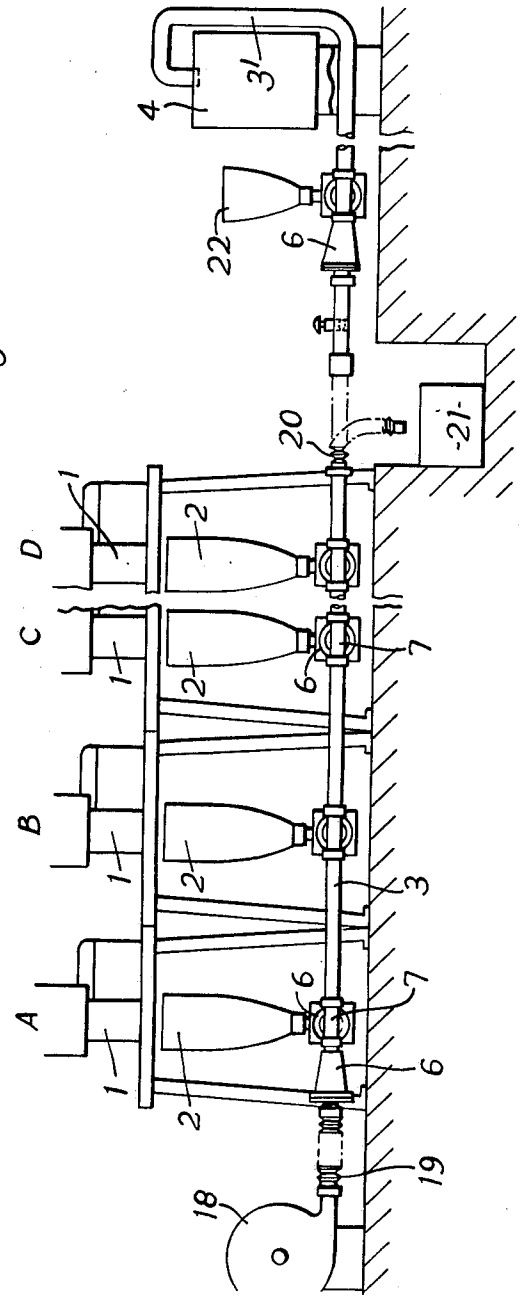
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PNEUMATIC COLLECTING SYSTEM

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Fig. 1.



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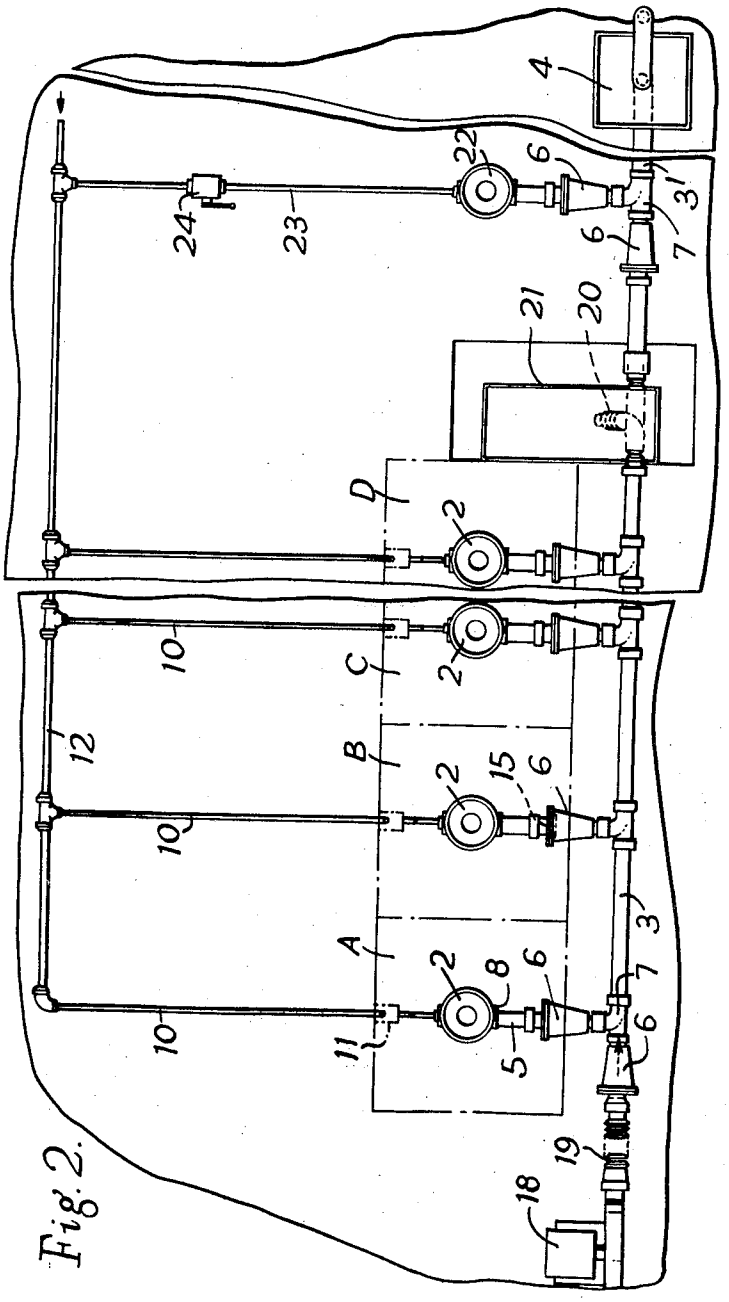


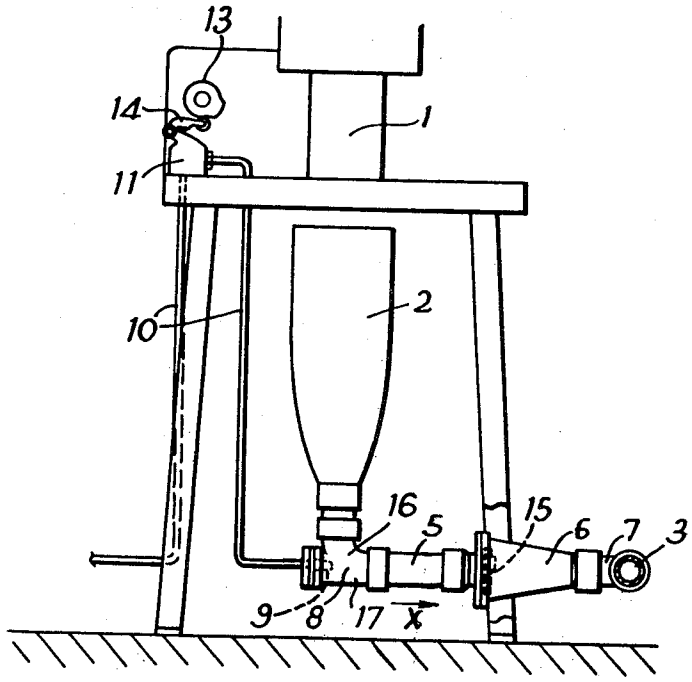
Fig. 2.

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Fig. 3.



United States Patent Office

3,195,959

Patented July 20, 1965

3,195,959

PNEUMATIC COLLECTING SYSTEM

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Filed June 3, 1963, Ser. No. 284,870
Claims priority, application Great Britain, June 7, 1962, 22,018/62; Jan. 22, 1963, 2,627/63
4 Claims. (Cl. 302—27)

The subject of this invention is a pneumatic system for the automatic collection into a common locality of lightweight goods from a plurality of separate despatch points.

It is to be understood that, where in this specification we use the term "collection," this is not necessarily to imply that the goods are invariably to be deposited in the aforesaid common locality, because the latter may, in fact, only represent a transit point in the passage of the goods to other destinations. There are numerous instances where a system of this nature is of great utility and to which the invention can be applied, but for simplicity we shall hereafter refer to the case of a group of knitting machines, which represents a very typical example.

In many kinds of such machines the knitted goods are delivered as separate articles or in separate lengths. Thus, for example, it is commonplace in circular knitting machines for, say, stockings to be knitted separately and, on completion of the article, for the yarn to be cut and trapped and the stocking dropped off. The articles or sections of fabric separated off in this way are conventionally collected by hand and transported to the next handling point.

Means are also known for despatching products pneumatically from knitting machines to a collecting point, or to a further treatment locality; usually this involves applying suction through a tubing leading to the machine, there usually being a suction line from each machine to this point. This known arrangements are thus relatively complicated and involve substantial installation costs.

The object of the present invention is an improved system for the automatic collection from a plurality of points of goods of a lightweight and non-bulky character which can be propelled by air pressure, for example stockings, socks and so on.

In general outline, this system involves a feed conduit serving each despatch point and connected to a service line common to the feed conduits, a blower nozzle in each feed conduit for applying compressed air downstream to the goods entering this conduit so as to blow them into the service line, and a non-return valve between the nozzle and the service line to prevent the passage of compressed air upstream of the feed conduit concerned.

The principle therefore is that each of the despatch points, in the chosen example a line or bank of knitting machines, has a feed conduit to the common service line and, when an article or product from any one of these machines is to be delivered into and along that line, the air nozzle in the feed conduit concerned is operated so that it will impel the article or product towards the service line and at the same time will force open the corresponding one-way valve to allow this article or product to pass, and the continuing effort of the blow will send the product or article along the service line to its delivery end. Because of the presence of the non-return valves in all the other feed conduits, the air blast from any one conduit will act to ensure that these other valves are held closed and thus preclude a rush of air into any of the other feed or tributary conduits, which might divert the work out of the common service line or interfere with the strength of the air propulsion on the trajectory of the goods.

In further pursuance of this requirement, it will be arranged that the feed conduits will join the main service line obliquely with a terminal part oriented in the direction of the delivery end of this line. Advantageously use is made for this purpose of a T junction piece with a curved junction between the stem and cross limb of the T, for the purpose stated. By this means the goods are ensured a smooth passage without distracting eddies or air currents being produced. Such couplings can, moreover, be used as standard parts of the equipment at other places in the system requiring a change in direction of the air flow.

Further the nozzles in all the feed conduits will most conveniently be supplied with compressed air from a common source depending, of course, on the number of nozzles to be served, and the output of the pump or compressor unit which represents the source of supply. These nozzles will, moreover, preferably be individually controlled, that is to say openable to allow the passage of compressed air therefrom without reference to the other nozzles in the system. In the chosen case of the knitting machines, this opening can, for example, be controlled by the pattern drum or cam drum controlling the other operations of the knitting machine, when it will be possible to time the blow so that it takes place as soon as the work has been delivered from the machine.

From the above it will be apparent that the air "blow" in each feed conduit is relied on to despatch the goods along the main service line to the ultimate destination. Now, the system can if need be, serve relatively scattered and widely-separated despatch points, and in some cases this may necessitate quite a high pressure air impulse if the service line or any feed conduit is at all lengthy. Further, as it is most convenient to supply all the nozzles from a common air source, unless special provisions are made there may in some circumstances be a substantial consuption of high pressure air in the system.

To cater for this possibility, in accordance with a feature of this invention, an auxiliary low pressure air blow is made available along the service line (in the direction towards the delivery end of the latter, of course), so that the primary air impulses from the blow nozzles need only be very short-lived and only powerful enough to move the goods concerned to the service line, where their further progress will be taken care of by the auxiliary supply.

This arrangement can secure a substantial reduction in the consumption of high pressure air in the system and, indeed, it is economically feasible, even if there are only a small number of despatch points in the system, to arrange for the auxiliary low pressure air supply to be applied permanently while the system is "alive," for example by means of a compressor coupled to the upstream end of the service line. Each time an individual primary impulse is applied at a despatch point, it opens the one-way valve of the feed conduit concerned and sends the goods through it into the steady low-pressure air stream with a momentum which boosts the power of the latter to assist conveyance of the goods to a final destination.

The use of junction pieces shaped and arranged as described above (so that the high pressure impulse will be positively directed downstream), militates against diversion of high pressure energy towards the compressor or other low pressure air source, but in any event a one-way valve will advantageously be provided between this compressor or source and the first branch conduit downstream therefrom along the service line. This not only avoids any loss of high pressure air, but also allows the low pressure source to be cut out of the system at any time, and the latter operated as previously described. This may be convenient, for example, to allow for main-

tenance or replacement of the compressor without interrupting the functioning of the system.

As a further feature of the invention the service line may be provided at its downstream end with an optionally-usable take-off for the goods and with an auxiliary feed conduit and blow nozzle for returning to the line goods withdrawn at the take-off.

The accompanying drawings illustrate an example of a system according to this invention utilised in conjunction with a bank of knitting machines. It is emphasized that these drawings are purely diagrammatic, and in them:

FIGURE 1 is an elevational illustration of the lay-out of the system,

FIGURE 2 is a plan view of the same, and

FIGURE 3 is an enlarged illustration of part of the system serving one particular unit.

It has been assumed that the arrangement illustrated in the drawings serves four side by side knitting machines, here indicated notionally as A, B, C and D, which are of the circular type for knitting stockings and in which the completely-knitted stockings are cast off automatically from the machine through a guide tube **1**.

These machines are assumed standing side by side, and it will be observed that collecting funnels **2**, forming part of the system of the present invention and representing the collecting points referred to, are located beneath the tubes **1** so as to receive the knitted stockings. The funnels **2** are all connected to a common service line **3**, by means of which the products will be conducted to a main collecting point, represented by a simple bin **4**. This may, for example, be located at the site of a hose-reversing and examining device, such as that described in co-pending application No. 22,019/62, now abandoned.

FIGURE 3 shows, in more particularity, the means by which each funnel **2** is connected to the service line **3**, viz. through a feed conduit **5**, an adjoining one-way flap valve **6** and a T junction piece **7**. In addition it will be observed that a further and like junction piece **8** connects the outlet from funnel **2** to conduit **5**, and this has an end closure disc in which is mounted a blow nozzle **9**, the orifice of which is directed along the axis of conduit **5**, i.e. in the direction of arrow X (FIGURE 3). As a result the air blow from nozzle **9** is most fully and effectively applied downstream behind a stocking dropped into the corresponding funnel **2** which the junction piece **8** immediately adjoins. Further, by virtue of the arrangement described the feed conduits **5** and service line **3** can be disposed horizontally at a low level, leaving the knitting machines and their operative mechanisms fully accessible.

Each nozzle **9** is connected through a high pressure air line **10**, containing a change-over air valve **11**, to a compressed air supply line **12** from which all the lines **10** are branched and which is supplied from a compressor or other source, for example of the kind normally available in a manufacturing plant. Each air valve **11** is shown (see FIGURE 3) as being automatically operable by a cam **13** on the pattern drum of the knitting machine concerned, the cam **13** being set so that it actuates the lever arm **14** to open the air valve **11** shortly after the termination of the knitting and the casting off of the product into funnel **2** for automatic despatch of the stocking to bin **4**.

The valves **6** are advantageously of the construction described and illustrated in our co-pending application No. 22,021/62, now abandoned. They will not therefore be described here in any detail, except to say that they each have a port closed by a loosely hinged flap plate **15** which will open to allow the passage of air, applied in the direction of arrow A (see FIGURE 3), from the corresponding blow nozzle **9**, but will be held firmly closed by any air pressure applied thereto from the reverse side, i.e. from the direction of the service line **3**.

It will further be observed that the T junction pieces **7** and **8** are of identical form, so that they can be interchangeably used in the system (being a simple push fit on a standard range of piping), and in each case comprise a stem **16** (see FIGURE 3) which is curved towards one end of the cross limb **17** of the piece. This provides for a smooth transition and an unobstructed flow of air and work from funnel **2** into the conduit **5** and from the valve **6** into service line **3**.

It will also be observed that this service line is connected at its upstream end to an air compressor **18** through a quickly detachable flexible coupling tube **19** and an adjoining air valve **6** of like form to those used in the feed conduits **5**. The compressor **18** can therefore be coupled up to the system or disconnected as required, and in the former case will be used to apply a low pressure blow, which can economically be continuously applied, to the suction conduit **3**, which will serve to reduce the air pressure required at the nozzles **9** to forward stockings from the funnels **2** along the service line **3** to their eventual destination at **4**. The associated valve **6** will serve as an anti-escape closure in the event that the compressor is uncoupled for any reason, for example when the system is operated purely under high pressure air, or for repairs or maintenance to this compressor without making the system inactive.

It will further be noted that a similar flexible and detachable coupling **20** is provided at the downstream end of the service line **3**. This expedient can be incorporated for the purpose of withdrawing stockings from the service line **3** into a sampling bin **21** for periodic inspection. With appropriately staggered knitting period effective at the different machines, it is possible to arrange that a group of successive stockings reaching **20** will be made up of one from each of the machines, so that one disconnection of the tube **20** will give a sample for each of the machines.

Furthermore, arrangements are made for returning these so-withdrawn stockings to the delivery end of the system, for which purpose a further funnel **22**, similar to funnels **2**, is connected up to the main compressed air line **12** through a branch **23** containing a manually operable change-over air valve **24**. Again use is made of a one-way flap valve **6** between funnel **22** and the end section **3'** of the service conduit **3**, a T junction piece **7** between valve **6** and section **3'**, and a further valve **6** between the latter and the remainder of the service line. It will be appreciated, of course, that the end section **3'** may be of extended length, being for example located in an adjoining room.

As will be apparent from the foregoing the system can be established from a small number of standard components which basically comprise lengths of tubing, standard flap valves **6** and junction pieces **7**. All these parts will preferably be made smooth-surfaced where delicate articles are to be transported, for example in the case of nylon hose. Acrylic plastics have been found admirable for this purpose and have the further advantage of transparency, which enables the working of the system to be supervised readily at all times. The single service lines **2** may extend throughout the length of the shop and possibly to other rooms, control stations or the like. Bends in this system may be catered for by lengths of flexible tubing, e.g. of ruber or nylon, with a push fit on to the adjacent tubing ends. Indeed, the layout of the system described is very flexible in that it can be physically adapted to suit very many varied conditions of machine arrangement, plant lay-out, and so on, without requiring elaboration. It will also be appreciated that the actual system itself can be duplicated or multiplied several times to serve particular work or other programmes, and these multiple systems can conceivably be served by common air sources.

We claim:

1. A system for the collection of goods from a plurality of despatch points, comprising a main service line, a feed conduit connected to each despatch point and to said service line, a blower nozzle associated with each feed conduit and adapted to apply a compressed air impulse down-

stream of this feed conduit and towards the main service line, and a non-return valve between said nozzle and said service line said non-return valve comprising a flap hinged to and seated against an annular stop surface in said feed conduit immediately in front of said nozzle, such that the flap will be swung upward by the direct impact of an air blast from said nozzle, and thereby opening a passage into said service line, and whereby said flap will be positively closed against the annular stop surface by air pressure directed thereagainst from said service line.

2. A system for the collection of goods from a plurality of despatch points, comprising a main service line, a feed conduit connected to each despatch point and to said service line, through a junction piece of T shape having a curved junction between the stem and cross limb of the T, a blower nozzle associated with each feed conduit and adapted to apply a compressed air impulse downstream of this feed conduit and towards the main service line, and a non-return flap valve between said nozzle and said service line said non-return valve comprising a flap hinged to and seated against an annular stop surface in said feed conduit immediately in front of said nozzle, such that the flap will be swung upward by the direct impact of an air blast from said nozzle, and thereby opening a passage into said service line, and whereby said flap will be positively closed against the annular stop surface by air pressure directed thereagainst from said service line.

3. A system for the collection of goods from a plurality of knitting machines, comprising a main service line, a

receiver funnel beneath each said linking machine, a feed conduit between each receiver funnel and said service line, a blower nozzle associated with each feed conduit and adapted to apply a compressed air impulse downstream of this feed conduit and towards the main service line, means operable by the knitting controls of the associated knitting machine to open said nozzle, and a non-return flap valve between said nozzle and said service line said non-return valve comprising a flap hinged to and seated against an annular stop surface in said feed conduit immediately in front of said nozzle, such that the flap will be swung upward by the direct impact of an air blast from said nozzle, and thereby opening a passage into said service line, and whereby said flap will be positively closed against the annular stop surface by air pressure directed thereagainst from said service line.

4. A system according to claim 1, further including means connected to the upstream end of said service line for applying an auxiliary low pressure air blow thereto.

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