Int. Cl. D04b 35/16, 15/48
U.S. Cl. 66—125 4 Claims

ABSTRACT OF THE DISCLOSURE

The combination of a circular multifeed knitting machine having no superstructure and at least one portable bobbin stand set up next to the machine. A first series of yarn failure and abnormality detector devices and associated yarn guides is mounted on the stand and a second such series is mounted on the machine. Yarns extend from bobbins on the stand, through the yarn guides thereon, to the detector devices of the first series, across from the stand to the machine and through the yarn guides on the latter to the detector devices of the second series and to the needles.

This invention appertains to a multifeed circular knitting machine for producing tubular fabric and has reference to such a machine equipped with a comparatively large number of feeds and of the class adapted for use in conjunction with at least one portable bobbin stand or creel set up next to the machine.

Such a bobbin stand or creel, which may, if desired, be furnished with castors, is set up on the floor adjacent to the machine and comprises a structure of longitudinals and ends fitted with upstanding pegs and associated holders for cones or other appropriate yarn packages.

Although there is no limitation in this respect, the present invention finds a useful application in conjunction with a multifeed circular knitting machine having a large open top cylinder and suitable for producing tubular fabric which is ultimately destined to be coated with polyvinyl chloride. Such a machine may be equipped with as many as ninety-six feeds. The invention is also applicable to large multifeed interlock and outerwear machines.

Heretofore, a multifeed circular knitting machine of the class concerned has had mounted above its knitting head a comparatively high superstructure carrying yarn guides, knot catchers and a top series of yarn failure or/and abnormality detector devices incorporated in electrical stop motion circuitry. Such a superstructure necessitates a complicated threading up system in which the single yarn ends extending across to the machine from relevant yarn packages mounted on the bobbin stand or creel have been required to extend upwardly to points high up on the superstructure before extending down again to needles in the cylinder.

The disadvantages of this arrangement were many. In the first place, the center of the machine above the knitting head was obstructed by the superstructure and closed in by a maze of yarns or threads extending upwardly and downwardly in separate feed paths, as a consequence of which the fluff or lint inevitably produced could not be easily dispersed by a blower and tended to drop with detrimental results, into the open top cylinder and thus on to the fabric being produced. Secondly, the great height of the top yarn failure or/and abnormality detector devices complicated the threading up operation and necessitated machine mechanics and operators standing upon supports disposed well above

floor level. Thirdly, the head room occupied by the machine tended to be excessive.

The primary object of the present invention is to provide an improved arrangement of a circular multifeed knitting machine of the class herein referred to associated with a bobbin stand or creel, the arrangement being designed to obviate the foregoing disadvantages as will be hereinafter described.

According to this invention, the aforesaid superstructure of the knitting machine is removed, and at least one of the series of yarn failure or/and abnormality detector devices together with relevant yarn guides are mounted upon the independent and portable bobbin stand or creel.

The expression "yarn failure" is used in a generic sense and intended to include the sudden absence of a travelling yarn or thread and as, for instance, when a yarn or thread either breaks or runs out. As to the expression "yarn abnormality" this is intended to cover not only excessive yarn or thread tension but also any other abnormal running yarn condition likely to result either in difficulty in knitting or damage to the fabric produced. Accordingly, the composite expression "yarn failure or/and abnormality detector device" means any device designed to detect and signal to electric stop motion circuitry any appropriate one or more of the foregoing yarn or thread conditions.

In one convenient embodiment of the invention the series of yarn failure or/and abnormality detector devices previously provided at the top of a superstructure on the circular multifeed knitting machine are now mounted upon the top of the portable bobbin stand or creel, whereas the remaining detector devices included in the arrangement are mounted upon a carrier component in turn supported on the said knitting machine at a lower level only a comparatively small vertical distance above the top of the needle cylinder.

More than one such independent and portable bobbin stand or creel may be arranged adjacent to one and the same multifeed circular knitting machine. Each stand or creel may be straight from end to end, or it may be of an arcuate shape and thus comprise curved tubular steel longitudinals and radially extending ends.

In order that the invention may be more clearly understood and readily carried into practical effect, specific arrangements constituting examples thereof will now be diagrammatic drawings, wherein:

FIGURE 1 is an elevational view of a portion of a typical multifeed circular knitting machine shown adjacent a bobbin stand or creel (one end only of which can be seen), the figure showing the path of a travelling yarn as it extends upwardly from the relevant cone or bobbins, through detector devices mounted respectively on the stand or creel and the machine and finally down to the needles,

FIGURE 2 is a detail plan view as seen in the direction of the arrow A in FIGURE 1,

FIGURE 3 is a plan view illustrating a typical layout of a plurality of bobbin stands or creels suitably arranged around a large multifeed circular knitting machine having a relatively great number of feeds,

FIGURE 4 is a plan view relating to a multifeed circular knitting machine which has a less number of feeds and is operated in conjunction with two straight bobbin stands or creels,

FIGURE 5 is a plan view illustrating in greater detail one of the series of yarn failure or/and abnormality detector devices mounted on each of the bobbin stands or creels,

FIGURE 6 similarly illustrates in detail one of the series of yarn failure or/and abnormality detector de-

vices mounted upon support elements in turn supported upon the circular knitting machine,

FIGURE 7 is a detail view of one of the yarn feed wheels mounted on the knitting machine,

FIGURE 8 is a perspective view of a modified form of portable bobbin stand or creel adapted to be readily dismantled,

FIGURE 9 is a view of such a stand showing the dismantling procedure, and

FIGURE 10 is a detail perspective view depicting a modification.

Like parts are designated by similar reference characters throughout the drawings.

Although FIGURES 1 and 3 depict many components and features in common, so far as the portrayal of the invention is concerned, it is to be clearly understood that the actual machines and the bobbin stands or creels are not of identical forms in the two figures. For example, the creels shown in FIGURE 3 are longitudinally curved and each carry a larger number of bobbins or cones than the creel of FIGURE 1 which is straight. Also, in the creels of FIGURE 3 the bobbins or cones at the lower part of the creels are mounted with the axes thereof vertical, whereas only the rear most bobbins or cones on the creel of FIGURE 1 are vertical. The result of this arrangement is that the yarn guides in the two creels are arranged in different positions.

In FIGURE 1, a large open top rotary needle cylinder of the multifeed circular knitting machine is provided within a sinker ring **2**. The cylinder gear, housed within a casing **3**, is adapted to be driven from a horizontal main shaft at **4** through the medium of gearing not shown but encased at **5**. The entire knitting head of the machine is supported from the framework **6**.

Although the illustrated machines are equipped with large numbers of feeds, a yarn feeder **7** at only one of such feeds is shown in FIGURE 1. The reference numeral **8** indicates the cross arms of the erstwhile bobbin stand of the machine.

In the particular example illustrated in FIGURE 3, six longitudinally curved and portable bobbin stands or creels **9** are set up on the floor around the machine. There are two opposed groups of these stands or creels arranged, as shown, at respectively opposite sides of the machine. In each such group there are three bobbin stands or creels **9** arranged end to end in a continuous arc. Substantial gaps G are left between the ends of the two such opposed arcuate groups. Each portable stand or creel comprises a structure of parallel longitudinals **10** and straight, radially extending ends **11** adapted to provide legs such as **12** (FIGURE 1). The structure is fitted with upstanding pegs such as **13** and associated holders **14** for yarn packages in the form of cones C.

In accordance with the characteristic feature of the present invention, the multifeed circular knitting machine is not provided with a superstructure supported by or from the cross arms **8**, and one series of yarn failure or/and abnormality detector devices **15** (i.e., those previously provided at the top of such a superstructure), together with associated yarn guides **16** and **17**, are all mounted upon the one or more independent and portable bobbin stands or creels **9**. The remaining detector devices **18** included in the arrangement are mounted upon a common carrier ring **19** in turn supported from the cross arms **8** of the machine in a manner presently to be described.

Each of the detector devices **15** is of the kind comprising, as shown in FIGURE 5, a pair of spaced pivoted dropper hooks **20** and a movable excessive tension plate **21**. The excessive tension plate **21** is mounted on a U-shaped section of wire **21***a* pivoted at the ends thereof to the main body **15***a* of the detector device **15**. A pair of ceramic sleeves C are mounted on the arms of wire section **21***a* and the yarn Y runs over sleeves C and over plate **21**, the dropper hooks **20** resting on the travelling yarn Y.

The U-shaped section of wire **21***a* is spring urged upwardly so that the yarn Y "rides" thereon, against the spring biasing. The ends of carrier wire **21***a* and the inner ends of the dropper hooks **20** influence a switch mechanism located within body **15***a*, the switch mechanism being incorporated in an electrical stop motion circuit. Thus a travelling yarn Y threaded through each detector device **15** holds up the dropper hooks and passes over the excessive tension plate **21** so that, in the event of the yarn breaking or running out, the dropper hooks **20** fall, whereas the excessive tension plate **21** is pulled down in the event of the yarn becoming unduly tensioned, the result in either case being to make the electrical stop motion circuit. The detector devices **15** on the or each bobbin stand or creel **9** may also be furnished with signal lamps adapted, when lighted, to indicate the source of yarn failure or yarn abnormality.

The detector devices **18** on the multifeed circular knitting machine are each of the known type comprising, as illustrated in FIGURES 1 and **6**, a spring-influenced pivoted arm **22** which at its outer end **22***a* is formed for the retention and guidance of a travelling yarn Y running over it and at its other end is associated with an electrical switch or switch contacts **23** incorporated in a stop motion circuit. The arrangement of each detector device **18** is such that while a yarn Y is running normally over the pivoted arm **22** the latter is held down to maintain the relevant stop motion circuit open. Whenever the yarn becomes excessively tensioned the arm is pulled down to the point where the yarn slips off it and the released arm thereupon swings up to make the circuit and initiate stoppage of the machine. Moreover, if the travelling yarn either breaks or runs out, the pivoted arm is in this case also permitted to swing up to make the circuit. Each of these detector devices **18** may, if desired and like the devices **15**, have combined therewith a signal lamp which is so incorporated into the circuit that it lights up to indicate a yarn failure or development of a yarn abnormality at that detector.

The common carrier ring **19** is itself carried by pillars or similar vertical elements such as **24** (FIGURE 1) which are secured upon circumferentially spaced radially extending horizontal rods **25**. The inner end of each rod **25** is secured in a bored bracket **26** mounted up on a further ring **27**. At appropriate intervals therearound this ring **27** is provided with lugs **27***a* whereby it is secured to, and thus carried by, the outer ends of the cross arms **8**. Well below these cross arms, and just above the rotary knitting portion of the machine, is located a support **28** for a circular series of fixed pot eyes **29**—one to each feed. Thus, since the particular machine diagrammatically represented in FIGURE 1 is equipped with ninety-six feeds, there are also ninety-six of the pot eye guides **29**. Upon the outer extremity of each rod **25** is secured a lug **30***a* depending from yet another ring **30** in which are fitted another ninety-six yarn guides **31** of pot eye form.

Also mounted upon each radial rod **25**, between the vertical element **24** thereon and the lug **30***a*, is a depending bracket **32**, the lower ends of these brackets carrying a ring **33** in turn serving to support rotary tape wheels **34** of yarn feeding devices **35** of known tape-operated type. As shown in FIGURE 1, there are two coaxial tape wheels **34** per device **35**, and in the layout depicted in FIGURE 3 there are forty-eight of the devices **35**, and hence ninety-six of the wheels **34**, one to each feed. Each yarn feeding device includes a plate **36** in which are set two pot eye guides **37**.

Referring to FIGURE 3, a continuous tape **51** extends around the machine in contact with the peripheries of each of the upper tape wheels **34** in each device **35**. A similar tape (not shown) extends around each of the lower wheels **34** in the devices. These tapes each pass around a drive pulley **52** at a location on the periphery of the machine, the two pulleys **52** being mounted coaxially on a vertical drive shaft **54** driven from the gearbox of the

machine. Thus, the tape wheels are all driven in rotation from pulleys **52**.

Yarn to be fed by a tape wheel **34** is passed around the periphery of the latter between the surface of the wheel and the tape.

The top of each independent and portable bobbin stand or creel **9** includes a horizontal rail **38** upon which are mounted the aforementioned yarn failure or/and abnormality detector devices **15**. The rail **38** is disposed at a height a little above that of the radial rods **25** and hence also that of the ring **30** in which are fitted the pot eyes **31**. A little below and in advance of the rail **38** there is provided on each stand or creel another horizontal rail **39** in which the yarn guides **17**, also in the form of pot eyes, are fitted. In the example shown in FIGURE 1, the rail **39** is carried by arms **40** secured to upright portions **41** of the stand or creel **9**.

The yarn guides **16** are formed at the outer ends of horizontal wires or arms **42** secured upon the one or more bobbin stands or creels.

Thus tracing the complete path of any one travelling yarn Y, the latter extends first upwardly from the relevant cone or bobbin C, through at least one of the guides **16** and from thence up to and through a detector device **15** mounted upon the rail **38** of the bobbin stand or creel **9**. From this detector device **15** the yarn Y extends downwardly and through the appropriate guide **17** set in the rail **39** on the stand or creel, whereafter it extends horizontally or nearly so right across the gap between the stand or creel and the knitting machine. Next, the yarn passes down through the relevant pot eye guide **31** mounted in the ring **30**, through a pot eye guide **37** in a plate **36**, then round a circumferential groove in the relevant tape wheel **34**, next over the pivoted arm **22** of a detector device **18** on the machine and finally down through a pot eye **29** to the needles.

The invention includes, as a feature, and for use in conjunction with a knitting machine, an independent portable bobbin stand or creel furnished with a set of yarn failure or/and abnormality detector devices.

In regard to a 96-feed machine, creels for 192 bobbins may be arranged for "pig-tail" tie up. In this case about a ¼ ton of yarn, calculated at 3 pounds a cone, would be involved. As will be appreciated to lift a load of this size a height of 6 feet in a conventional machine with an overhead bobbin-stand creates considerable difficulty which has been solved by the present invention.

A 44-feed interlock or outerwear machine set up with creels for 88 bobbins for "pig-tail" tie-up gives long uninterrupted runs.

FIGURE 4 illustrates in plan view, a 48-feed circular knitting machine which is operated in conjunction with two straight bobbin stands or creels 9^1.

There are occasions, especially during packaging of components forming the arrangement of this invention, for transport and delivery, when it is advantageous to provide portable bobbin stands or creels which, instead of being welded construction, are so made as to be capable of being readily dismantled and packed into a minimum of space. Such a collapsible stand or creel is illustrated in FIGURES 8 and 9, the article being complete in FIGURE 8 and shown in the course of dismantling in FIGURE 9. Although this feature is shown applied to a straight stand or creel it can manifestly also be applied to a longitudinally curved stand or creel. As will be seen, the modified bobbin stand or creel is based on the fact that the ends 11^1 can be separated from the parallel tubular longitudinals 10^1, and the upright portions 41^1 can be similarly separated both from the said ends 11^1 and also from a horizontal rail **43**, by the simple expedient of loosening screws. Thus, the inner sides of the ends 11^1 have welded thereto sockets **44** to receive the ends of the tubular longitudinals 10^1, each joint being secured by two screws **45**. Similar sockets **46** combined with screws **45** are provided on the top rails of the ends 11^1 to receive the lower ends of the uprights 41^1. Again sockets **47** welded to these uprights serve to receive the ends of the horizontal rail **43**. Screw and nut fastenings at **48**, **49** are provided to secure in position the rails 38^1 and 39^1. The sockets may alternatively be formed as shown at 44^1 in FIGURE 10, the lugs **44***a* being adapted to be secured together by a single screw **50**.

I claim:

1. In combination: a circular multifeed knitting machine equipped with needles and having no superstructure; at least one independent portable bobbin stand set up next to said machine for supporting bobbins of yarn; a first series of yarn failure and abnormality detector devices mounted upon the top of the said stand; an erstwhile bobbin stand mounted on the machine, a first ring secured to said bobbin stand, brackets mounted on said first ring, horizontal rods extending radially outwardly from said brackets, a second ring supported from said horizontal rods, and a second series of detector devices mounted upon said second ring, and yarn guides located on both the machine and the stand for guiding and threading yarns travelling from the bobbins to the needles of the machine through the detector devices of both series.

2. A combination according to claim **1** further comprising yarn feeding devices including wheels, a ring for supporting said wheels, and brackets depending from said horizontal rods for carrying said ring.

3. A combination according to claim **2** further comprising a ring for mounting the yarn guides on the machine, said ring being supported by said horizontal rods.

4. A combination according to claim **3** further comprising a horizontal rail mounted on the top of the portable bobbin stand for mounting the relevant detector devices, said rail being disposed at a height a short distance above said ring for mounting said yarn guides, said combination further comprising a further horizontal rail mounted below and in advance of said first-mentioned rail on said stand, and yarn guiding eyes fitted in said further horizontal rail.

References Cited

UNITED STATES PATENTS

932,522	8/1909	Wardwell	242—131.1
1,022,283	4/1912	Wardwell	242—131.1
2,387,100	10/1945	Wachsman	66—163
2,967,413	1/1961	Jackson et al.	66—132
3,018,645	1/1962	Fried	66—125

FOREIGN PATENTS

1,172,006	6/1964	Germany.

ROBERT R. MACKEY, Primary Examiner

U.S. Cl. X.R.

66—163, 132; 242—131